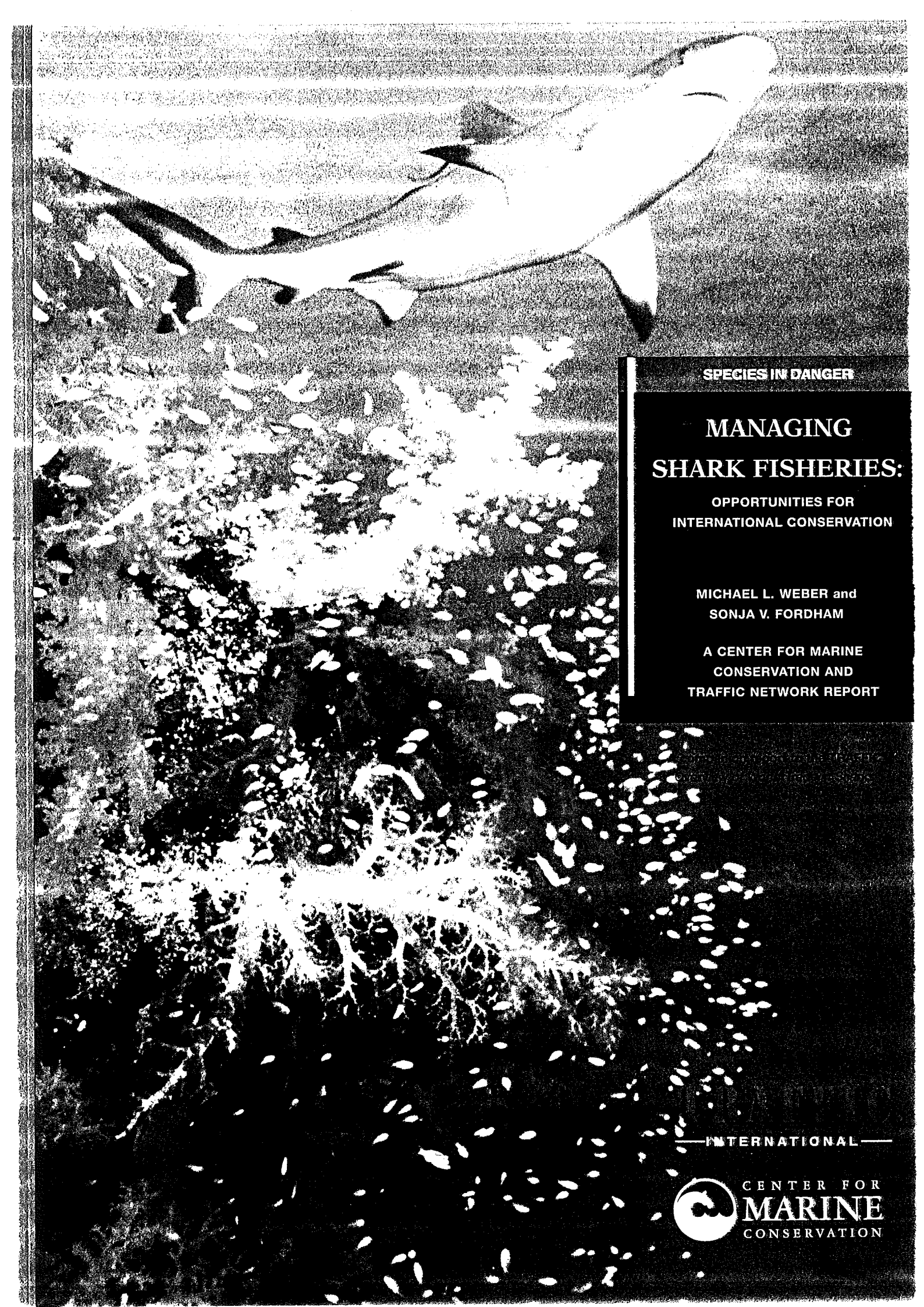

SPECIES IN DANGER

MANAGING SHARK FISHERIES:

OPPORTUNITIES FOR INTERNATIONAL CONSERVATION

MICHAEL L. WEBER and
SONJA V. FORDHAM

A CENTER FOR MARINE CONSERVATION AND TRAFFIC NETWORK REPORT

INTERNATIONAL
CENTER FOR MARINE CONSERVATION

MANAGING SHARK FISHERIES: OPPORTUNITIES FOR INTERNATIONAL CONSERVATION

by

Michael L. Weber
Sonja V. Fordham

CONTENTS

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Maps 1 through 4 reprinted from *Overview of World Elasmobranch Fisheries*, FAO Fisheries Technical Paper No. 341.

Maps in Appendix I reprinted from *Sharks of the World*, FAO Species Catalogue, Volume 4, Parts 1 and 2. 1984.

Illustrations in Appendix I by Kim Barcas for the Center for Marine Conservation.

EXECUTIVE SUMMARY

In Conference Resolution 9.17 on "Status of International Trade in Shark Species," the CITES Parties called upon the CITES Animals Committee to compile and review existing information on the biological and trade status of shark species. As a contribution to this effort, the Center for Marine Conservation (CMC) has prepared this report regarding existing international agreements that may promote the conservation of sharks.

Although they share many features with other fishes, many species of shark have biological and behavioral characteristics closer to those of sea turtles, cetaceans, large land mammals, and birds: These species grow slowly, mature late, produce few offspring, and live long. These features, which have served sharks well since the Cretaceous era, make them extremely vulnerable to overfishing. Once depleted, they are slower to recover than other fishes, even given a complete respite from exploitation.

Unlike other fishes, most sharks are captured incidentally in fisheries directed at other species, such as tuna, billfish, and shrimp, that are more abundant, faster growing, more fecund, and economically more valuable than are sharks. In such circumstances, fishing for tuna and billfish could continue to be economically viable long after less abundant populations of less valued sharks have been extirpated.

Due partly to the historically low economic value of sharks, little effort has been made to collect even the most basic kinds of fisheries information, such as numbers of sharks caught and discarded, necessary for meeting even minimal standards of management of fisheries affecting sharks.

Since World War II especially, fisheries that directly and indirectly catch sharks have expanded around the world. According to statistics on catches provided to FAO by individual countries, landings of sharks increased by more than 100,000mt between 1985 and 1994, when 730,784mt were recorded. (See Table 1) Of these, 182,000mt were sharks, 197,000mt were skates and rays, 5,000mt were chimaeras, and 347,000mt were unidentified.

Over the centuries, different cultures have relied on sharks for a wide variety of products, such as meat, skins for leather or abrasives, liver oil for textile and tanning industries, for lubricants, cosmetics and vitamins, cartilage for use in fishmeal, cartilage as a reputed cancer treatment, teeth and jaws for the tourist trade, and fins for shark fin soup. This report focuses on three types of shark products: meat, oil, and fins.

Several recent reviews have found little or no attention paid by domestic and international fishery management institutions to the directed and incidental catch of sharks, despite their vulnerability, the important role that sharks play in marine ecosystems, and the increasing volume of catches and of trade in shark products. In his review of elasmobranch fisheries, Bonfil (1994) found that of 26 countries reporting shark catches greater than 10,000mt, only the United States, New Zealand, and Australia had domestic management and research programs, and that these three programs are recent and cover only some species and some areas. None of the other 26 countries have management and research programs, although in some cases, such as Indonesia and Pakistan, shark landings have been growing rapidly.

This report analyzes several existing international fisheries regimes, and identifies gaps in the conservation of sharks. Gaps are of two general types. Geographical gaps result from incomplete geographical coverage of species of concern by existing management regimes. Functional gaps result from the lack of authority or capability in an international regime to carry out some key element in conservation, such as enforcement or data collection and analysis. A comparison of the range of key species of sharks with the jurisdiction of existing fisheries management regimes reveals large gaps in some areas. Also, in the Pacific as well as the Atlantic and Indian Oceans, significant numbers of countries whose vessels target or incidentally capture sharks in areas under the purview of international organizations are not members of those organizations.

In August 1995, a United Nations Conference adopted The 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 —an extraordinary consensus among the community of nations regarding proper management and conservation of living marine resources. In analyzing existing agreements regarding functional gaps, this report uses the UN Agreement as a framework, focusing upon the precautionary approach, collection and analysis of fisheries data, assessment of the impacts of fishing on associated or dependent species, and minimization of bycatch and discards.

This study analyzes the following six fisheries regimes: Northeast Atlantic Fisheries Commission, General Fisheries Council for the Mediterranean, International Commission for the Conservation of Atlantic Tunas, Inter-American Tropical Tuna Commission, South Pacific Forum Fisheries Agency, and Commission for the Conservation of Southern Bluefin Tuna. The key elements of the UN Agreement identified above are nearly or entirely absent from the texts and programs of these regimes.

The analysis then evaluates opportunities for advancing the conservation of sharks under several other living resource conservation regimes: The Convention on International Trade in Endangered Species of Wild Fauna and Flora, the Convention on Biological Diversity, and the Migratory Species Convention. The report closes with several recommendations:

- Countries should become active members of relevant treaty organizations as a matter of priority.
- At a minimum, existing regimes for the conservation of living marine resources should be strengthened to reflect the precautionary approach and other elements of sound fisheries management.
- Countries should sign and ratify the UN Agreement on straddling and highly migratory populations of fish.
- Among the most immediate priorities is the initiation of programs to collect, evaluate, and disseminate information on the capture of sharks in fisheries.
- Parties to the Bonn Convention should identify populations of sharks that would benefit from international agreements among range states promulgated under the treaty, list these on the appropriate Appendix, and convene negotiations to develop necessary agreements under the Convention.
- As parties to the Convention on Biological Diversity draw up their national strategies, they should take the opportunity to develop better information and domestic management structures for sharks.
- Finally, without prejudging or endorsing any particular listing proposals, it is recommended that CITES Parties should carefully consider proposals to list species of sharks that may qualify under CITES criteria, taking into account enforceability, adequacy of supporting data, and any potential conservation benefits.

INTRODUCTION

At the Ninth Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) in 1994, delegates responded to mounting concerns over some of the last unmanaged harvests of wild animals in the world—fisheries that capture sharks, rays, skates, and chimaeras.[1] In its resolution on "Status of International Trade in Shark Species" (Conference Resolution 9.17), the Parties called upon the CITES Animals Committee to compile and review existing information on the biological and trade status of shark species. The Animals Committee was to draw upon information provided by the United Nations Food and Agriculture Organization (FAO), other international fisheries management organizations, and the non-governmental community. The Animals Committee is to submit a discussion paper on these matters six months before the Tenth Conference of the Parties in June 1997.

Several reports that will contribute to a final report to the Parties were presented to the Animals Committee at its September 1996 meeting in the Czech Republic. At the request of the Chair of the Animals Committee, the U.S. National Marine Fisheries Service (NMFS) had compiled information about shark fisheries and other relevant matters provided by CITES Parties in response to CITES Secretariat Notification 884 (Oliver, 1996). The Shark Specialist Group of the World Conservation Union (IUCN), which has been preparing a global action plan for the conservation of sharks, presented a draft paper on the implications of biology on conservation and management of sharks (Anon., 1996a). The TRAFFIC Network, the wildlife monitoring programme of the IUCN and the World Wide Fund for Nature, presented a preliminary summary of a detailed analysis of world trade in sharks. Finally, FAO summarized its ongoing work that will contribute to CITES current efforts. The Government of Japan also presented a paper summarizing catch and species composition in its pelagic fisheries in the North Pacific.

Drawing upon these three recent reports as well as a TRAFFIC global overview of the trade in sharks and other literature, the Center for Marine Conservation (CMC) evaluated existing international wildlife agreements and fishery management regimes relevant to shark conservation. In assessing current agreements, CMC used the standards and features of the recently concluded United Nations Agreement on straddling fish stocks and highly migratory fish stocks since this document reflects a consensus view of the necessary elements in the management and conservation of global fisheries. The present document conveys the results of this investigation.

THE BIOLOGY OF SHARKS

Although they share many features with other fishes, most species of sharks have biological and behavioral characteristics closer to those of sea turtles, cetaceans, large land mammals, and birds (Anon., 1996a). These species grow slowly, mature late, produce few offspring, and live long. These features, which have served sharks well since the Cretaceous era, make them extremely vulnerable to overfishing. Once depleted, they are slower to recover than other fishes, even given a complete respite from exploitation.

There is great diversity among sharks. For instance, individuals of some species, such as the Australian Sharpnose Shark *Rhizoprionodon taylori* may mature within one year, while individuals of other species, such as the Dusky Shark *Carcharhinus obscurus* may take 20 to 25 years to mature. Soupfin Sharks *Galeorhinus galeus* may live 60 years, while the lifespan of a Blue Shark *Prionace glauca* is approximately 20 years (Anon., 1996a). (See Appendix I for descriptions and range maps of selected species.)

Sharks inhabit a very broad range of habitats, from deep oceans to freshwater rivers and lakes. Some migrate great distances, while others are quite restricted in their distribution. About half of all species are found over the continental shelves to a depth of 200 meters (Anon., 1996a). Another third inhabit deeper waters to 2,000

meters. Just five percent of shark species are truly oceanic. Many species use nearshore waters, especially bays and estuaries, for pupping young and early growth, while others pup on the open ocean.

Although the differences among sharks are great, they are far less than the differences between sharks and most other fishes. These latter differences have profound implications for managing fisheries affecting sharks and conserving shark populations. For instance, traditional strategies for managing fisheries are predicated on the reproductive biology of fishes that release large numbers of eggs, few of which need survive to adulthood in order to maintain abundance (Oliver, 1996). Sharks, on the other hand, produce few young, many of which survive to adulthood. As a result, there is a much closer correlation between the number of breeding adults and the number of offspring annually added to a population of sharks. Under natural conditions, in which predation on sharks is minimal, this low reproductive potential can maintain populations of sharks. However, increased mortality caused by fishing can upset this balance.

Other biological aspects of sharks also make them vulnerable to overfishing. For instance, some species such as Blue Sharks and Piked Dogfish *Squalus acanthias* gather in schools by age, sex, and reproductive state (Anon., 1996a). Intense fishing can eliminate large segments of particular age classes, including reproductively active segments. As described in the report submitted by the Shark Specialist Group and elsewhere, fisheries directed at sharks have led quickly to collapse. For instance, after several cycles of increased effort and landings followed by declines, the Norwegian longline fishery for Porbeagle in the Northwest Atlantic grew from landings of 1,824mt in 1961 to 8,060mt in 1964, as catch-per-unit-effort (CPUE) grew to 9.1 sharks for every 100 hooks deployed. By 1968, however, CPUE had fallen to 2.9 sharks per 100 hooks, and total landings had declined to 207mt. Since the late 1970s, Norway's annual landings of Porbeagles has not exceeded 100mt. Similar collapses have been documented for Basking Sharks *Cetorhinus maximus*, Soupfin Sharks *Galeorhinus galeus*, and Piked Dogfish[2] (Anon., 1996a).

Unlike other fishes, most sharks are captured incidentally in fisheries directed at other species, such as tuna, billfish, and shrimp, that are more abundant, faster growing, more fecund, and economically more valuable than sharks. In such circumstances, fishing for tuna and billfish could continue to be economically viable long after less abundant populations of less valued sharks have been extirpated (Anon., 1996a).

There is another consequence arising from the generally low economic value of sharks: Little effort has been made to collect even the most basic kinds of information, such as numbers of sharks caught and discarded, necessary for meeting even minimal standards of management of fisheries affecting sharks. Similarly, one of the greatest challenges to the conservation of sharks is overcoming the current poor state of our knowledge about the life history and biological parameters of most species, such as growth rates, reproductive potential, distribution, movements, and interactions with other species.

FISHERIES AND MARKETS

Types of Shark Fisheries

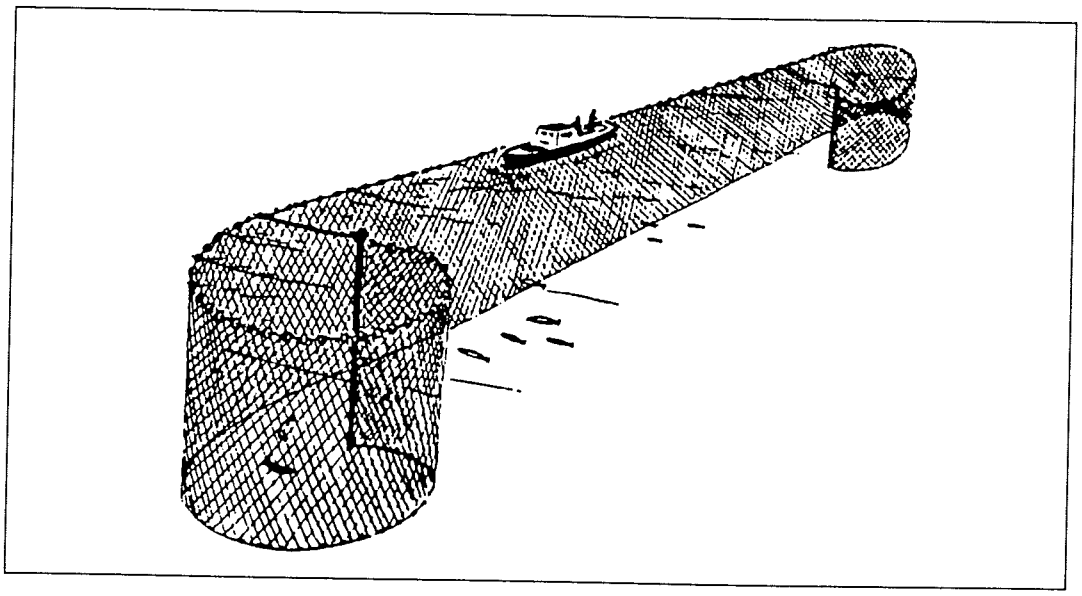
Fisheries affecting sharks fall into several general categories. In directed fisheries, sharks are the principal target. In response to growing demand, directed fisheries using longlines, gillnets, and trawls have been increasing their catches. Most sharks that are caught, however, are caught incidentally in fisheries that target other species, but land or discard some sharks (Oliver, 1996).

There are other important distinctions among fisheries affecting sharks. For instance, industrial commercial fisheries rely on large vessels and technologically sophisticated gear, such as miles-long driftnets or longlines, satellite navigation, and onboard freezing equipment. These vessels may remain at sea for months. Other commercial fisheries, called artisanal fisheries, rely on small-scale gear and boats from canoes and handlines to boats powered by outboard motors. In the last several decades, recreational fisheries for sharks have grown; for the most part, sharks caught in recreational fisheries are not sold. Finally, for centuries, sharks have been caught in subsistence fisheries—non-commercial, small-scale fisheries that provide basic means of support for an individual or community.

This report concerns itself primarily with large-scale commercial fisheries, since these capture far more sharks than other types of fisheries and supply the raw material for most of the trade in sharks (Oliver, 1996; Rose, 1996).

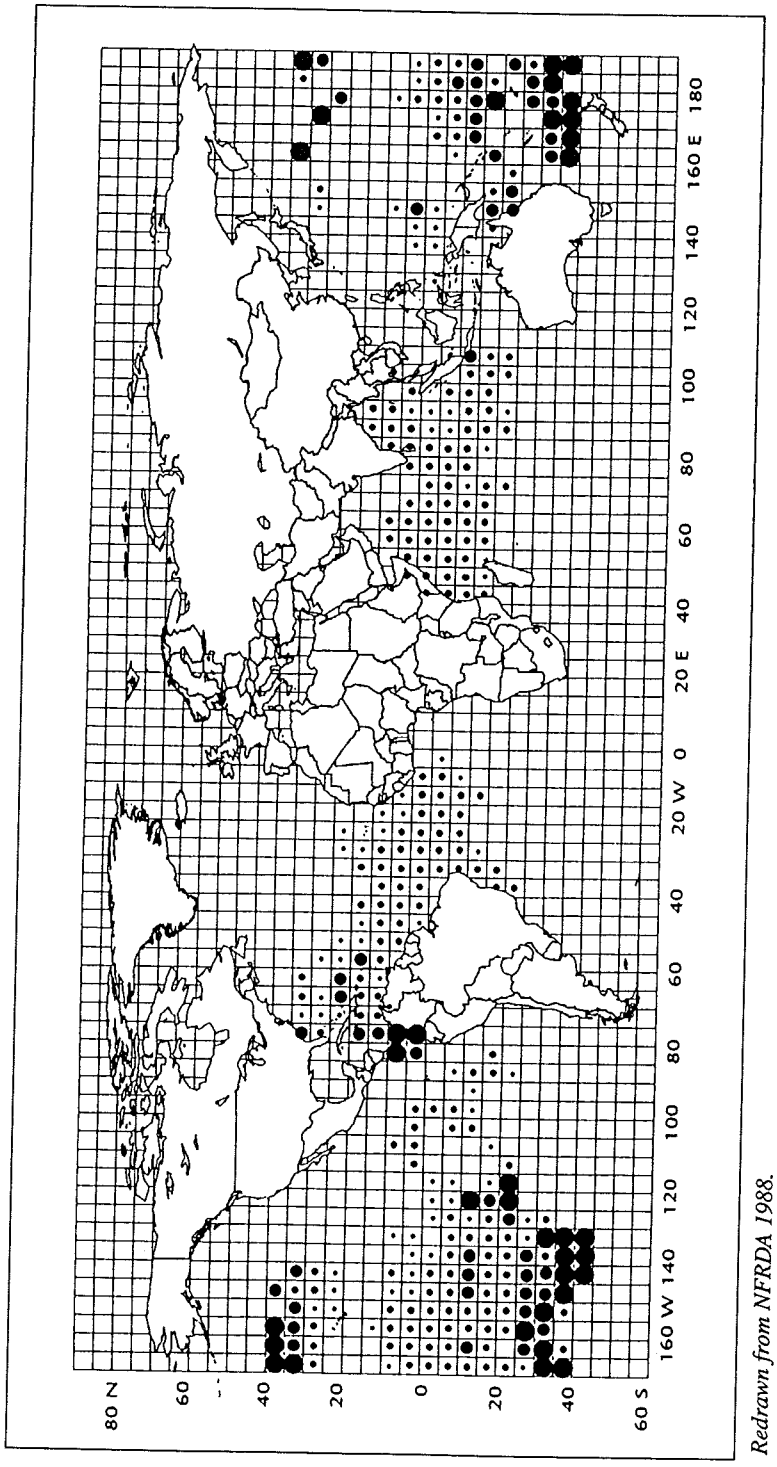
Sharks are caught by several types of fishing gear. Gillnets are panels of mesh in which fish become entangled; gillnets may be floated at the surface and allowed to drift, or fixed to the bottom or in midwater (Nédélec, 1990). (See Figure 1.) In many fisheries, gillnets are indiscriminate in what they catch. The incidental capture of marine mammals, sharks, and other marine wildlife in large driftnets set for squid, salmon and tuna prompted the United Nations to adopt Resolution 44/225, calling for an end to the use of large-scale driftnets on the high seas by the end of 1992. The International North Pacific Fisheries Commission estimated that the high seas driftnet fishery for squid caught 1.8 million Blue Sharks and nearly 140,000 Salmon Sharks in 1990 alone (Bonfil, 1994).

Figure 1
Drift Gill Net



Gillnets also are used within the Exclusive Economic Zones (EEZ) of many countries, both in fisheries for sharks and in fisheries for other species. For instance, gillnets fixed to the bottom in the Mediterranean Sea and off the south coast of Ireland incidentally capture several species of sharks, including Soupfin, Porbeagle, Blue, and Basking Sharks (Oliver, 1996). Surface driftnets deployed for albacore in the Bay of Biscay capture Blue, Porbeagle, Common Thresher *Alopias vulpinus*, and Basking Sharks.

Since World War II especially, fisheries using longlines have expanded around the world (Oliver, 1996). (See Maps 1, 2, and 3.) Longlines consist of a main line as long as 80 miles, to which shorter lines with baited or unbaited hooks are attached at fixed intervals (Nédélec, 1990). The main line is set horizontally near the bottom or surface. (See Figure 2.) Floats may be attached to the main line, allowing the gear to float.

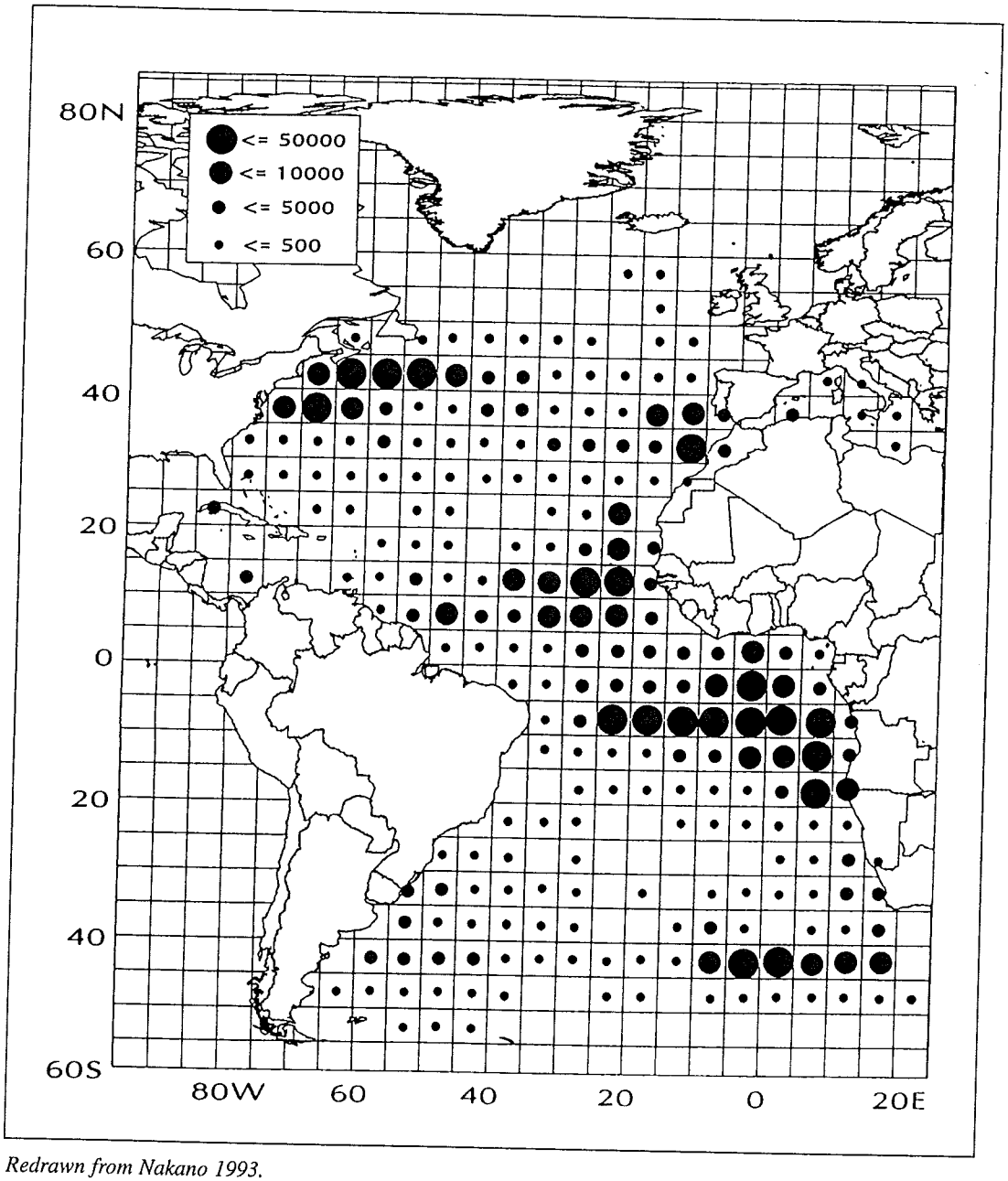


Map 1
Distribution of Korean longline catches, no units given.

Redrawn from NFRDA 1988.

Map 2

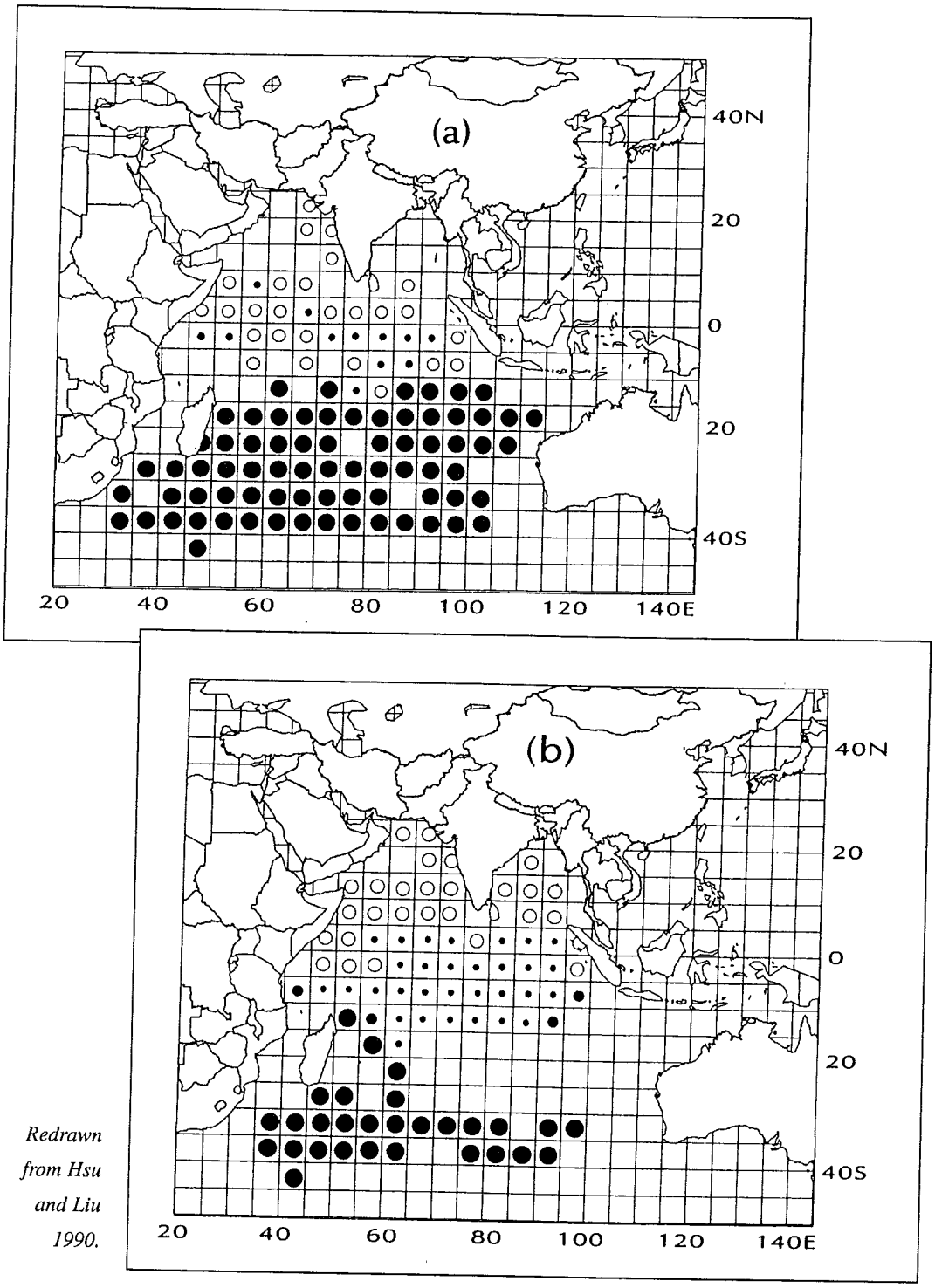
Effort distribution of Japanese longline fishery in the Atlantic Ocean in the 1980s. Keys indicate accumulated nominal book numbers in thousands



Redrawn from Nakano 1993.

Maps 3a and 3b

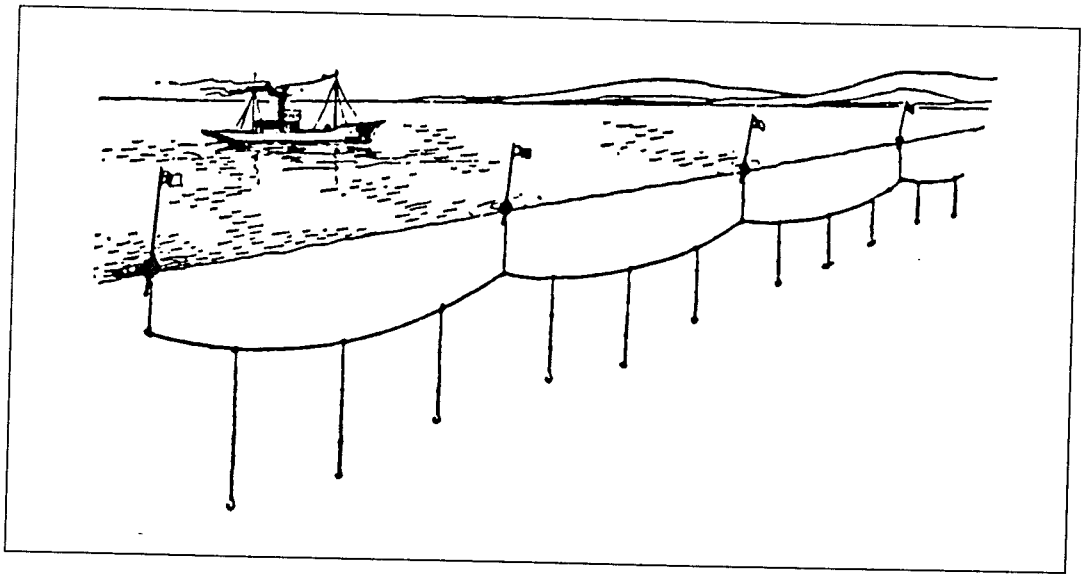
Distribution of Taiwanese catch per unit effort of albacore by (a) regular and (b) deep longline fisheries during 1988 in the Indian Ocean.



Redrawn from Hsu and Liu 1990.

Figure 2

Longline

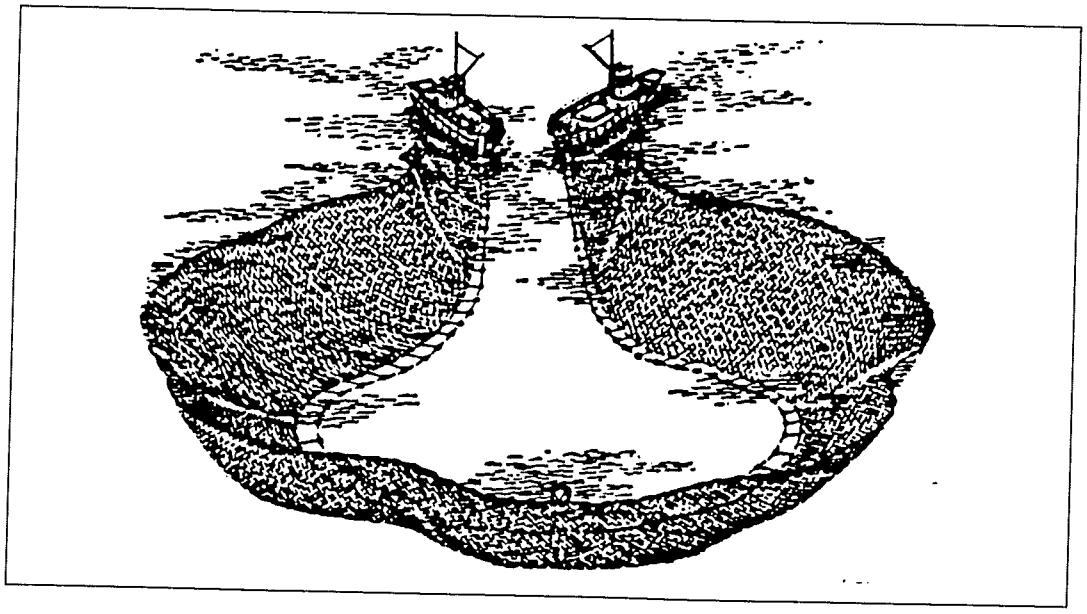


In some areas, longlines are deployed to catch sharks. The principal fisheries using longlines target tunas and billfish, but regularly capture sharks and other marine wildlife. In 1991, when they deployed 750 million hooks on longlines fishing for tuna and billfishes, the longline fleets of Japan, Korea, and Taiwan incidentally captured an estimated 8.3 million sharks, weighing 232,425mt, or nearly one-third of the landings reported to the FAO for 1994 (Bonfil, 1994; Rose, 1996).

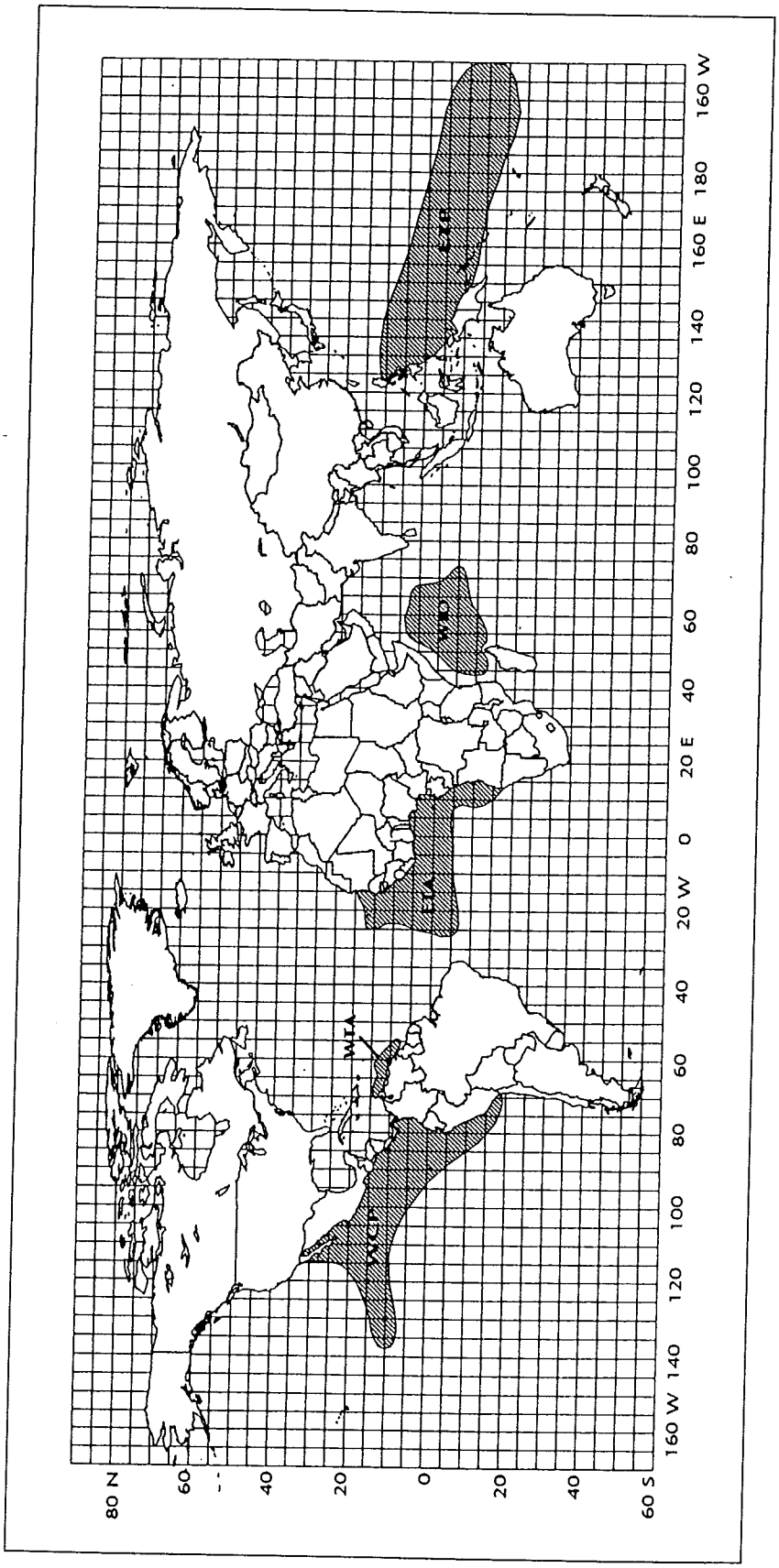
Since the late 1950s, when the invention of the power-block enabled fishermen to handle much larger nets, purse seines have been used for the capture of yellowfin and skipjack tunas. (See Figure 3.) Purse seines catch fish by surrounding them from the sides and from beneath (Nédélec, 1990). Generally, a long panel of net is

Figure 3

Purse Seine



let from a catcher vessel and drawn in a circle by a skiff; once the circle is closed, a line along the bottom of the net draws the net closed, and the net is brought on board. Purse seine fisheries for tuna are conducted principally in four ocean areas in the tropics. (See Map 4.)



Map 4
Major areas of Tuna purse-seine fisheries in the world.

Purse seines also incidentally capture species other than tunas (Bonfil, 1994). In the Eastern Tropical Pacific Ocean, for instance, where fishermen often target schools of tuna by locating schools of dolphins swimming above, purse seines often capture large numbers of dolphins; in 13 percent of these sets, sharks also are captured. Purse seiners also set their nets around drifting logs or Fish Aggregating Devices that attract tunas; in 40 percent of these sets, sharks also are caught. Silky Sharks *Carcharhinus falciformis* are the most commonly caught species. Other sharks captured in purse seine nets include Blue, Salmon, Porbeagle, Oceanic Whitetip *Carcharhinus longimanus*, Hammerhead *Sphyrna* spp., Thresher *Alopias* spp., and Whale *Rhincodon typus* Sharks. Bonfil (1994) estimated that in 1989, purse seiners caught 6,345mt of sharks: 856mt in the tropical Atlantic; 1,122mt in the Western Indian Ocean; 2,939mt in the Western Central Pacific; and 1,428mt in the Eastern Tropical Pacific.

Other types of gear incidentally capture sharks. Pole and line fisheries for tunas may capture as many sharks as purse seines (Bonfil, 1994). New Zealand's orange roughy trawl fishery captures at least 4,400mt of deep-water sharks *Squalus* spp., well above the estimated sustainable yield for these species. Most are discarded. Shrimp trawl fisheries around the world capture large numbers of shark, particularly juveniles (Oliver, 1996). Ninety-five percent of France's considerable catch of sharks (mostly skates and rays) are incidentally caught in trawl fisheries.

Directed and Incidental Fisheries for Sharks

According to statistics on catches provided to FAO by individual countries, landings of sharks increased by more than 100,000mt between 1985 and 1994, when 730,784mt were recorded (Rose, 1996). (See Table 1) Of these, 182,000mt were sharks, 197,000mt were skates and rays, 5,000mt were chimaeras, and 347,000mt were unidentified. Nineteen countries and territories recorded more than 10,000mt in nominal catches, including Argentina, Brazil, France, India, Indonesia, Italy, Japan, Malaysia, the Maldives, Mexico, New Zealand, Pakistan, Portugal, South Korea, Spain, Sri Lanka, Taiwan, the United Kingdom, and the United States. Other leaders were Australia, Canada, Nigeria, Norway, the Philippines, Thailand, and Venezuela (See Table 2).

There are several reasons for regarding these as underestimates of actual shark catches (Rose, 1996; Bonfil, 1994). First, in some instances, FAO receives species-specific landings statistics from only a few of the harvesting countries: Although Soupfin Shark is landed in many countries, FAO statistics reflect nominal catch statistics only for Portugal and the United States. In other instances, FAO receives no statistics from countries with shark fisheries. FAO statistics also do not include landings in artisanal or recreational fisheries. Finally, FAO's records do not reflect sharks that are incidentally captured and discarded. Bonfil (1994) estimated that the actual total catch of sharks, rays, and chimaeras was about 1,350,000mt, or nearly twice what FAO's catch statistics show.

Current statistics on fisheries affecting sharks have other limitations. With a few exceptions, national, regional, and international management organizations have not collected basic information on landings, bycatch, and discards of sharks generally or by species. As a result, it is very difficult to determine the impact of current and past fishing on particular species or populations of sharks.

As favored fishes have declined in abundance due to overfishing and habitat degradation, more fishing effort has been directed at sharks. In its investigation of shark fisheries and trade, the TRAFFIC Network found active directed fisheries for sharks in a number of countries (Rose, 1996).

Table 1

Nominal Elasmobranch catches by FAO Fishing Area, 1985-1994

FAO Fishing Area	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
21 NW Atlantic	22,671	29,571	37,647	34,995	31,291	51,188	62,609	45,412	44,380	42,880
27 NE Atlantic	90,731	90,117	100,022	93,225	80,443	79,582	78,429	79,089	69,664	64,700
31 W Central Atlantic	25,463	24,836	25,018	30,786	32,513	29,742	26,680	29,759	27,088	33,874
34 E Central Atlantic	32,106	22,549	26,545	27,441	23,531	26,055	22,659	27,381	25,369	28,960
37 Mediterranean/Black Sea	25,589	23,886	21,699	22,932	20,011	17,112	18,722	20,663	16,590	23,118
41 SW Atlantic	47,297	44,770	45,733	49,138	46,188	45,827	51,452	48,587	48,215	54,954
47 SE Atlantic	5,470	5,593	5,426	5,411	10,424	7,033	3,437	4,031	5,373	4,409
48 Antarctic, Atlantic	44	17	-	-	1					
51 Western Indian	74,438	88,680	92,375	95,507	95,969	96,428	105,893	115,683	129,485	146,640
57 Eastern Indian	47,284	53,035	58,474	78,110	62,653	50,880	59,146	63,520	68,414	89,020
58 Antarctic, Indian	4	3		1						
61 NW Pacific	103,439	96,835	95,404	74,300	91,880	108,494	104,403	99,192	102,176	73,358
67 NE Pacific	11,368	13,366	8,683	7,807	4,302	4,906	8,836	20,416	2,754	3,669
71 W Central Pacific	69,425	78,094	83,684	86,108	97,622	96,204	99,195	87,968	98,430	107,275
77 E Central Pacific	26,379	24,046	23,170	29,420	26,238	30,491	27,989	30,452	31,642	29,751
81 SW Pacific	15,251	13,336	14,772	19,090	13,592	14,711	14,397	12,752	17,849	16,354
87 SE Pacific	20,226	27,582	28,260	33,391	34,149	19,793	12,231	14,190	12,659	12,820
88 Antarctic, Pacific										
TOTAL	617,185	636,316	666,912	687,661	670,806	678,446	696,078	699,097	700,088	731,782

Source: Rose, 1996.

Table 2

Countries and territories reporting more than 100 MT in landings of Elasmobranchs in any year 1990-1994
(SRS = Skates, rays, sharks; Sh = sharks; Sk = skates, Ra = rays)

	ATLANTIC							INDIAN		PACIFIC					
Country	FAO 21 NW	FAO 27 NE	FAO 31 WCen	FAO 34 ECen	FAO 4 SW	FAO 47 SE	FAO 37 Med, Black	FAO 51 West	FAO 57 East	FAO 61 NW	FAO 67 NWE	FAO 71 WCen	FAO 77 ECen	FAO 81 SW	FAO 87 SE
Algeria							SRS								
Angola						Sk									
Argentina					SRS										
Australia									SRS			SRS		SRS	
Belgium		Sh, Sk													
Benin				SRS											
Brazil					SRS										
Cote d'Ivoire				SRS											
Cameroon				SRS											
Canada	SRS														
Chile											SRS				
China, PR															SRS
Colombia			SH								Sh		Sh		
Congo				SRS											SH
Costa Rica															
Croatia													SRS		
Cuba			SRS	SRS			SRS								
Denmark		Sh													
Egypt							SRS								

Table 2 (continued)

Countries and territories reporting more than 100 MT in landings of Elasmobranchs in any year 1990-1994
(SRS = Skates, rays, sharks; Sh = sharks; Sk = skates, Ra = rays)

	ATLANTIC							INDIAN				PACIFIC			
Country	FAO 21 NW	FAO 27 NE	FAO 31 WCen	FAO 34 ECen	FAO 4 SW	FAO 47 SE	FAO 37 Med, Black	FAO 51 West	FAO 57 East	FAO 61 NW	FAO 67 NWE	FAO 71 WCen	FAO 77 ECen	FAO 81 SW	FAO 87 SE
Eritrea															
Faeroe Islands		Sh, Sk						Sh							
France		SRS					"Sk, Ra"								
Fr. Polynesia															
Gambia													Sh		
Ghana				SRS											
Greece				SRS											
Guatemala				Sh			SRS								
Hong Kong													SRS		
Iceland										SRS					
India		Sh, Sk													
Indonesia								SRS	SRS						
Ireland									SRS			SRS			
Italy		Sh, Sk													
Japan				SRS	SRS		SRS	SRS							
Kenya	Sh	SRS		SRS	SRS	SRS		SRS	SRS	SRS		SRS	SRS	SRS	SRS
Kiribati								Sh							
Korea, Rep. of	Sk		Sk, Ra		Sk, Ra	Sk, Ra		Sk, Ra	Sk, Ra	SRS		SRS Sk, Ra	SRS	SRS	Sk, Ra
Liberia				SRS											

Table 2 (continued)

Countries and territories reporting more than 100 MT in landings of Elasmobranchs in any year 1990-1994
(SRS = Skates, rays, sharks; Sh = sharks; Sk = skates, Ra = rays)

	ATLANTIC							INDIAN		PACIFIC					
Country	FAO 21 NW	FAO 27 NE	FAO 31 WCen	FAO 34 ECen	FAO 4 SW	FAO 47 SE	FAO 37 Med, Black	FAO 51 West	FAO 57 East	FAO 61 NW	FAO 67 NWE	FAO 71 WCen	FAO 77 ECen	FAO 81 SW	FAO 87 SE
Lithuania	Sh, Sk	Sk													
Madagascar								SRS							
Malaysia									SRS			SRS			
Maldives								SRS							
Martinique			SRS												
Mauritania				SRS											
Mexico			SRS										SRS		
Morocco				SRS											
Mozambique								SRS							
New Zealand														SRS	
Nigeria				SRS											
Norway		Sh, Sk													
Oman								SRS							
Pakistan								SRS							
Peru															SRS
Philippines												SRS			
Portugal	Sk	SRS		SRS											
Russian Fed.	Sh, Sk	Sk			Sk, Ra										
Sao Tome/Princ.				SRS											

Table 2 (continued)

Countries and territories reporting more than 100 MT in landings of Elasmobranchs in any year 1990-1994
(SRS = Skates, rays, sharks; Sh = sharks; Sk = skates, Ra = rays)

	ATLANTIC						INDIAN			PACIFIC				
Country	FAO 21 NW	FAO 27 NE	FAO 31 WCen	FAO 34 ECen	FAO 4 SW	FAO 47 SE	FAO 37 Med, Black	FAO 51 West	FAO 57 East	FAO 61 NW	FAO 67 NWE	FAO 71 WCen	FAO 77 ECen	FAO 81 SW	FAO 87 SE
Saudi Arabia								SRS							
Scotland		"Sh, Sk"													
Senegal				SRS											
Seychelles								"Sh,Ra"							
Sierra Leone				SRS											
Singapore															
Somalia												SRS			
South Africa								Sh							
Spain						SRS									
Sri Lanka	Sk	"Sk, Sh"			"Sk, Ra"	SRS	SRS								
St. Pierre/Miquelon								SRS							
Sweden	Sk														
Tanzania		Sh													
Thailand								SRS							
Trinidad/Tobago									SRS			SRS			
Tunisia			SRS												
Turkey							SRS								
Ukraine							SRS								
UAE							SRS								
								SRS							

Table 2 (continued)

Countries and territories reporting more than 100 MT in landings of Elasmobranchs in any year 1990-1994
(SRS = Skates, rays, sharks; Sh = sharks; Sk = skates, Ra = rays)

	ATLANTIC							INDIAN			PACIFIC				
Country	FAO 21 NW	FAO 27 NE	FAO 31 WCen	FAO 34 ECen	FAO 4 SW	FAO 47 SE	FAO 37 Med, Black	FAO 51 West	FAO 57 East	FAO 61 NW	FAO 67 NWE	FAO 71 WCen	FAO 77 ECen	FAO 81 SW	FAO 87 SE
United Kingdom		SRS													
USA	Sh, Sk		SRS								SRS		SRS		
Uruguay					SRS										
Venezuela			SRS												
Yemen								SRS							
Yugoslavia							Sh,Sk,Ra								

Source: FAO in Oliver (1996)

Most sharks are caught incidental to fisheries directed at other species. Depending upon the fishery, sharks may or may not be retained. Discarded sharks may or may not survive, depending upon the type of gear, the species, and whether the fins are removed before discarding. For instance, sharks caught in shrimp trawls generally do not survive. Some species of sharks may survive when hooked on longlines if the lines are frequently retrieved and the captured sharks are carefully released. Other species that must maintain movement are less likely to survive. What is unmistakable is that longlining for tuna and billfish is pursued in much of the world's oceans by thousands of vessels, which regularly catch sharks.

Like other aspects of shark fisheries, incidental capture is very poorly documented. What little we do know gives cause for concern. In his review of high seas longline fisheries for tuna and billfish, Bonfil (1994) calculated that, worldwide, longlines set for tunas and billfish caught 8.3 million sharks, about 40 percent of which were blue sharks. Bonfil based his estimate on the number of hooks deployed in different ocean areas and observed rates of shark bycatch, which generally ranged between 1-10 sharks caught for every 1000 hooks deployed. Bonfil's estimates of regional shark bycatch in longline fisheries are as follows:

Estimates of Regional Shark Bycatch in Longline Fisheries (Bonfil 1994)

AREA	NUMBERS	MT
Atlantic	2,305,940	76,318
Indian	1,931,574	75,180
South/Central Pacific	1,996,350	39,927
North Pacific (above 20N)	2,050,135	41,000
TOTAL	8,283,999	232,425

Although millions of incidentally captured sharks are discarded every year, shark bycatch also is a major source of shark landings for many countries. For instance, three quarters of Japan's landings of shark were caught incidentally by its tuna longliners (Bonfil, 1994). With the rise in market value for some shark products, especially fins, and the decline of traditional sources of seafood, incidentally caught sharks are increasingly valued in fisheries large and small. Below is a brief review of these fisheries based on the TRAFFIC Network global overview (Rose, 1996).

Trade in Shark Products

The TRAFFIC Network recently conducted an investigation regarding world trade in sharks (Rose, 1996), upon which the following discussion on markets and trade in shark products is based. Although TRAFFIC's investigation had to overcome a widespread lack of government statistics on trade in shark products, it has provided a useful description of markets and trade in shark products.[3]

Over the centuries, different cultures have relied on sharks for a wide variety of products, such as:

- meat,
- skins for leather or abrasives,
- liver oil for textile and tanning industries, for lubricants, cosmetics and vitamins;
- cartilage for use in fishmeal;
- cartilage as a reputed cancer treatment;

- teeth and jaws for the tourist trade; and
- fins for shark fin soup.

This report by CMC focuses on three types of shark products: meat, fins, and oil. Table 3 indicates countries importing and/or exporting these different products.

Because shark meat contains high levels of urea, it spoils quickly unless processed immediately. Because of the relatively low market value of shark meat, sharks caught incidentally to fisheries pursuing more valuable species, such as tuna, billfish, or shrimp, generally are not retained for their meat, since the carcasses take up valuable refrigerated storage space.

Still, shark meat has become increasingly popular in some markets, such as the United States, Europe, and Japan. In different markets, favored species include: Shortfin Mako *Isurus oxyrhinchus*, Thresher *Alopias* spp., and Porbeagle *Lamna nasus* Sharks, Requiem Sharks *Family Carcharhinidae*, Dogfish *Squalus* spp. and Smoothhounds *Triakidae*, and Giant Guitarfish *Rhynchobatus djiddensis*. Here are regional highlights of markets and international trade in shark meat:

For at least a millenium, the fibers and gelatinous collagen found in shark fins have provided the central ingredient in one of China's most revered culinary dishes—shark fin soup. Growing demand for shark fin soup in Hong Kong, China, and Singapore, relaxation of trade barriers to China, and other factors led to increased prices and trade in the 1980s. These increased prices have led to more intense fisheries in areas such as the southeastern United States, and to increased finning of sharks captured incidentally in fisheries, especially longline fisheries for tuna and billfish.[4] More often than not, fishermen remove the fins of incidentally captured sharks before discarding the rest of the animal. Unlike meat, shark fins require little processing and storage area.

Although the fins of nearly all shark species can find a buyer, different markets favor the fins of some species over others. In its investigation, the TRAFFIC Network found that in Hong Kong, the fins of Hammerhead, Tiger, Oceanic Whitetip, Blacktip, Dusky, and Blue Sharks are preferred, whereas the fins of Thresher, Nurse *Ginglymostoma cirratum* sharks, and ray and skate wings had little value. In Taiwan, fin traders preferred the fins of Giant Guitarfish, Hammerhead, Dusky, and Blacktip Reef Sharks, and ranked Blue and Thresher Sharks lower. Finally, in the United States, processors preferred Hammerhead and Sandbar Shark fins most, followed by Dusky, Tiger, Blacktip, Bull, and Silky Shark.

Instead of a swimbladder, sharks rely for buoyancy on large livers saturated with oil. Shark liver oil has been used for centuries for lubrication, tanning and curing leather, and fueling street lamps. In the 1930s and 1940s, shark liver oil was used as a source of Vitamin A, but the synthesis of this vitamin in the 1950s collapsed the markets and fisheries for shark liver oil. Shark liver oil also yields squalene, which is used in a wide range of products from bactericides to skin moisturizers. Oil from the livers of dogfish also yields squalamine, which now is used against bacterial infection and viruses.

The preferred sources of shark liver oil rich in Vitamin A are Soupfin, Longfin Mako, Tiger, and Hammerhead Sharks, Piked Dogfish, Cuban Dogfish *Squalus cubensis*, and Catsharks *Apristurus* spp. Generally, the oil of deepwater sharks is rich in squalene; key species include Gulper Sharks *Centrophorus* spp. and Basking Sharks. The oil from Porbeagle, Thresher, and Roughskin Dogfish *Squalus asper* is used for more general purposes.

Table 3

Countries reporting trade in prinicpal Elasmobranch products

	MEAT		FIN		OIL	
Country	Imports	Exports	Imports	Exports	Imports	Exports
Argentina		X		X		
Australia	X	X	X	X		X
Austria				X		
Bahrain*			X			
Batam*				X		
Belgium	X			X		X
Brazil	X			X		
Canada	X	X		X	X	
"China, PR"	X	X	X	X		
Comoros	X					
Costa Rica				X		
Denmark	X	X				
Ecuador				X		
Eritrea		X		X		
Fiji*				X		
France	X	X	X	X	X	X
Germany	X	X	X	X	X	
Greece	X					
Guatemala				X		
Guyana				X		
Hong Kong			X	X	X	
India		X		X		X
Indonesia		X	X	X	X	X
Ireland	X	X	X			
Israel	X					
Italy	X	X	X	X		
Japan	X	X	X	X		X
Kenya	X			X		
Kiribati				X		
"Korea, Rep. of"	X	X	X	X	X	
Kuwait			X			
Libya*			X			
Madagascar		X		X		
Malaysia	X	X	X	X	X	
Maldives*				X		X
Mauritania*		X				
Mexico	X	X		X		
Mozambique		X				
Myanmar*			X	X		
Netherlands	X	X		X		X

Table 3

Countries reporting trade in prinicpal Elasmobranch products (continued)

MEAT	FIN		OIL			
Country	Imports	Exports	Imports	Exports	Imports	Exports
Netherlands Antilles				X		
New Zealand	X	X				
Nicaragua				X		
Norway		X	X	X	X	X
Oman*		X		X		
Pakistan				X		
Panama				X		
Papua New Guinea						X
Peru				X		
Philippines		X		X		X
Portugal				X	X	X
Saudi Arabia	X		X	X		
Seychelles		X		X		
Singapore			X	X		
Solomon Islands*				X		X
Somalia		X		X		
South Africa		X		X		
Spain	X	X	X	X		X
Sri Lanka			X	X		
Surinam				X		
Sweden						X
Switzerland				X	X	
Tanzania	X			X		
Thailand			X	X		
Trinidad/Tobago				X		
Turkey*				X		
UAE				X		
United Kingdom	X	X	X		X	X
USA	X	X	X	X	X	X
Uruguay		X		X		
Vanuatu				X		
Venezuela				X		
Vietnam				X		
Yemen*		X		X		
Zanzibar*		X				

* Not a Party to CITES.

Source: Rose, 1996

MECHANISMS FOR CONSERVATION AND MANAGEMENT OF SHARKS

Several recent reviews have found little or no attention paid by domestic and international fishery management institutions to the directed and incidental catch of sharks, despite their vulnerability, the important role that sharks play in marine ecosystems, and the increasing volume of catches and of trade in shark products (Rose, 1996; Oliver, 1996; Bonfil, 1994).

The recent review by the U.S. National Marine Fisheries Service, which was requested by the Animals Committee and relied on submissions from CITES parties, confirmed earlier reviews by finding that no international fisheries management organizations have sufficient ability to manage sharks, although they may manage other highly migratory species (Oliver, 1996). This review found that several organizations have jurisdiction over fisheries affecting sharks in several regions, but carry out little if any data collection and no active management for sharks. Recently, the International Commission for the Conservation of Atlantic Tunas (ICCAT) has begun requesting data from member countries regarding shark bycatch, but this is one of a very few cases of action, not merely discussion, by international bodies concerning shark conservation.

In his review of elasmobranch fisheries, Bonfil (1994) found that of 26 countries reporting shark catches greater than 10,000mt, only the United States, New Zealand, and Australia had domestic management and research programs, and that these three programs are recent and cover only some species and some areas. None of the other 26 countries have management and research programs, although in some cases, such as Indonesia and Pakistan, shark landings have been growing rapidly. (See Table 4.)

In its investigations, the TRAFFIC Network confirmed these other studies (Rose, 1996). South Pacific nations generally do not have legislation enabling management of domestic fisheries, nor do they require the distant water fleets operating in their Exclusive Economic Zones (EEZs) to restrict or report on the bycatch of sharks. Under a subsidiary agreement to the Convention on the Conservation of Southern Bluefin Tuna (CCSBT), the Australian government has required that sharks caught incidentally in the Japanese fishery be released alive or retained. Of African countries, only South Africa has any management measures for sharks, and that is limited to complete protection for a single species, Great White Sharks *Carcharodon carcharias*.

In Europe, TRAFFIC found few restrictions on shark fisheries. The United Kingdom has imposed some minimum sizes for skates and rays, and established some closed areas. The European Union's common fisheries policy includes no management measures for sharks, with the exception of quotas under agreements with Norway and the Faeroe Islands.

In 1994, Canada developed a management plan for Porbeagle, Blue, and Shortfin Sharks. Besides prohibiting finning of sharks, the plan includes so-called precautionary quotas and manages the fishery as an experimental fishery.

An Assessment of International Regimes

With the decline of some major traditional fisheries and the rise in demand for shark fins especially, as well as shark meat and oil, the trend toward increased exploitation of shark populations around the world will likely continue. Domestic management of fisheries affecting sharks certainly has an important role to play, particularly for species and populations that have a restricted distribution. However, many species and populations of sharks straddle boundaries between adjacent EEZs or between an EEZ and the high seas; others are highly migratory and move among EEZs of various countries and between the high seas and waters under coastal State jurisdiction.[5]

Table 4
Reported world catches in commercial Elasmobranch fisheries
(Methods of capture: D = directed fishery, I = indirect fishery)
(Landings in metric tons)

COUNTRY	METHOD	1987	1988	1989	1990	1991
Total world catch		666,000	694,000	679,000	695,000	704,000
Indonesia	D/I	58,200	63,900	74,900	73,300	79,800
Taiwan	D/I	50,100	43,900	54,800	75,700	68,600
India	D/I	57,900	73,500	66,300	51,200	52,900
Pakistan		28,600	30,300	27,600	40,000	45,100
United States	D/I	15,200	17,200	20,400	34,600	35,500
Mexico	D/I	27,900	34,600	33,100	38,100	34,000
Japan	D/I	42,900	28,600	33,900	32,100	33,800
France	D/I	36,600	36,400	34,000	34,000	25,700
Brazil		27,800	24,300	24,900	24,700	25,200
United Kingdom	D	25,900	24,600	21,200	21,700	20,400
Philippines	D/I	16,200	17,900	19,000	18,400	19,000
Sri Lanka	D/I	16,100	16,700	17,000	15,300	18,400
Argentina	D/I	15,300	21,100	16,500	16,700	17,600
South Korea	D/I	16,200	21,700	20,800	15,700	17,300
Malaysia	I	11,700	16,800	13,400	16,800	16,900
Spain	I	22,000	16,700	21,700	14,700	15,900
Italy	I	9,800	10,400	8,400	9,600	13,700
New Zealand	D/I	9,500	13,000	10,800	12,300	13,700
Norway	D/I	5,100	5,200	8,000	11,100	12,300
Thailand	I	14,400	11,400	11,200	11,000	11,800
Australia	D/I	13,500	14,200	8,300	6,700	7,600
Nigeria		9,500	9,500	6,900	8,400	7,200
Peru		23,100	26,600	25,000	12,600	5,700
Ireland	D/I	11,400	8,900	6,200	5,000	4,000
USSR		18,100	20,900	12,000	6,000	3,100

Source: Landings from Bonfil (1994); methods of capture from Rose (1996).

This assessment by CMC identifies gaps and opportunities in the suite of international regimes that might be brought to bear on the conservation of sharks. Gaps are of two general types (Weber, 1996). Geographical gaps result from incomplete geographical coverage of species of concern by existing management regimes. Functional gaps result from the lack of authority or capability in an international regime to carry out some key element in conservation, such as enforcement or data collection and analysis.

Geographical Gaps

At present, there are no international management regimes that directly address the conservation of sharks. However, there are a number of regimes established for the management of fisheries generally or of fisheries for specific schools of fish in an area. In many cases, these regimes manage fisheries, such as longlining for tuna and billfish or purse seining for tuna, that may greatly affect populations of sharks through incidental capture. This analysis focuses upon these regimes.

A comparison of the range maps of key species of sharks with the jurisdiction of existing fisheries management regimes reveals large gaps in some areas. (See Appendix I and Map 5.) Enormous areas of the Pacific Ocean, where longlining for tuna and billfish occurs to varying degrees, fall beyond the jurisdiction of existing management regimes. (See Map 1.) In the Pacific as well as the Atlantic and Indian Oceans, significant numbers of countries whose vessels target or incidentally capture sharks in areas under the purview of international organizations are not members of those organizations. (See Table 5.) In some instances, the conventions establishing these regimes, such as the Forum Fisheries Agency in the South Pacific, restrict membership, so that distant water fishing nations, such as Japan, Korea, and Taiwan, are prevented from participating. In other instances, such as the Inter-American Tropical Tuna Commission (IATTC) or the International Commission for the Conservation of Atlantic Tunas (ICCAT), countries have not acceded to a convention.

These gaps have resulted in a lack of basic information on rates of catch, amounts and numbers of sharks captured and retained or discarded, species captured, trends in catch, geographical distribution of species, and effective application of conservation measures for target species, sharks, and other species.

Functional Gaps

The following analysis evaluates the constraints and capabilities of existing management regimes, using contemporary thinking on standards in international conservation of living marine resources generally, and the recently concluded United Nations agreement on straddling fish stocks and highly migratory fish stocks ("the UN Agreement").[6] This analysis restricts itself, for the most part, to the language of the conventions establishing the various regimes. This approach has a number of disadvantages; for instance, it does not reflect the activities by management organizations that go beyond a narrow interpretation of what a convention authorizes. Nonetheless, this analysis does provide a meaningful assessment of the fundamental authority of the regime.

International conservation of living marine resources has a long history. The first international wildlife agreement, signed in 1886, concerned the management of salmon in the Rhine River (Lyster, 1985). Over the years, many other international regimes have been established to manage exploitation and conservation of living marine resources. In recent years, experience with the operation of these regimes has attracted increased scrutiny with a view to improving upon the past. Recently, the U.S. Marine Mammal Commission sponsored a review of several existing international regimes and of the considerable literature analyzing the performance of these and other regimes. This review identified key elements for effective international regimes for the conservation of living marine resources (Weber and Spivy-Weber, 1995). These elements begin with the following goal of management:

> **The goal of management is the maintenance, and where necessary the restoration, of the abundance and diversity of living marine resources through establishment of harvest levels that are sustainable over the short- and long-term and that reflect uncertainty concerning the size and productivity of the living marine resources and their relationships with other components of their ecosystem.**

Map 5

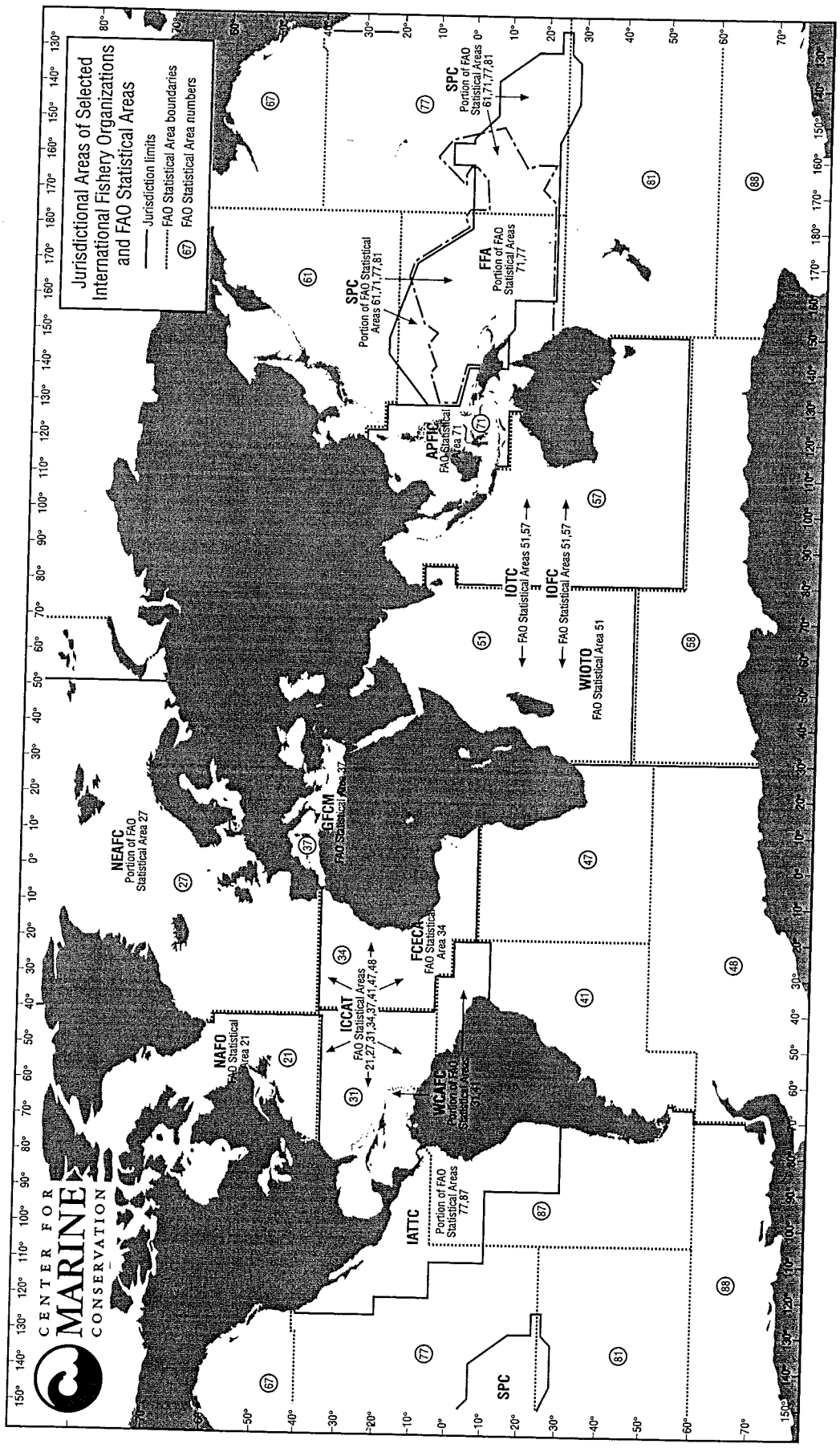

Jurisdictional Areas of Selected International Fishery Organizations and FAO Statistical Areas
Jurisdiction limits
FAO Statistical Area boundaries
FAO Statistical Area numbers
CENTER FOR MARINE CONSERVATION
NEAFC
Portion of FAO Statistical Area 27
GFCM
FAO Statistical Area 37
NAFO
FAO Statistical Area 21
ICCAT
FAO Statistical Areas 21,27,31,34,37,41,47,48
FCEC
FAO Statistical Area 34
WCAFC
Portion of FAO Statistical Area 71
IATTC
Portion of FAO Statistical Areas 77,87
SPC
Portion of FAO Statistical Areas 61,71,77,81
APFIC
FAO Statistical Area 71
SPC
Portion of FAO Statistical Areas 61,71,77,81
FFA
Portion of FAO Statistical Areas 71,77
IOTC
FAO Statistical Areas 51,57
IOFC
FAO Statistical Areas 51,57
WIOTO
FAO Statistical Area 51
SPC

Table 5

Membership in international management regimes by countries landing sharks

(By country with FAO Statistical Areas in which shark landings recorded)

(By treaty with FAO Statistical Areas under jurisdiction.)

Country-FAO Area	ICES-27	NEAFC-27	NAFO-21	GFCM-37	FCECA-34	IBSFC-27	AFRICA ATL.-34,37	WCAFC-31,41	ICCAT-21,27,31, 34,37,41,47,48	IOFC-51,57	IOTC-51,57	WIOTO-51	ASFC-South China Sea	FICES-61,67,77	IATTC-77,87	FFA-71,81	SPC-71,77	CCSBT	UNCLOS	UN Agreement	CITES	Biodiversity	Bonn
Algeria-37				X					O										X		X	X	
Angola-47							X		X										X				
Argentina-41								O	O										X	S	X	X	X
Australia-57,71,81										X	O		X			X	X	X	X	S	X	X	X
Belgium-27 (a)	X																			S	X		X
Benin-34					X		X		O												X	X	X
Brazil-41								X	X										X	S	X	X	
Cameroon-34					X		X		O										X		X	X	X
Canada-21,67	X		X						X					X						S	X	X	
Chile-87															O						X	X	X
China, PR-61,71													X	X		O	O		X		X	X	
Colombia-31,87								X	O						O						X	X	
Congo-34					X		O		O												X		
Costa Rica-77								X							X				X		X	X	
Cote d'Ivoire-34					X		X		X										X	S	X	X	
Croatia-37				X					O										X				

Table 5 (continued)

Membership in international management regimes by countries landing sharks

(By country with FAO Statistical Areas in which shark landings recorded)

(By treaty with FAO Statistical Areas under jurisdiction.)

Country-FAO Area	ICES-27	NEAFC-27	NAFO-21	GFCM-37	FCECA-34	IBSFC-27	AFRICA ATL.-34,37	WCAFC-31,41	ICCAT-21,27,31, 34,37,41,47,48	IOFC-51,57	IOTC-51,57	WIOTO-51	ASFC-South China Sea	FICES-61,67,77	IATTC-77,87	FFA-71,81	SPC-71,77	CCSBT	UNCLOS	UN Agreement	CITES	Biodiversity	Bonn
Cuba-31,34			X		X		O	X	O	X									X		X	X	
Denmark-27 (a)	X	X	X							X										S	X	X	X
Egypt-37				X				O		X									X	S	X		X
Equa. Guinea-34					X		O		X												X	X	
Eritrea-51											X	O									X		
European Comm.		X	X		X	X														S			
Faeroe Islands-27 (b)																							
France-27,37 (a)	X	O		X	X			X	X	X			X		X		X		X		X	X	X
Fr. Polynesia-77 (c)																	X						
Gambia-34					X		X		O										X		X	X	
Ghana-34					X		O		X										X		X	X	X
Greece-34,37 (a)"				X	X				O	X									X	S	X	X	
Guatemala-77								X							O						X	X	
Hong Kong-61 (d)																							
Iceland-27	X	X	X						O										X	S		X	
India-51,57										X	O	X	X						X		X	X	X

Table 5 (continued)

Membership in international management regimes by countries landing sharks

(By country with FAO Statistical Areas in which shark landings recorded)

(By treaty with FAO Statistical Areas under jurisdiction.)

Country-FAO Area	ICES-27	NEAFC-27	NAFO-21	GFCM-37	FCECA-34	IBSFC-27	AFRICA ATL.-34,37	WCAFC-31,41	ICCAT-21,27,31, 34,37,41,47,48	IOFC-51,57	IOTC-51,57	WIOTO-51	ASFC-South China Sea	FICES-61,67,77	IATTC-77,87	FFA-71,81	SPC-71,77	CCSBT	UNCLOS	UN Agreement	CITES	Biodiversity	Bonn
Indonesia-57,71										X	O		X			O	O		X	S	X	X	
Ireland-27 (a)	X	O							O										X	S	X		X
Italy-34,37,41,51 (a)				X	X			O	O	O	O	O							X	S	X	X	X
Japan-21,27,34,41,47, 51, 57,61,71,77,81,87	O	O	X		X			X	X	X	O	O	X	X	X	O	O	X	X		X	X	
Kenya-51										X	O	O							X		X	X	
Kiribati-71																X	X					X	
Rep Korea-21,31,41,47, 51,57,61,71,77,81,87			X		X			X	X	X	O	O	X	X		O	O	O	X		X	X	
Liberia-34					X		X		O												X		
Lithuania-21,27	O	O	X			X																	
Madagascar-51										X	O	O									X		
Malaysia-57,71										X	O		X			O	O				X	X	
Maldives-51										X	O	O								S		X	
Martinique-31 (c)																							
Mauritania-34					X		X		O											S			
Mexico-31								X	O										X				

Table 5 (continued)

Membership in international management regimes by countries landing sharks

(By country with FAO Statistical Areas in which shark landings recorded)

(By treaty with FAO Statistical Areas under jurisdiction.)

Country-FAO Area	ICES-27	NEAFC-27	NAFO-21	GFCM-37	FCECA-34	IBSFC-27	AFRICA ATL.-34,37	WCAFC-31,41	ICCAT-21,27,31, 34,37,41,47,48	IOFC-51,57	IOTC-51,57	WIOTO-51	ASFC-South China Sea	FICES-61,67,77	IATTC-77,87	FFA-71,81	SPC-71,77	CCSBT	UNCLOS	UN Agreement	CITES	Biodiversity	Bonn
Morocco-34				X	X		X		X											S	X	X	
Mozambique-51										O	O	O									X	X	X
New Zealand-81													X			X	X	X		S	X	X	
Nigeria-34					X		X		O										X		X	X	
Norway-27	X	X	X		X	O			O	X									X	S	X	X	X
Oman-51										X	O	O							X		X	X	X
Pakistan-51										X	O	O	X							S		X	
Peru-87															O						X	X	X
Philippines-71													X			O	O		X	S	X	X	
Portugal-21,27,34 (a)	X	O	O						X	X										S	X	X	X
Russian Fed.-21,27,41	X	X	X			X			X					X						S	X	X	X
Sao Tome/Princ.-34					X		X		X										X		X	X	
Saudi Arabia-51										X	O	O							X				
Senegal-34					X		X		O										X	S			X
Seychelles-51										X	O	X							X		X	X	X
Sierra Leone-34					X		X		O										X		X	X	

Table 5 (continued)

Membership in international management regimes by countries landing sharks

(By country with FAO Statistical Areas in which shark landings recorded)

(By treaty with FAO Statistical Areas under jurisdiction.)

Country-FAO Area	ICES-27	NEAFC-27	NAFO-21	GFCM-37	FCECA-34	IBSFC-27	AFRICA ATL.-34,37	WCAFC-31,41	ICCAT-21,27,31, 34,37,41,47,48	IOFC-51,57	IOTC-51,57	WIOTO-51	ASFC-South China Sea	FICES-61,67,77	IATTC-77,87	FFA-71,81	SPC-71,77	CCSBT	UNCLOS	UN Agreement	CITES	Biodiversity	Bonn
Singapore-71																O	O		X		X	X	
Somalia-51										X	O	O							X		X		
South Africa-47							O		X												X		X
Spain-21,27,37,41,47 (a)	X	O	O	X	X			X	X	X									X		X	X	X
Sri Lanka-51										X	X	O	X						X	S	X	X	X
St.Pierre/Miquelon-21(c)																					X	X	X
Sweden-27	X	O							O	X									X	S			
Tanzania-51										X	O	O							X		X	X	X
Thailand-57,71										X	O		X			O	O						
Trinidad/Tobago-31																			X		X		
Tunisia-37				X					O										X		X		
Turkey-37				X					O												X	X	X
Ukraine-37				O					O											S			
UAE-51										X	O	O										X	
United Kingdom-27 (a)	X	O						X	X	X			X				X			S	X		
USA-21,31,67,77	X		X		X			X	X	X			X	X	X		X			X	X	X	X

Table 5 (continued)

Membership in international management regimes by countries landing sharks

(By country with FAO Statistical Areas in which shark landings recorded)

(By treaty with FAO Statistical Areas under jurisdiction.)

Country-FAO Area	ICES-27	NEAFC-27	NAFO-21	GFCM-37	FCECA-34	IBSFC-27	AFRICA ATL.-34,37	WCAFC-31,41	ICCAT-21,27,31, 34,37,41,47,48	IOFC-51,57	IOTC-51,57	WIOTO-51	ASFC-South China Sea	FICES-61,67,77	IATTC-77,87	FFA-71,81	SPC-71,77	CCSBT	UNCLOS	UN Agreement	CITES	Biodiversity	Bonn
Uruguay-41								O	X										X	S	X	X	X
Venezuela-31								X	X												X	X	
Yemen-51										O	O	O			X				X				
Yugoslavia-37				X					O										X				

LEGEND: X = Party with shark landings.

O = Non-party with shark landings from relevant FAO Statistical Area.

S = A signatory that has yet to ratify the UN Agreement.

NOTES: (a) Represented by the European Union in some instances.

(b) Represented by Denmark.

(c) Represented by France.

(d) Represented by the United Kingdom.

Sources: Marashi 1996; CIESIN 1996.

Key to Table 5:

UNCLOS = United Nations Convention on the Law of the Sea

UN Agreement = United Nations Agreement on the Management and Conservation of Straddling Fish Stocks and Highly Migratory Fish Stocks

ICES = International Council for the Exploration of the Sea

NEAFC = Northeast Atlantic Fisheries Commission

NAFO = Northwest Atlantic Fisheries Commission

GFCM = General Fisheries Council for the Mediterranean

FCECA = Fishery Committee for the Eastern Central Atlantic

IBSFC = International Baltic Sea Fishery Commission

African Atl. = Regional Convention on Fisheries Cooperation Among African States Bordering the Atlantic Ocean

WCAFC = Western Central Atlantic Fishery Commission

ICCAT = International Commission for the Conservation of Atlantic Tunas

IOFC = Indian Ocean Fishery Commission

IOTC = Indian Ocean Tuna Commission

WIOTO = Western Indian Ocean Tuna Organization

ASFC = Asia-Pacific Fishery Commission

PICES = North Pacific Marine Science Organization

IATTC = Inter-American Tropical Tuna Commission

FFA = South Pacific Forum Fisheries Agency

SPC = South Pacific Commission

CCSBT = Commission for the Conservation of Southern Bluefin Tunas

CITES = Convention on International Trade in Endangered Species of Wild Fauna and Flora

Biodiversity = Convention on Biological Diversity

Bonn = Convention on the Conservation of Migratory Species of Wild Animals

In seeking to achieve this goal, several operational principles are key. These are an ecosystem perspective, an integrative perspective, independent scientific advice, responsive management, anticipatory management, conservative management, and accountability. Key participants include fishing nations, non-governmental organizations, and intergovernmental organizations. Implementation requires adequate financing mechanisms, integrated monitoring and decision making, accurate and timely reporting by harvesters and processors, independent data collection, full economic accounting, impact assessment, and compliance monitoring and enforcement. (See Appendix II for brief descriptions of these elements.)

Most international fisheries regimes evaluated in this review include few of these elements. For the most part, this reflects the fact that most of the conventions establishing these regimes were developed at a time when both scientists and managers viewed conservation and management of fisheries very differently, and when fish catches were limited by the number and sophistication of fishing vessels rather than by limited fishery resources. Some international regimes, such as the Inter-American Tropical Tuna Commission (IATTC), have carried out some elements, although they were not explicitly mentioned in the relevant treaty convention. Others, such as ICCAT, have clung to traditional approaches to fisheries conservation and management that emphasize maximum production of target species.

The UN Agreement

The United Nations Convention on the Law of the Sea (UNCLOS), which formally came into force in July 1994, has provided a framework for conservation and management of fisheries and other uses of the seas since its adoption in 1982. Under Article 56, coastal states may exercise sovereign rights to living marine resources within 200 nautical miles of their shores (Iudicello and Lytle, 1994). Coastal states must ensure that living marine resources within their EEZs are not overexploited. Foreign fleets, which may gain access to the fishery resources of an EEZ with the permission of the coastal state, must abide by conservation measures. These measures may include the licensing of fishers, establishing quotas, regulating seasons and areas of fishing, and regulating bycatch of other species (Tsamenyi and McIlgorm, 1995).

Taken together, UNCLOS provisions on EEZs and the high seas require cooperation between coastal and other states in the conservation and optimum utilization of highly migratory species. Measures may be developed through bilateral agreements or an international organization and may apply throughout a species' range. Article 61(4) requires coastal states to consider the effects of fishing upon associated and dependent species but does not specify the scope of this obligation (Pusch, 1996). Article 61 also calls upon coastal states to use the best available scientific evidence, but states are not obliged to increase scientific understanding of exploited living marine resources.

Like most other domestic and international regimes regarding management of fisheries, UNCLOS adopts as a goal of management in Article 61(3) maximum sustainable yield, qualified by environmental and economic factors.[7] Coastal states are to insure that bycatch in fisheries does not prevent populations from being maintained at levels above those at which their reproduction may become seriously threatened.

UNCLOS did not resolve major issues regarding the management, exploitation, and conservation of living marine resources, particularly highly migratory species of fish and populations of fish that straddled the boundaries between EEZs or between EEZs and the high seas. Rising conflicts between fishing fleets as well as concern about the status of high seas and other fisheries led to extensive discussions about fisheries at the 1992 United Nations Conference on Environment and Development (UNCED). As one of their final acts, nations attending UNCED called for the convening of an international conference to resolve the management and conservation of highly migratory and straddling populations of fish.

In August 1995, such a conference adopted The 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 (Marashi, 1996). As Marashi remarks: "It is, by far, the most detailed and comprehensive international legal instrument on the conservation and management of straddling and highly migratory fish stocks." It is fair to say that the agreement represents an extraordinary consensus among the community of nations regarding proper management and conservation of living marine resources and may serve as a reasonable guide to the development of effective management regimes for other fisheries as well.

The UN Agreement may be summarized as follows (Weber, 1996):

Management Goal: The management goal of the UN Agreement, expressed in Article 2, is "to ensure the long-term conservation and sustainable use" of straddling fish stocks and highly migratory fish stocks.

Precautionary Approach: Article 6 and Annex II describe the precautionary approach. The core of the precautionary approach is to act cautiously but expeditiously when information is "uncertain, unreliable, or inadequate," in the words of the UN Agreement. The UN Agreement describes a process for applying this approach that includes the following general features:

a) identifying precautionary reference points for each stock of fish;

b) identifying in advance management measures that will be adopted if reference points are exceeded;

c) adopting "cautious" management measures for developing fisheries, until information allows setting reference points;

d) monitoring the impact of fishing on non-target species and developing plans to conserve them;

e) adopting emergency measures if continued fishing would increase the risk of depletion caused by a natural event.

Compatibility of Measures: Article 7 requires compatibility between conservation measures on the high seas and those in the EEZs of coastal States. Among other considerations in determining compatibility, States are to take into account the biological unity of stocks and the distribution of the stocks, the fisheries, and the geography of the region. If compatible measures are not achieved, States are to use the procedures for dispute resolution identified in the UN Agreement.

Elements of Regional Agreements: According to Article 9, regional arrangements are to identify the stocks under management, the area of application, and the way in which a regional regime will obtain scientific advice.

Functions of Regional Regimes: Article 10 identifies 13 specific functions which may be summarized as follows:

a) developing conservation measures in a timely manner;

b) obtaining scientific advice;

c) collecting, analyzing, and disseminating fisheries data;

d) monitoring and enforcing conservation measures;

e) insuring full cooperation of national agencies in implementation;

f) identifying how new members will be accommodated; and

g) promoting peaceful settlement of disputes.

Transparency: Article 12 calls for transparency in decision making by regional regimes and for the participation of intergovernmental and nongovernmental organizations, subject to procedural rules that are not "unduly restrictive."

Membership: Article 17 calls upon State members of regional regimes to request that non-participating States join the regime and to take action to deter activities that undermine the effectiveness of regional conservation regimes.

Flag State Responsibilities: Article 18 enumerates eight obligations of flag States, including maintaining an accessible registry of vessels authorized to fish on the high seas, requirements for vessel and gear marking and for timely reporting of catch and other information, national inspection and observer schemes, and measures to insure transshipment at sea does not undermine conservation measures.

Enforcement: Article 19 enumerates five obligations of flag States in enforcing regional conservation measures. Articles 20-23 describe procedures by which Flag States and other States should collaborate in enforcing regional conservation measures, and provides authority for States to board fishing vessels of other States. Article 21 identifies eight specific activities that qualify as serious violations, including failing to maintain accurate records of catch, fishing in closed areas or seasons, or using prohibited fishing gear. Regional regimes may identify other serious violations.

Developing States: Articles 24-26 of the UN Agreement call for providing financial and technical assistance to developing States for management under the Agreement. Conservation measures are not to place an undue burden on developing States.

Dispute Resolution: Articles 27-32 call for States to settle disputes through peaceful means of their choice, and describe procedures for settling disputes.

Information Collection and Analysis: Article 14 describes five principal obligations of States for collecting and providing information and cooperating in scientific research. Annex I provides specific types of data that should be collected on fisheries and vessels, and describes obligations for frequent reporting by vessels, verification of data, and data exchange.

Other Obligations: Article 5 briefly describes 12 general tasks, some of which are described in greater detail elsewhere in the UN Agreement. Tasks that do not receive significant additional treatment in the UN Agreement include:

a) Assess the impacts of fishing and other factors on target, associated, or dependent stocks;

b) adopt measures to maintain or restore associated or dependent species above levels "at which their reproduction may become seriously threatened";

c) minimize pollution, waste, discards, catch by lost or discarded gear, and bycatch;

d) protect biodiversity;

e) adopt measures to prevent or eliminate overfishing and overcapitalization;

f) consider the interests of artisanal and subsistence fishers.

In Article 8, the UN Agreement calls for the establishment of new fisheries regimes where they are needed and, in Article 13, for the strengthening of existing regimes. In order to gain access to living marine resources under management by a regional or international organization, parties to the UN Agreement must either participate in the relevant organization or must observe the conservation measures adopted by that organization.

Other discussions have yielded equally ambitious statements of necessary elements in effective management and conservation of living marine resources. Late in 1995, for instance, the FAO Conference adopted the FAO Code of Conduct for Responsible Fisheries that sets out principles and international standards of behavior for responsible practices in order to assure effective conservation, management, and development of living aquatic resources, while promoting protection of ecosystems and biodiversity (Marashi, 1996). Agenda 21, which was adopted in June 1992 by the nations attending UNCED, includes other useful guidance.

Since the UN Agreement is the most recent statement of management principles and measures and will be binding upon ratifying countries, it will be used as a framework in evaluating several existing international regimes that may contribute to the conservation of sharks. Indeed, the UN Agreement provides a ready framework for initiating or greatly improving the management and conservation of many populations of sharks.

An Assessment of Six Fisheries Regimes

Rather than attempting a review of all relevant international regimes, this analysis focuses on the text of conventions establishing several key fisheries regimes. Furthermore, the analysis emphasizes the following key elements in the UN Agreement:

- The precautionary principle,
- collection and analysis of fisheries data,
- assessment of the impacts of fishing on associated or dependent species, and
- minimization of bycatch and discards.

This study analyzes six fisheries regimes. These were selected because each includes basic authorities for carrying out management and scientific activities, represents a geographical region, and manages fisheries that affect sharks. The regimes are the following:

- Northeast Atlantic Fisheries Commission,
- General Fisheries Council for the Mediterranean,
- International Commission for the Conservation of Atlantic Tunas,
- Inter-American Tropical Tuna Commission,
- South Pacific Forum Fisheries Agency, and
- Commission for the Conservation of Southern Bluefin Tuna.

The analysis then evaluates opportunities for advancing the conservation of sharks under several other living resource conservation regimes. These are as follows:

- Convention on International Trade in Endangered Species of Wild Fauna and Flora,
- Convention on Biological Diversity, and
- Highly Migratory Species Convention.

Other international regimes that may contribute to the conservation of sharks are described briefly in Appendix III.

Northeast Atlantic Fisheries Commission (NEAFC)

Established by the Convention on Future Multilateral Cooperation in Northeast Atlantic Fisheries, which came into force in March 1982, NEAFC oversees fishery resources within an area that roughly coincides with FAO Statistical Area 27 (Marashi, 1996). (See Map 5.) NEAFC does not cover marine mammals, sedentary species, or highly migratory species and anadromous stocks under other international agreements. Current members are Denmark (on behalf of the Faeroe Islands and Greenland), the European Community, Iceland, Norway, Poland, and the Russian Federation.

The main objectives of NEAFC are to provide a forum for exchange of information about fishery resources of the Northeast Atlantic and about management policies to promote conservation and optimum utilization of these resources, and to recommend conservation measures for waters outside the national jurisdiction of the

parties. Under Article 7, these measures may include size limits, closed seasons and areas, and quotas; this article does not mention measures to address bycatch of non-target species. For populations of fish that straddle the high seas and the EEZ of member states, the Commission is to seek consistency in measures, according to Article 5. This applies as well to recommendations that might affect other straddling populations. Article 11 provides that through timely objection, parties may relieve themselves of the obligation to observe measures adopted by the Commission.

Under Article 4, the Convention calls for the use of the best scientific evidence available to the Commission in the interest of conservation and optimum utilization. The Commission may recommend the collection of statistics regarding fisheries on the high seas and within the EEZs of member countries. Article 14 explicitly calls upon the Commission to seek information and advice from the International Council for the Exploration of the Sea (ICES), and to promote ICES' collection and analysis of information relevant to the fishery resources of the NEAFC area.

Evaluation: **The text of the Convention establishing NEAFC does not preclude undertaking research and management activities regarding sharks. The Convention also provides sufficient authority to collect and analyze information on shark catches. Article 5 may provide authority to address indirect impacts of fisheries, such as bycatch, upon sharks, but the Convention does not include any language calling for minimization of bycatch or discards. Finally, the Convention does not embody, in general or in specifics, the precautionary principle.**

General Fisheries Council for the Mediterranean (GFCM)

The GFCM was established by an agreement drawn up under the FAO Constitution, which entered into force in February 1952. Within the Mediterranean and Black Seas, the Council's purview covers all living marine resources. (See Map 5.) Since 1990, the GFCM has collaborated with the International Commission for the Conservation of Atlantic Tunas (see below) regarding the monitoring and management of tunas. Current members include Albania, Algeria, Bulgaria, Croatia, Cyprus, Egypt, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Romania, Spain, Syria, Tunisia, Turkey, and the former Yugoslavia (Marashi, 1996).

Among functions described in Article III, the GFCM is to promote proper development of aquatic resources, to encourage research on improved methods of utilization, to assemble and disseminate oceanographic information, to recommend national and international research projects necessary to fill gaps in knowledge, and to make comparative studies of fisheries legislation of member countries.

Evaluation: **The agreement establishing the GFCM does not preclude undertaking research regarding sharks, but it does not provide authority for recommending or adopting management measures. Nowhere does the Convention specifically address the impacts of fisheries on non-target species, nor does the Convention call for minimization of bycatch. Finally, the Convention does not embody, in general or in specifics, the precautionary principle.**

International Commission for the Conservation of Atlantic Tunas (ICCAT)

The Convention establishing ICCAT came into force in March 1969, and was amended in 1984 and 1992. All waters of the Atlantic, including adjacent seas, are within the area of competence of ICCAT. The Convention covers tuna and tuna-like fisheries and other species exploited in tuna fishing and not under investigation by another international organization. Current members are Angola, Brazil, Cape Verde, Canada, Côte d'Ivoire, Equatorial Guinea, France, Gabon, Ghana, Guinea, Japan, the Republic of Korea, Libya, Morocco, Portugal, Russia, Sao Tomé and Principe, Spain, South Africa, the United Kingdom, the United States, Uruguay, and Venezuela (Marashi, 1996).

Under Article IV, the Commission is responsible for the study of populations of tuna and tuna-like species, and is to conduct research on their abundance and ecology, the oceanography of their environment, and the effects of natural and human factors upon their abundance. The Commission is to collect and analyze statistics "relating to the current conditions and trends of the tuna fishery resources of the Convention area," as well as studying methods for maintaining tuna populations "at levels which will permit the maximum sustainable catch and which will ensure the effective exploitation of these fishes in a manner consistent with this catch."

Article VIII provides authority for the Commission to adopt recommendations, on the basis of scientific evidence, regarding management measures, which then become applicable to the member countries, unless a member country objects. Article IX calls for member countries to provide statistical, biological, and other scientific information, and for the member countries to collaborate in international enforcement of measures.[8]

The Commission has adopted conservation actions regarding Yellowfin *Thunnus albacores*, Bigeye *Thunnus obesus*, Southern Albacore *Thunnus alalunga*, and Bluefin Tunas *Thunnus thynnus*, as well as Swordfish *Xiphias gladius*. In 1994, the Commission expanded its research program to include collection of statistics on shark bycatch. Finding that existing information was insufficient, the Standing Committee on Research and Statistics (SCRS) recommended that estimates for bycatch be incorporated into the statistical database and that additional empirical information be gathered, perhaps through a scientific observer program (Anon., 1996b). The Commission resolved that SCRS collaborate with FAO in studying the status of sharks and bycatch.

Evaluation: **The Convention establishing ICCAT does not embody, in general or in specifics, the precautionary principle. Nor does the Convention specifically authorize or mandate minimization of bycatch and discards; Article IV, which authorizes the study of other species, does not provide for recommending management measures for these species (Pusch, 1996). The Convention does provide ample authority for collecting information on shark bycatch, and the Commission has undertaken a program to do so.**

Inter-American Tropical Tuna Commission (IATTC)

The Convention for the Establishment of an Inter-American Tropical Tuna Commission was signed at Washington in May 1949 and entered into force in March 1950. In 1995, member countries issued a Declaration on Strengthening the Objectives and Operation of the Convention establishing the IATTC, which called for implementing the UN Agreement on straddling fish stocks and highly migratory fish stocks (Marashi, 1996). Members now are Costa Rica, France, Japan, Nicaragua, Panama, the United States, Vanuatu, and Venezuela.[9]

The Convention identifies the species under management as Skipjack Tuna *Katsuwonus pelamis*, Yellowfin Tuna, and fish used as bait. The IATTC's area of competence is defined as the Eastern Pacific Ocean. In 1962, the Commission established by the Convention created the Yellowfin Regulatory Area (CYRA): all waters bounded by the mainland of the Americas and seaward to a series of lines as depicted generally on Map 5 (Marashi, 1996). This corresponds with part of FAO Statistical Areas 77 and 87.

Article II of the Convention authorizes recommending measures to keep these tunas "at those levels of abundance which will permit the maximum sustained catch." Among functions identified in Article II is investigating the abundance, biology, and ecology of Yellowfin Tuna and Skipjack Tuna, bait fishes, and the effects of natural and human factors "on the abundance of the populations of fishes supporting all these fisheries." Article II also calls for collecting and analyzing information on population trends, studying methods for maintaining and increasing these populations, collecting information on catches and operations of fishing boats; and publishing reports regarding its findings. Research has also included analysis of gear, flag, and fish-carrying capacity of vessels fishing for Skipjack, Yellowfin, and Bluefin Tuna. Besides Skipjack and Yellowfin Tuna, IATTC staff have studied Bigeye Tuna, Bluefin Tuna, Albacore Tuna, billfishes, and dolphins.

Regarding bycatch, the Commission agreed in 1976 on a policy to maintain tuna harvests at current levels while maintaining dolphin populations at or above levels that would ensure their survival (Anon., 1996b). To this end, the IATTC has carried on a program promoting the reduction of dolphin mortality in the fishery, including training skippers and observers. It also adopted limits on dolphin mortality, required 100 percent observer coverage, and authorized research to improve existing fishing gear.

Evaluation: **Although the Convention establishing the IATTC does not embody, in general or in specifics, the precautionary principle, the Commission has managed Yellowfin and Skipjack Tuna in a precautionary manner. Nonetheless, neither the Convention nor policies adopted by the IATTC have explicitly adopted the precautionary principle or the mechanisms for implementing it that are detailed in the UN Agreement. Nor does the Convention specifically authorize or mandate minimization of bycatch and discards, although the Commission has sought to do that in the case of dolphins. The Convention does provide ample authority for collecting information on shark bycatch; the IATTC has carried out programs that have led to estimates of shark bycatch in purse seines (Oliver, 1996).**

South Pacific Forum Fisheries Agency (FFA)

The Convention establishing the FFA, which came into force in August 1979, describes its area of competence as the South Pacific region, which coincides mainly with FAO Statistical Areas 71 and 18 (Marashi, 1996). The Convention covers all living marine resources, but focuses upon highly migratory species. Membership is open to members of the South Pacific Forum, and now includes Australia, the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, the Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, the Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa.[10]

The Convention seeks conservation and optimum utilization of the living marine resources in the region, regional cooperation and coordination in fisheries policies, maximum benefits from the living resources for the peoples of the region, and collection, evaluation, and dissemination of scientific and economic information

about the resources. Under Article V of the Convention, the FFA is to harmonize fisheries policies to facilitate cooperation in relations with distant water fishing nations and in surveillance and enforcement, among other things. Article VII of the Convention calls for the FFA to collect and disseminate information regarding management procedures and legislation adopted within and without the region and to provide technical assistance in management policy making, issuance of licenses, and surveillance and enforcement. Under Article IX, the member countries agree to provide catch and effort statistics for fisheries within their jurisdiction or by vessels flying their flags, enact relevant laws, collect biological and statistical data, and take action on decisions by the Fisheries Committee.

Since 1979, several other regional fisheries agreements have been concluded by the members of the South Pacific Forum. In 1982, the Nauru Group of countries, which includes the Federated States of Micronesia, Kiribati, the Marshall Islands, Nauru, Papua New Guinea, the Solomon Islands, and Tuvalu, adopted the Nauru Agreement Concerning Cooperation in the Management of Fisheries of Common Interest. This agreement coordinates licensing policies for distant water fishing vessels, including requirements for reporting, observers, vessel identification, and compliance with coastal state laws. Only vessels that are in good standing on the Regional Register of Foreign Fishing Vessels maintained by the FFA may receive licenses. In 1992, the Nauru Group adopted additional provisions regarding transshipments, reporting of high seas catch data, observers, and the deployment of transponders.

In 1992, the Nauru Group adopted an Arrangement for the Management of the Western Pacific Purse Seine Fishery to control purse seining by limiting the number of vessels licensed to operate in the management area.

In June 1988, the Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States came into force. This agreement had been concluded in 1987 at Port Moresby, Papua New Guinea, and was renewed for ten years in 1993. Under the agreement, fishing vessels from the United States are permitted into the fisheries jurisdictions of the 16 FFA member countries that are party to this treaty. Fees paid for this access are divided among the parties. The treaty was innovative in requiring U.S. vessels to comply with the same reporting and enforcement provisions on the high seas as applied within the EEZs of the member countries.

Upon discovering large-scale driftnetting operations in the area, a 1989 meeting of the FFA in Kiribati issued the Tarawa Declaration calling for the end of such driftnetting. This led later to the Convention for the Prohibition of Fishing With Long Driftnets in the South Pacific, which was concluded at Wellington, New Zealand, in November 1989 and came into force in May 1991.

Finally, in July 1992, members of the FFA concluded the Niue Treaty on Cooperation in Fisheries Surveillance in the South Pacific Region, which entered into force in May 1993. The principal purpose of the Niue agreement is to overcome the difficulties of enforcement in so large an area of ocean by, among other things, permitting reciprocal and joint enforcement and surveillance of measures adopted by individual countries.

Evaluation: **The text of the Convention establishing FFA and other agreements adopted within the South Pacific Forum framework do not embody, in general or in specifics, the precautionary principle. The agreements do provide sufficient authority to collect and analyze information on shark catches both within EEZs and on the high seas. Article VII allows the FFA to provide individual countries with advice on management measures, on request, and these could well include measures regarding sharks. The agreements do not include language calling for minimization of bycatch or discards.**

Commission for the Conservation of Southern Bluefin Tuna (CCSBT)

Since 1986, Australia, New Zealand, and Japan have sought to develop an international management regime for Southern Bluefin Tuna *Thunnus maccoyii*, based on a global total allowable catch and national catch quotas (Weber, 1996). Implementing management measures were voluntary until the Convention for the Conservation of Southern Bluefin Tuna went into effect in May 1994. Among other things, the Convention established the Commission for the Conservation of Southern Bluefin Tuna (CCSBT).

The Convention covers Southern Bluefin Tuna. It does not mention a specific area of competence; Southern Bluefin Tuna range as far west as South Africa and as far east as waters off New Zealand. Current members are Australia, New Zealand, and Japan. Membership is open to other countries that fish for Southern Bluefin, or whose waters are utilized by Southern Bluefin during their migrations. Fleets fishing for Southern Bluefin but not represented at the CCSBT sail from Indonesia, Taiwan, and Korea.

The purpose of the Convention is to achieve the conservation and optimum utilization of Southern Bluefin Tuna. The Convention includes mandatory quota setting procedures and mandatory allocation of total allowable catch among parties. In setting these, the commission is to consider relevant scientific advice, the need for orderly and sustainable development of the fishery, the interests of parties with EEZs through which Southern Bluefin Tuna migrate, the interests of those who now or in the past have fished for Southern Bluefin Tuna, and the contribution of each party to the conservation and enhancement of scientific research on Southern Bluefin Tuna.

Evaluation: **The Convention establishing the CCSBT is silent regarding the precautionary principle in general or in most of its specifics. It does require the Commission to collect information regarding "ecologically related species," which are defined as those that associate with Southern Bluefin Tuna, including predators and prey.**

Wildlife Conservation Regimes

Convention on International Trade in Endangered Species of Wild Fauna and Flora

In July 1975, the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) came into force. As of September 1996, 133 countries were Party to CITES (Anon., 1996b). The principle mission of CITES is international cooperation to protect certain species of wild fauna and flora from overexploitation through international trade.

Species are listed according to their conservation status and the contribution of international trade to their decline.[11] Species that are threatened with extinction are listed on Appendix I, and trade is prohibited with few exceptions. Species that are "not necessarily threatened with extinction" may be listed on Appendix II if they may become so unless trade is regulated. Under Article II, paragraph 2(a), species may be listed on Appendix II also if harvesting for international trade has, or may have, a detrimental impact on the species by exceeding sustainable levels of harvest over an extended period, or by reducing the population to a level at which it is vulnerable to other influences (Wijnstekers, 1995). Species may be listed on Appendix II also if they resemble other listed species. Trade in Appendix II species is permitted provided that the Scientific Authority of the exporting country has advised that the export is not detrimental to the survival of the species. Very few marine species have been listed on CITES appendices; these species include several of the great whales, sea turtles, the salt water crocodile, six taxa of coral, and five species of marine fish, of which three are anadromous (Tsamenyi and McIlgorm, 1995).

Articles III(5) and IV(6) govern trade in any specimen of a species included in Appendix I or II that is "introduc[ed] from the sea," which is defined to mean any "species which were taken in the marine environment not under the jurisdiction of any state." As a result, trade in specimens of any species listed on Appendix I would be subject to trade prohibitions if they were transported from outside a member country's EEZ into areas under that country's jurisdiction (Crouse et alii, 1992). Landing specimens of species listed on Appendix II that were caught outside a country's EEZ would require a certificate granted only if the Scientific Authority of the country had advised that the introduction would not be detrimental to the survival of the species.[12] The listing of a species on Appendix I or II would not affect domestic harvest or consumption.

Article IV stipulates that the export of a specimen of a species on Appendix II must be accompanied by a permit granted only if the Scientific Authority of the exporting country has determined that the export will not be detrimental to the species, among other things. Under Article IV(3), a Scientific Authority may recommend limitations on export permits if it determines those limitations necessary "in order to maintain that species throughout its range at a level consistent with its role in the ecosystems in which it occurs and well above the level at which that species might become eligible for inclusion in Appendix I."

Article XIV relieves a Party of its CITES obligations if its vessels have caught specimens of species listed on Appendix II of CITES in accordance with an international agreement that entered into force before CITES came into force. Furthermore, according to Article XIV(5), export of such specimens does not require a CITES export permit, but rather a certificate from the Management Authority affirming that the specimen was taken in accordance with provisions of that other treaty (Wijnstekers, 1995).

Evaluation: **With adoption of Conference Resolution 9.24, the CITES Parties adopted the precautionary principle. In so many words, where there is scientific uncertainty, the Parties are to act in the best interest of conservation of the species when considering amendment of the Appendices (Wijnstekers, 1995). Because CITES already has an established process for monitoring trade in Appendix I and II species, it can contribute to management of marine species, by assembling information on catch and trade that are not now collected, but are crucial to proper management of the fisheries. Scientific Authorities would be required to determine that introduction from the sea of specimens caught outside a country's EEZ and export of specimens caught within the EEZ were not detrimental to the survival of the species. Furthermore, many countries that are members of CITES are not members of regional fisheries organizations with management responsibility for fish populations that their vessels directly or indirectly catch, such as sharks.**

Convention on Biological Diversity (CBD)

The Convention on Biological Diversity was concluded at the 1992 United Nations Conference on Environment and Development. Currently, 133 countries are members of the CBD. The aims of the Convention are to conserve biological diversity and to promote sustainable, fair, and equitable use of its benefits (Tsamenyi and McIlgorm, 1995). Among other things, Parties are to develop or adopt national strategies for the conservation and sustainable use of biological diversity in accordance with the CBD, to monitor components of biological diversity that are important for conservation, and to identify and monitor activities that have or are likely to have adverse impacts on conservation and sustainable use of biological diversity.

It is not clear what the implications of the CBD are for fisheries (Tsamenyi and McIlgorm, 1995). Implementation may include restrictions on fishing gear, capture of certain species, or fishing in particular areas or habitats. At its November 1995 meeting, the Conference of the Parties adopted the "Jakarta Mandate on Marine and Coastal Biodiversity" (de Fontaubert and McAllister, 1996). Among other things, the mandate calls upon Parties to take action for sustainable use of marine and coastal living resources, and invites major international bodies to improve their existing activities in this area. In the next three years, the Executive Secretary is to coordinate a process to implement the recommendations in the mandate.

Evaluation: **The CBD provides an umbrella for funding and discussion regarding marine and coastal biological diversity. The CBD can serve as a means for elevating the conservation of sharks within EEZs through the development of national strategies for the conservation of biological diversity and through monitoring populations of sharks and fisheries affecting sharks.**

The Convention on the Conservation of Migratory Species of Wild Animals (The "Bonn Convention")

The United Nations Conference on the Human Environment, held in Stockholm in 1972, recommended the development of an international convention to protect species that inhabit international waters or migrate from one territory to another (Lyster, 1985). In June 1979, 28 states signed the Convention on the Conservation of Migratory Species of Wild Animals, which came into force in November 1983. There are now 47 parties to the Bonn Convention, of which 29 have reported shark landings greater than 100mt in recent years. (See Table 5.)

The main objective of the Bonn Convention is to protect migratory species (Lyster, 1985).[13] It does so by providing strict protection for species listed in Appendix I, which are migratory species in danger of extinction throughout all or a significant portion of their range. The Convention places strict obligations on Parties that are "range states," including a prohibition on taking that has few exceptions.[14] The Convention also seeks to persuade range states to conclude agreements for the conservation and management of Appendix II species. These are species that have an unfavorable conservation status and require international agreements for their conservation, or species that would significantly benefit from international cooperation.[15]

Article V of the Convention includes the requirements for Agreements for the conservation of species on Appendix II. Among other things, Agreements should cover the whole range of the species concerned, and be open to accession by all range states, whether or not they are members of the Convention. Each Party to an Agreement is to designate a national authority with responsibility for implementation. Article V also includes guidelines on fourteen different aspects of conservation and management that should be included in each Agreement, including research into the ecology and population dynamics of listed species, maintenance of a network of suitable habitats, and measures based on ecological principles to manage the taking of species (Lyster, 1985).

Although no commercially sought marine species are listed under the Bonn Convention, several agreements for the conservation of marine species have been developed (Tsamenyi and McIlgorm, 1995). Denmark, Germany, and the Netherlands have concluded an agreement for the protection of seals living in the Waddensee.

Evaluation: **The Bonn Convention provides a unique mechanism for convening states, including distant water fishing nations, that exploit populations of sharks moving among EEZs, and for concluding agreements for their conservation. Because the Convention addresses not only the impact of exploitation but also the impact of habitat alteration, it can supplement traditional fisheries regimes' emphasis on the regulation of exploitation and collection of fisheries data. Another important benefit derives from the fact that the mechanisms of the Convention, particularly those regarding conservation Agreements among range states, do not hinge upon endangerment. Rather, these provisions may apply to species that are not endangered but would benefit from cooperation among range states.**

OPPORTUNITIES FOR IMPROVING THE CONSERVATION OF SHARKS

The biology and behavior of sharks and their historically low economic value, as well as growing markets for shark meat and fins, make populations of this group of animals vulnerable to overexploitation and depletion. Current domestic and international regimes for managing fisheries that directly or incidentally catch sharks are inadequate for insuring shark conservation. Besides large geographical gaps in which there is no management of fisheries affecting sharks, existing management regimes suffer from significant functional gaps, including the collection of information on shark catch and bycatch and application of the precautionary approach to the management of these fisheries.

Although fisheries for other species, particularly tuna and billfish, incidentally capture and discard millions of sharks, no international, and few domestic, management organizations adequately take into account the need for shark conservation. As a result, few if any shark conservation measures are in place, nor has there been a systematic effort to collect basic information on sharks necessary for their conservation. It is difficult to imagine that, in this day and age, such levels of unmanaged exploitation of wildlife would be tolerated on land.

In the last several decades, the international community has developed a framework within which more effective conservation of sharks can be achieved. The recently concluded UN Agreement on straddling and highly migratory fish stocks provides ample guidance and authority for replacing the current laissez-faire approach to the international management of shark fisheries with an approach that reflects what has been learned from decades of fisheries management. Likewise, the Bonn Convention offers a means for promoting regional collaboration in the management of shark fisheries within the EEZs of range states. And the Convention on Biological Diversity provides a mechanism for incorporating shark conservation into domestic conservation programs. Finally, CITES can assist by monitoring trade in species or populations at risk of extinction or depletion such that they no longer fulfill their role in their ecosystems.

Where the gaps in active management and conservation of wildlife are so widespread as they are in the case of sharks, considerable improvements can be obtained by broadening current activities of domestic and international conservation and management regimes. The nascent efforts of ICCAT to collect information on shark bycatch and utilization should be expanded and taken up by other international fisheries regimes. Where treaty organizations have the authority to recommend international or domestic management measures to conserve living marine resources, they should begin formulating management programs to address shark bycatch and discard.

The conservation and management programs of existing international regimes will be handicapped, however, if countries whose vessels fish in a regime's area of competence are not active members of that regime. Thus, countries should become active members of relevant treaty organizations as a matter of priority. Table 5 serves as a starting point for identifying potential participants in relevant international regimes.

Furthermore, existing regimes for the management of fisheries do not reflect the last two decades of evolution in understanding regarding the management and ecology of fisheries. At a minimum, existing regimes should be strengthened to reflect the precautionary approach and other elements of sound fisheries management that have been articulated in the UN Agreement and the FAO Code of Conduct for Responsible Fisheries. As described in the UN Agreement, the basic elements of this approach generally are as follows:

a) identifying precautionary reference points for each stock of fish;

b) identifying in advance management measures that will be adopted if reference points are exceeded;

c) adopting "cautious" management measures for developing fisheries, until information allows setting reference points;

d) monitoring the impact of fishing on non-target species and developing plans to conserve them;

e) adopting emergency measures if continued fishing would increase the risk of depletion caused by a natural event.

Among the most immediate priorities is the initiation of programs to collect, evaluate, and disseminate information on the capture of sharks in directed fisheries, as well as bycatch, utilization, and discards in other fisheries. Although existing international treaties may not explicitly mention collection of data on sharks, they all provide sufficient authority to do so. Because of the magnitude of bycatch in domestic and distant water longline fisheries for tuna and billfish, international organizations with authority to make or adopt recommendations for conservation measures should undertake to document the extent and impact of this bycatch. Notwithstanding their difficulty and expense, observer programs should be initiated, particularly in fisheries where declines in abundance have already been documented or where bycatch rates or levels of fishing effort are high.

As a matter of priority, countries should sign and ratify the UN Agreement on straddling and highly migratory populations of fish. This agreement reflects years of discussion and negotiation that led to a consensus regarding key elements in the management and conservation of fisheries. The international community should build upon this investment by amending international fisheries agreements so that they fully reflect this agreement. As well, new agreements should be concluded, particularly where there are gaps in coverage, as in the Pacific Ocean particularly. Precautionary quotas on shark captures in directed and other fisheries should be adopted.

As mentioned above, through the negotiation of regional Agreements, the Bonn Convention can serve as a vehicle for promoting regional cooperation in the management of shark fisheries that take place within the EEZs of range states. Among other things, this Convention can foster collaborative data gathering regarding sharks themselves and the fisheries. However, concerned parties to the Convention first must identify populations of sharks that would benefit from such international cooperation and place these populations on the appropriate Appendix. Similarly, as parties to the Convention on Biological Diversity draw up their national strategies, they should take the opportunity to develop better information and domestic management structures for sharks.

Finally, monitoring of trade in specimens of shark species that might be listed in the CITES Appendices could contribute to the management of fisheries supplying that trade by providing information on landings from the high seas and on international trade in products that could assist managers in formulating policies for shark conservation. Without prejudging or endorsing any particular listing proposal, it is recommended that the CITES Parties carefully consider proposals to list species of sharks that may qualify under CITES criteria. In doing so, the Parties should take into account enforceability, adequacy of biological and trade information, and any conservation benefits that may accrue from a listing.

Sharks and their relatives are vulnerable to rapid, global changes in fishing capacity and efficiency and increased demand for shark products. Consequently, the international community should develop comprehensive, cooperative tools for the conservation and management of sharks. A number of these tools already exist, such as the UN Agreement on highly migratory and straddling stocks. Others can be created, such as new agreements for shark conservation under the Bonn Convention. Now it is a matter of using those tools.

NOTES

1. In this paper, the term "shark" is used generically, to refer to all species of cartilaginous fishes, including sharks (about 400 species), rays, skates, and sawfishes (about 600 species), and chimaeras (about 30 species). (Anon., 1996a)

2. Also known as the Spiny Dogfish.

3. The TRAFFIC Network found that FAO statistics on world trade in sharks do not reflect the volume of trade; as an example, relying on the statistics provided by national governments, FAO reports annual production of 23mt of "other shark oil" in the period 1984-1993, although Korean customs statistics record average annual imports of 327mt.

4. Finning is the practice of removing only the fins and discarding the remainder of a shark back to the sea.

5. Under the United Nations Law of the Sea (UNCLOS), the following species and families of sharks are considered highly migratory: Bluntnose Sixgill Shark *Hexanchus griseus*, Basking Shark *Cetorhinus maximus*, Whale Shark *Rhincodon typus,* Threshers *Family Alopiidae*, Requiem *Family Carcharhinidae*, Hammerheads *Family Sphyrnidae*, and Makos *Family Isuridae* [former taxonomic name of *Family Lamnidae*].

6. The full title is: 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 Stocks.

7. Maximum sustainable yield (MSY) may be defined as the largest average catch that can be taken continuously from a population under average environmental conditions (Oliver, 1996).

8. In 1995, ICCAT began to consider recommendations that member countries take non-discriminatory trade sanctions against several countries suspected of diminishing the effectiveness of the Convention (Anon., 1996b).

9. In 1990, major fishing countries in FAO Statistical Area 87, which covers most of the IATTC's CYRA, included, in rank order, the following countries that were not members of the IATTC at the time: Ecuador, Colombia, Peru, Venezuela, Mexico, Chile, El Salvador, the Republic of Korea, the Soviet Union, and Cuba. Venezuela later joined the IATTC.

10. The charter of the South Pacific Forum does not provide for several countries whose distant water fishing fleets fish in the Convention Area. These include the United States, the Republic of Korea, Japan, and Taiwan. As a result, these countries cannot participate as members in the deliberations of the FFA.

11. Article 1(a) defines "species" as "any species, subspecies, or geographically separate population thereof." Resolution Conference 9.26 recommends that a subspecies be included in the Appendices only if it is recognized as a valid taxon and is easily identifiable in its tradeable form. If identification is difficult, either the entire species should be included or the range of the subspecies should be circumscribed and populations within this area should be identified country by country (Wijnstekers, 1995).

12. CITES Parties are to establish at least one Scientific Authority and a Management Authority. Among other things, Management Authorities are responsible for the issuance of CITES permits. Export or import permits or certificates of introduction from the sea are not to be granted without obtaining the

advice of the Scientific Authority, specifically whether or not the actions will be detrimental to the survival of the species (Wijnstekers, 1995). The Management Authority of an exporting country is to insure that the specimens were legally acquired in its country, among other things.

13. Article I(1)(a) defines a "migratory species" as "the entire population or any geographically separate part of a population of any species or lower taxon of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries."

14. Article I(1)(h) defines a Range State as any State "that exercises jurisdiction over any part of the range of that migratory species, or a State, flag vessels of which are engaged outside national jurisdictional limits in taking that migratory species."

15. Species may be included on both Appendix I and Appendix II.

REFERENCES

Anon. 1996a. The Implications of Biology for the Conservation and Management of Sharks. A paper prepared by the Shark Specialist Group of the Species Survival Commission of the IUCN-The World Conservation Union for the Thirteenth Meeting of the CITES Animals Committee, 23-27 September 1996, Pruhonice, Czech Republic. 2 September 1996. 37 pages.

Anon. 1996b. International Living Marine Resource Agreements. 12 February 1996. National Marine Fisheries Service, Silver Spring, Maryland. 103 pages.

Bonfil, R. 1994. Overview of world elasmobranch fisheries. FAO Fisheries Technical Paper No. 341. FAO, Rome, Italy. 119 pages.

Consortium for International Earth Science Information Network (CIESIN). 1996. Environmental Treaties and Resource Indicators (ENTRI) [online]. University Center, Michigan: CIESIN.URL: http://sedac.ciesin.org/entri/

Compagno, L.J.V. 1984. Sharks of the World. FAO Species Catalogue, Volume 4, Part 1. (United Nations Food and Agriculture Organization, Rome). 249 pages.

Compagno, L.J.V. 1984. Sharks of the World. FAO Species Catalogue, Volume 4, Part 2. (United Nations Food and Agriculture Organization, Rome). Pages 251-655.

Crouse, D. and M. Donnelly and M. Bean and M. Sutton and H. Upton. 1992. CITES and Marine Fishes. Paper submitted to the Eighth Meeting of the Conference of the Parties, Kyoto (Japan), 20-13 March 1992. IUCN-the World Conservation Union. 11 pages.

de Fontaubert, C. and D. McAllister. 1996. Addressing Marine & Coastal Biodiversity Through the CBD Process: The "Jarkarta Mandate" and Beyond. Biodiversity Bulletin, August 1996, page 2.

Fordham, Sonja V. 1996. New England Groundfish: From Glory to Grief. Center for Marine Conservation. 170 pages.

Iudicello, S. and M. Lytle. 1994. Marine Biodiversity and International Law: Instruments and Institutions That Can Be Used To Conserve Marine Biological Diversity Internationally. Tulane Environmental Law Journal, Winter 1994. (8 Tul.Envtl.L.J. 123)

Last, P.R. and J.D. Stevens. 1994. Sharks and Rays of Australia. CSIRO Division of Fisheries, Australia.

Lyster, S. 1985. International Wildlife Law. Grotius Publications Limited, Cambridge, England 470 pages.

Marashi, S.H. 1996. Summary Information on the Role of International Fishery and Other Bodies with Regard to the Conservation and Management of Living Resources of the High Seas. FAO Fisheries Circular No. 908. (United Nations Food and Agriculture Organization, Rome) 104 pages.

Michael, Scott W. 1993. Reef Sharks and Rays of the World: A Guide to Their Identification, Ecology, and Behavior. Sea Challenges, Monterey, California. 107 pages.

Nédélec, C. and J. Prado. 1990. Definition and Classification of Fishing Gear Categories. FAO Fisheries Technical Paper No. 222, Rev. 1. FAO, Rome, Italy. 92 pages.

Oliver, A. 1996. Draft Discussion Paper Pursuant to CITES Resolution Conf. 9.17: An Overview of the Biological Status of Shark Species. 15 July 1996. National Marine Fisheries Service, Silver Spring, Maryland. 53 pages plus appendices.

Peel, E. 1996. No Place to Hide: Highly Migratory Fish in the Atlantic Ocean. Center for Marine Conservation, Washington, DC. 126 pages.

Pusch, G.T. 1996. Models for a Multilateral Shark Management Regime. 9 April 1996. 20 pages.

Rose, D.B. 1996. An Overview of World Trade in Sharks. Draft. 67 pages.

Tsamenyi, M. and A. McIlgorm. 1995. International Environmental Instruments: Their Effect on the Fishing Industry. Report of the Fisheries Research and Development Corporation project. University of Wollongong and Australian Maritime College. September 1995. 51 pages.

Van Dyke, J. and M. Nakano and E. Gardner. 1996. Draft: Shark Management Under the Precautionary Principle. 51 pages.

Weber, M.L. 1996. Gaps in the International Conservation of Large Migratory Fishes in the Pacific Ocean. Ocean Wildlife Campaign, Washington, D.C. 28 pages plus appendices.

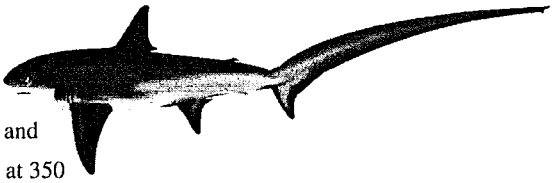
Weber, M.L. and F. Spivy-Weber. 1995. Proposed Elements For International Regimes To Conserve Living Marine Resources. A report in fulfillment of MMC Contract T30916119. (National Technical Information Service, Springfield, Virginia). 95 pages.

Wijnstekers, W. 1995. The Evolution of CITES: A reference to the Convention on International Trade in Endangered Species of Wild Fauna and Flora. Fourth edition. CITES Secretariat, Châtelaine-Geneva, Switzerland. 519 pages.

APPENDIX I: DESCRIPTIONS OF SELECTED SHARK SPECIES

The following descriptions of some key shark species are drawn from Compagno (1984), Fordham (1996), Last and Stevens (1994), Michael (1993), and Anon. (1996a). These species were selected based upon their importance in fisheries and their diversity in form, behavior and habitats.

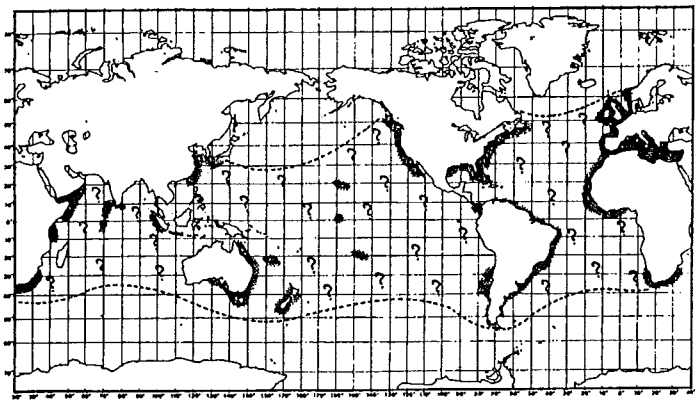
Thresher Shark, *Alopias vulpinus*



Alternative Names: Thintail Thresher, Fox Shark.

Basic Life History: Males mature at 260 to 340cm and reach 319cm to at least 420cm, while females mature at 350 to 400cm and reach 376cm to 549cm. After a gestation period of nine months, females bear two to six live young, which measure 114 to 150cm at birth.

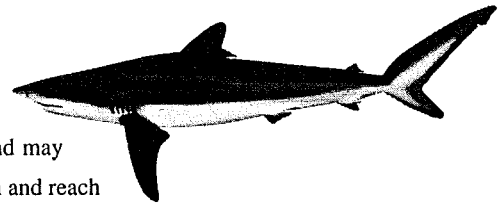
Distribution: The Thresher Shark is found around the world in warm oceanic and coastal seas from the surface to more than 350m.



Ecological Aspects: The Thresher feeds on small schooling species, such as fishes and squids, which it encircles as it swims and may stun with its tail. This species of Thresher feeds principally on herring, needlefish, mackerel, squid, bonito, and bluefish.

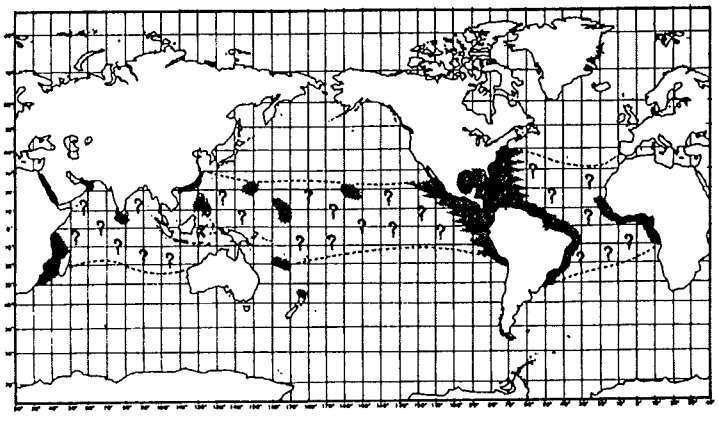
Fishing Activities: Threshers are valued for their meat, which is sold fresh, frozen, smoked, or dried and salted. Fins are used for soup, livers for vitamins, and hides for leather. In the central Pacific, both Russia and Japan have fished for pelagic Thresher by floating longlines. Off California, Thresher Sharks have been the target of a coastal gillnet fishery. Threshers also are captured with line gear and fixed bottom nets. Like other Threshers, *A. vulpinus* commonly becomes hooked by longlines when it strikes the bait with its tail.

Silky Shark *Carcharhinus falciformis*



Basic Life History: Silky Sharks reach a maximum length of about 330cm. Males mature at 187 to 217cm and may reach 270 to 300cm, while females mature at 213 to 230cm and reach at least 305cm. Females bear a litter of 2 to 15 young, which measure 70 to 87cm in length.

Distribution: Silky Sharks are abundant sharks found around the world in coastal and oceanic tropical waters. Longline records indicate that silky sharks are more abundant in offshore waters near land than in the open ocean. Silky Sharks have been reported as deep as 500m, over deepwater

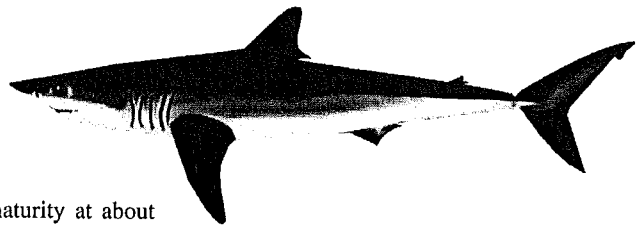


reefs, the edge of the continental shelves, and near insular slopes. Young are found in offshore nursery grounds, while adults are seaward of these areas.

Ecological Aspects: Silky Sharks often are found with Blue Sharks and Oceanic Whitetip Sharks. They feed upon offshore and nearshore fishes including sea catfish, mullet, mackerel, yellowfin and albacore tuna, porcupine fish, squid, paper nautilus, and pelagic crab.

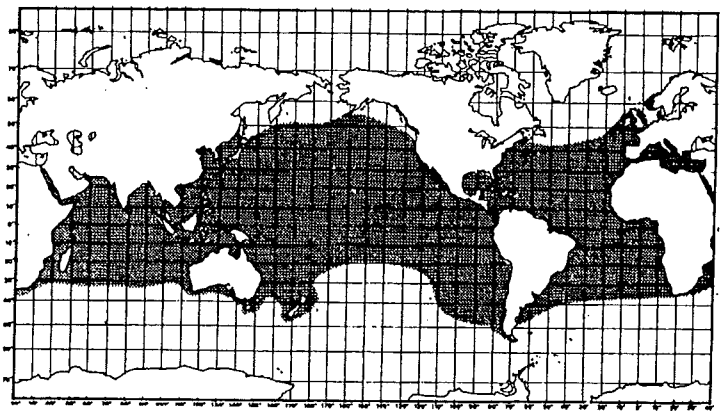
Fishing Activities: Silky Sharks are commonly caught on longlines, as well as fixed bottom nets. The meat of Silky Sharks is used fresh or preserved; the hide is used for leather; the fins for soup; the liver for oil, which is high in vitamin A. Silky Sharks swim with schools of tuna, and may be caught as bycatch in purse-seine nets and longlines.

Shortfin Mako *Isurus oxyrinchus*



Alternative Names: Mako Shark, Blue Pointer, Mackerel Shark, Snapper Shark

Basic Life History: Males reach sexual maturity at about 195cm and reach more than 285cm in length, while females mature at about 280cm and reach 400cm in length. Females bear 4 to 16 live young, which measure between 60 and 70cm in length.

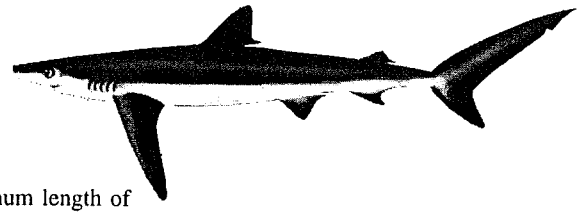


Distribution: Shortfin Mako are found in coastal and oceanic waters of tropical and temperate latitudes around the world. In the northern and southern extremes of its range, the Shortfin Mako follows the movement of warm water toward the poles in the summer.

Ecological Aspects: Shortfin Mako feed on a wide variety of fishes, including swordfish, tunas, herring, and cod.

Fishing Activities: Large fisheries for Shortfin Mako have been conducted off southern California and in the western and central Pacific, using gillnets, pelagic longlines, and hook-and-line. Known for their spectacular leaping ability, Shortfin Makos also are a favorite of recreational fishers. The meat, fins, liver, and skin of Shortfin Makos are used.

Blue Shark *Prionace glauca*

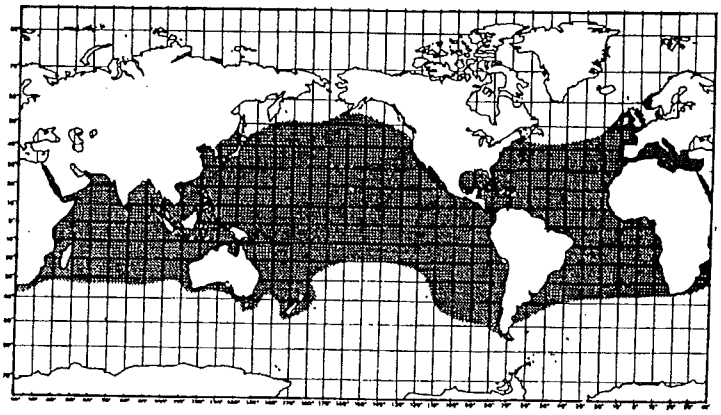


Alternative Names: Blue Whaler, Great Blue Shark

Basic Life History: Blue Sharks reach a maximum length of 383cm. Males mature between 182 and 281cm, and may reach more than 310cm. Females mature at 173 to 221cm. Females bear 4 to 135 young per litter, after a gestation of nine to twelve months.

Distribution: Blue Sharks are one of the most wide-ranging of shark species. They are known to travel across the Atlantic and between the Northern and Southern Hemispheres. In temperate waters, Blue Sharks often are found in large groups close to the surface, and at greater depths in tropical waters. Blue Sharks are most abundant between 20° and 50°N, with strong seasonal fluctuations due to migration north in the summer and south

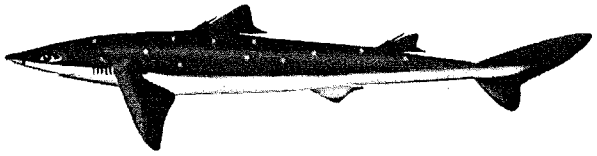
in the winter. Blue Sharks are abundant throughout the year in tropical waters between 20°N and 20°S. Females seem to be more abundant than males in higher latitudes.



Ecological Aspects: Blue Sharks feed heavily on relatively small prey, including fishes, squids and other invertebrates, small sharks, and seabirds. Fish prey include herring, sardines, anchovies, conger eels, Pacific salmon, daggertooths, lancetfish, needlefish, sauries, flyingfish, hake, cod, whiting, pomfrets, mackerel, bigeye and yellowfin tunas, jacks, and rockfish, among others.

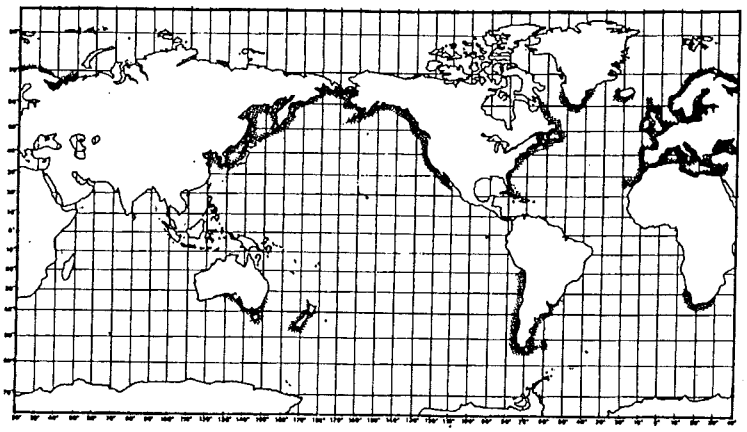
Fishing Activities: Blue Sharks commonly are caught with longlines, as well as hook-and-line, and pelagic trawls. They are also a common bycatch in longline and high seas driftnet fisheries. Blue shark meat, liver oil, hide, and fins all are used.

Piked Dogfish, *Squalus acanthias*



Alternative Names: Spiny Dogfish, White-Spotted Spurdog, Victorian Spotted Spurdog.

Basic Life History: Estimates of life history parameters vary between stocks, with the North Pacific reporting the largest, latest maturing individuals. Males grow to 100cm and reach maturity at 6 to 14 years. Females grow to 124cm and mature at 12 to 23 years. An exceptional maximum size of 160cm has been reported from the North Pacific. In the Northwest Atlantic, Piked Dogfish live an estimated 35-40 years, while individuals in other regions may reach 50 or even 100 years of age. The two-year gestation period of the Piked Dogfish is among the longest of all vertebrates, after which they give birth to an average of only six live young. Litters range from 1 to 20 pups, each about 22cm long.



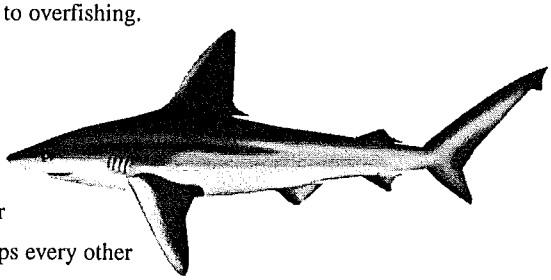
Distribution: Piked Dogfish are cosmopolitan and widely distributed in the North Atlantic and Pacific, as well as around the southern tips of South America, Africa, and New Zealand. Piked Dogfish have been found from the intertidal zone to 900m. Usually coastal and demersal, they migrate north and south as well as nearshore and offshore in search of temperate and subarctic waters of 6 to 15 degrees Celsius. Piked Dogfish school by size and sex. Pupping is known to occur in deep offshore waters of the outer continental shelf, but may also take place in shallow bays.

Ecological Aspects: Piked Dogfish are opportunistic feeders, preying upon a variety of available small fish and invertebrates, including herring, hake, menhaden, squid, krill, capelin, ratfish, octopus, cod, and haddock. They are eaten primarily by larger sharks.

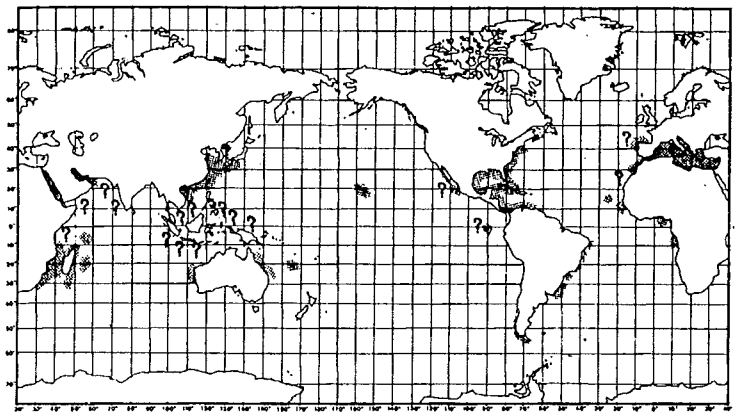
Fishing Activities: Due to its historical abundance and variety of uses, the Piked Dogfish is a commercially important species throughout its range and is accepted by consumers in Europe, Australia, New Zealand, South America, and Japan. Dogfish are caught primarily in bottom trawls and line gear, but also in gillnets and by sport rod and reel. Their meat is eaten fresh, fresh-frozen, dried, smoked, salted, boiled, marinated, and in fish-cakes and also used to make fishmeal, pet food and fertilizer. Piked Dogfish fins are sold for shark fin soup, while their livers and hides provide oil and leather. Several Piked Dogfish populations around the globe, such as the Scottish-Norwegian stock, have collapsed due to overfishing.

Sandbar Shark *Carcharhinus plumbeus*

Alternative Names: Thickskin Shark.



Basic Life History: This slow-growing species takes more than 13 years to mature and can live for more than 30 years. Females give birth to 1 to 14 pups every other year, following a 9 to 12 month gestation period. Pups measure about 60 cm and grow to a maximum size of approximately 240cm. Size at maturity varies between stocks, but ranges from 130 to 180cm for males, and from 145 to 185cm for females.



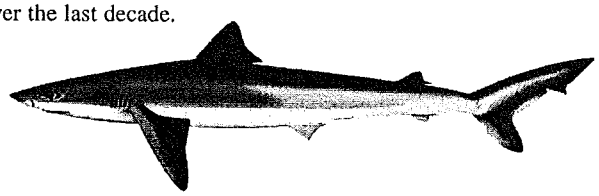
Distribution: Sandbar Sharks are a wide-ranging, coastal-pelagic species with a patchy, cosmopolitan distribution. They are found in tropical and warm temperate waters of the continental and insular shelves and adjacent deep water (down to 280m), usually near the bottom. While Sandbar Sharks off Hawaii appear to be year-round residents, individuals in the western North Atlantic and South African stocks are known to make extensive, seasonal migrations of up to 2,700km or more. Migrating Sandbar Sharks separate by sex, with males travelling earlier and in deeper waters than females. In the western North Atlantic, adult females use shallow, estuarine waters as pupping grounds, where juveniles remain for several years, segregated from the adult population.

Ecological Aspects: Sandbar Sharks eat a wide variety of relatively small fishes including sardines, mackerel, catfishes, flounders, jacks, eels, and rays, as well as invertebrates such as octopi, conchs, and shrimps.

Fishing Activities: Sandbar Sharks are significant in coastal shark fisheries around the world, particularly in the western and eastern North Atlantic and the South China Sea. They are caught with longlines, hook and line, gillnets, and sports rod and reel. Sandbar Sharks possess both valuable fins and good quality flesh, which is used fresh, fresh-frozen, smoked, and dried-salted. In addition, the hides are made into leather, and the liver is used for its oil. In the western North Atlantic, Sandbar Sharks dominate the catch of the directed shark long-

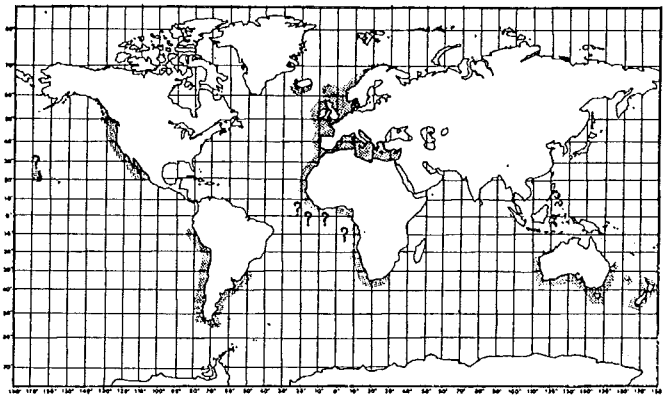
line fishery, which began a rapid expansion in the mid-1980s. The Sandbar Shark is also a favorite of the region's recreational fishery. Consequently, a very large original stock has been reduced by an estimated 85-90% over the last decade.

Soupfin Shark *Galeorhinus galeus*



Alternative Names: Tope, School Shark, Snapper Shark.

Basic Life History: Maximum size varies regionally, ranging from 175cm to 195cm. Males mature at 120 to 170cm or 8 to 10 years; females at 130 to 185cm, or 10 to 15 years. After a year-long gestation period, female Soupfin Sharks give birth to litters of 8 to 50 (mean of 30) pups, each about 30 to 40cm long. Soupfin Sharks are estimated to live 60 years.

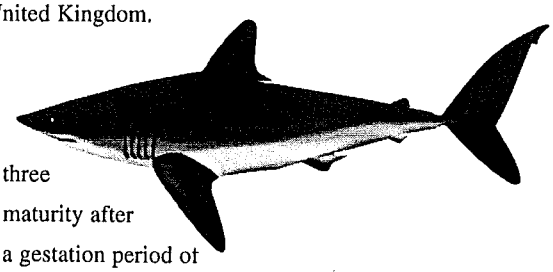


Distribution: The coastal-pelagic Soupfin Shark is widely distributed throughout temperate waters of the eastern North Atlantic, western South Atlantic, eastern North and South Pacific, and off South Africa, New Zealand and southern Australia. They are found nearshore and out to 800m depths. These sharks form small schools, often according to size or sex, and migrate long distances of 2500km or more.

Ecological Aspects: The diet of the Soupfin Shark includes a variety of midwater and bottom fishes, such as herring, sardines, tuna, cod, hake, and flounders. Soupfin sharks also prey readily upon invertebrates including squid, crabs, and snails.

Fishing Activities: Soupfin Sharks have been commercially exploited since the 1920s. They are sought for their high-quality meat (eaten fresh, fresh-frozen, or dried-salted), valuable fins, and liver oil that is extremely high in Vitamin A. Soupfin Sharks are caught using gillnets, longlines, trawls, and hook and line, and have been fished heavily off California, South Africa, southern Australia, New Zealand, South America, and northern Europe. Intense California and South Africa Soupfin Shark fisheries in the 1930s and 40s declined due to stock depletion and the development of synthetic Vitamin A. The overfished southern Australian stock is still a major component of the region's shark fishery. In addition, Soupfin Sharks are a popular sportsfish for recreational anglers off California, South Africa, and the United Kingdom.

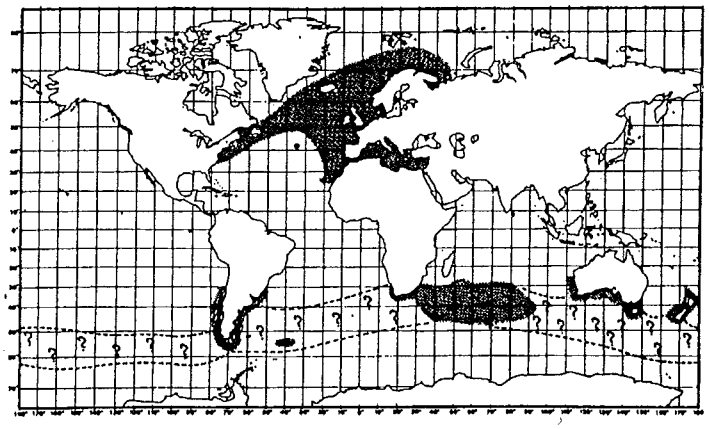
Porbeagle *Lamna nasus*



Alternative Names: Mackerel Shark.

Basic Life History: Porbeagle Sharks grow to at least three meters and can live 30 years or more. Females reach maturity after five years and produce litters of one to five pups after a gestation period of about eight months.

Distribution: Porbeagle Sharks are anti-tropical in the North and South Atlantic, South Pacific, and Southern Indian Oceans. They usually occur in the open ocean, far from land, but can be found near shore. Preferring cold water of 18 degrees Celsius or less, Porbeagles inhabit surface waters down to depths of 350 meters.



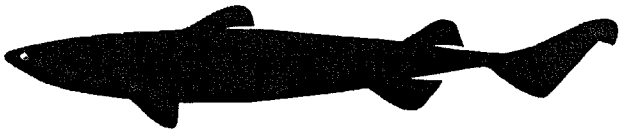
Porbeagles segregate by size and sex, and are also known to roam singly.

Ecological Aspects: Porbeagles prey upon schools of small, pelagic fishes such as mackerel and herring, as well as on cod, haddock, hake, cusk, whiting and squid. They are also known to eat dogfish and soupfin sharks.

Fishing Activities: The Porbeagle is sought for its quality meat, used fresh or dried and salted, as well as for its oil and fins. It has been heavily fished in the North Atlantic for several decades, primarily by European countries. In the 1960s, the Northwest Atlantic Porbeagle population collapsed after just seven years of heavy fishing. Today, more than thirty years later, the population has not fully rebounded. Porbeagles are caught primarily by pelagic longlines, in addition to trawls, handlines, and gillnets. Considerable numbers of Porbeagles are taken as bycatch in the Japanese longline fishery for bluefin tuna off the coast of Tasmania.

Kitefin Shark *Dalatias licha*

Alternative Names: Black Shark, Seal Shark.



Basic Life History: These dark, bottom-dwelling dogfish are about 30cm in length at birth and grow to at least 160cm in length. Males reach sexual maturity at about 100cm. Females mature at 120cm and give birth to litters of 10 to 16 pups.

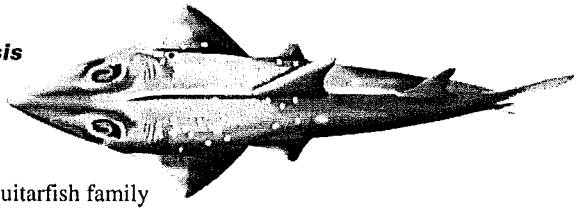
Distribution: Kitefin Sharks are found on the outer continental and insular slopes and shelves of the eastern and western Atlantic, western Indian Ocean, and parts of the western and central Pacific. This deepwater species occurs, usually singly, on or near the oceanfloor, rarely in less than 200 meters of water. They have been recorded at depths of 1,800m, but generally range between 450m and 850m.

Ecological Aspects: Kitefin Sharks feed primarily on bony fishes, but may also eat invertebrates and other sharks or rays. It is thought that this species, like the "cookie cutter shark," is capable of tearing small chunks of flesh from much larger fish.

Fishing Activities: The Kitefin Shark is caught as bycatch in bottom trawls, as well as in limited directed deepwater line fisheries. This species is used for oil, meat, leather, and fishmeal. It is expected that this particularly vulnerable species, like other deep-dwelling fish, will become subject to increasing directed and incidental take as depletion of nearshore stocks and technological advances continue to drive commercial fisheries farther offshore.

Giant Guitarfish *Rhynchobatus djiddensis*

Alternative Names: White-Spotted Guitarfish, White-Spotted Shovelnose Ray.

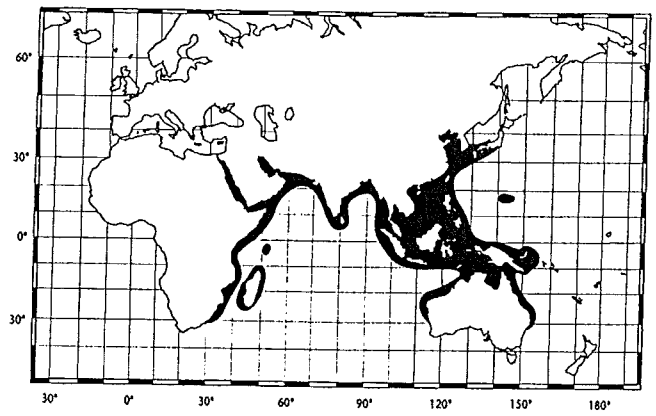


Basic Life History: This large member of the guitarfish family can grow to more than three meters and weigh more than 220kg. Males of the species reach sexual maturity at approximately 110cm. Pups of 43 to 60cm are born in litters of up to 10 individuals.

Distribution: Giant Guitarfish inhabit estuaries, lagoons, and sandy bottoms near reefs in the tropical and warm-temperate waters of the Indo-Pacific continental shelf. They range from northern Australia to Japan, and from South Africa to the Red Sea.

Ecological Aspects: Giant Guitarfish prey upon small fishes and invertebrates such as crabs, clams, and lobsters.

Fishing Activities: The fins of the Giant Guitarfish are among the most prized in the world, while the meat is also eaten. The Giant Guitarfish is also a popular sports fish.



APPENDIX II: ELEMENTS IN INTERNATIONAL CONSERVATION OF LIVING MARINE RESOURCES

Source: Weber and Spivy-Weber 1995)

Goal of Management

The goal of management is the maintenance, and where necessary the restoration, of the abundance and diversity of living marine resources through establishment of harvest levels that are sustainable over the short- and long-term and that reflect uncertainty concerning the size and productivity of the living marine resources and their relationships with other components of their ecosystem.

Operational Principles

1) **Ecosystem Perspective:** The harvesting of living marine resources should be managed to ensure that it does not reduce target, dependent, or associated species below the lower limit of their natural equilibrium range, or alter the basic structure and resilience of the ecosystem of which they are a part.

2) **Integrative Perspective:** The development of management measures should consider ecological, economic, social, demographic, and behavioral aspects of fishing.

3) **Independent Scientific Advice:** International regimes for the conservation of living marine resources should provide means for obtaining independent, peer-reviewed scientific advice that includes majority and minority views as well as clear statements regarding uncertainty and the possible consequences of harvesting without resolving that uncertainty.

4) **Responsive Management:** The exploitation of living marine resources should be structured to ensure that monitoring and reporting mechanisms are sufficient to develop information necessary to meet management objectives and to change in response to anticipated and unanticipated outcomes.

5) **Anticipatory Management:** The needs of management for information and effective controls over harvest rates should prevail over expanded exploitation.

6) **Conservative Management:** When faced with uncertainty, managers should favor the long-term over the short-term, and should place the burden of proof upon proponents for increasing direct and indirect resource exploitation or for delaying measures to rebuild depleted resources.

7) **Accountability:** International regimes for the conservation of living marine resources should include means for analyzing the effectiveness of management measures, for ensuring accountability by all stakeholders, including government representatives and fishermen, and for addressing any failures to meet responsibilities.

Key Participants

1) **Harvesting Nations:** A regime for the conservation of living marine resources must address the activities of all harvesting nations, whether or not they are parties to a management agreement.

2) **Non-Governmental Organizations:** International regimes for the conservation of living marine resources should encourage open and regular involvement of non-governmental organizations in the development and implementation of conservation measures by providing for their attendance as observers and their access to the data and information upon which the regime's decisions are based.

3) **Intergovernmental Organizations:** Intergovernmental organizations should actively participate in regimes to conserve living marine resources by providing technical assistance, facilitating the exchange of data and information, and helping to coordinate competing and complementary activities.

Implementing Activities

1) **Adequate Financing Mechanisms:** International regimes for the conservation of living marine resources should include explicit means for identifying and securing funding for management activities, including research, monitoring, and enforcement.

2) **Integrated Monitoring and Decision Making:** Conservation regimes should provide for the design and funding of monitoring programs sufficient to assess the effectiveness of management measures, to improve the understanding of living marine resources and the effects of their exploitation, and to provide other information needed by decision-makers.

3) **Accurate and Timely Reporting By Harvesters and Processors:** Regimes for the conservation of living marine resources should require and provide the means for timely and accurate reporting of landings, effort, and incidental catch by harvesting vessels.

4) **Independent Data Collection:** Regimes for the conservation of living marine resources should require and make provisions for funding programs to verify fishery-dependent data and gather independent data and information on key parameters of target and selected non-target species.

5) **Full Economic Accounting:** Regimes for the conservation of living marine resources should regularly obtain economic analyses of fisheries and associated activities, including such things as investment in vessels, operating costs, and trends in markets and prices.

6) **Impact Assessment:** International regimes for the conservation of living marine resources should provide for analyses of planned harvesting activities to evaluate possible effects on target and non-target species and habitat as well as cumulative effects of these activities when taken together, with a view to ensuring ecologically and environmentally sound and sustainable use of living marine resources.

7) **Compliance Monitoring and Enforcement:** International agreements for the conservation of living marine resources should include a range of methods for promoting compliance with management measures ranging from collective action, including sanctions, to differentiated responsibilities and technology transfer.

APPENDIX III: SUMMARIES OF OTHER RELEVANT TREATIES

Below are brief summaries of international regimes that are not discussed elsewhere in this paper but may contribute to the conservation of sharks. These summaries are based on Marashi (1996).

International Council for the Exploration of the Sea (ICES)

The original 1902 charter of ICES was renewed by a new convention in 1964 that came into force in July 1968. Although the Convention refers generally to the Atlantic Ocean and its adjacent seas, ICES generally restricts its activities to FAO Statistical Area 27. All living marine resources within this area are under its purview. Current members are Belgium, Canada, Denmark, Estonia, Finland, France, Germany, Iceland, Ireland, Latvia, the Netherlands, Norway, Poland, Portugal, Russia, Spain, Sweden, the United Kingdom, and the United States. New members must be approved by three quarters of the member states.

The principal objectives of ICES are to promote and organize research regarding the seas and living marine resources of the area and to disseminate the results of its research. Although ICES is not a management body, its Advisory Committee on Fishery Management provides scientific advice and management recommendations to several international bodies such as the European Community, the International Baltic Sea Fishery Commission, and the Northeast Atlantic Fishery Commission.

Northwest Atlantic Fisheries Organization (NAFO)

The Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries, which established NAFO, entered into force in January 1979. The general area of competence is FAO Statistical Area 21, within which NAFO may establish a "Regulatory Area" outside the jurisdiction of the Coastal States. NAFO's purview includes all fishery resources, except salmon, tunas and marlins, cetaceans managed by the International Whaling Commission, and sedentary species of the continental shelf. The membership of the General Council is to include Contracting Parties that fish in the Regulatory Area as well as those that intend to fish there in the coming year. The members of NAFO are: Bulgaria, Canada, Cuba, Denmark, Estonia, the European Community, Iceland, Japan, Korea, Latvia, Lithuania, Norway, Poland, Romania, Russia, and the United States.

The principal objective of the Convention is to promote conservation and optimum utilization of fishery resources in the Northwest Atlantic, consistent with the Coastal States' jurisdiction. The Fisheries Commission is responsible for management of fisheries within the Regulatory Area, and may adopt measures to control fisheries and enforce these measures. The Commission also adopts allocation of catch quotas to the Contracting Parties, and administers a system of joint international inspection. Contracting Parties may bring to the attention of non-Party States fishing activities that may be adversely affecting the objectives of the Convention.

Fishery Committee for the Eastern Central Atlantic (FCECA)

Established in 1967 pursuant to Article VI of the FAO Constitution, the FCECA's primary objective is to promote the optimum utilization of living marine resources through improved management and development of fisheries, the development of aquaculture, and improved processing and marketing. FCECA has the power to recommend management measures. The geographic area covered by FCECA coincides, for the most part, with FAO statistical area 34. The members of FCECA are: Benin, Cameroon, Cape Verde, Congo, Cuba, the

European Community, Equatorial Guinea, France, Gabon, Gambia, Ghana, Greece, Guinea, Guinea-Bissau, Italy, Côte d'Ivoire, Japan, Korea, Liberia, Mauritania, Morocco, Nigeria, Norway, Poland, Romania, São Tomé and Principe, Senegal, Sierra Leone, Spain, Togo, the United States, and Zaire.

International Baltic Sea Fishery Commission (IBSFC)

Established in 1973 by the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and Belt, IBSFC's main objective is to achieve optimum yield of living resources in the Baltic Sea. IBSFC has the power to set gear, seasonal, area, and catch restrictions. IBSFC regulates all living resources in the waters of the Baltic Sea and the Belts. The Commission's members are Estonia, the European Community, Finland, Latvia, Lithuania, Poland, the Russian Federation, and Sweden.

Regional Convention on Fisheries Cooperation Among African States Bordering the Atlantic Ocean

Established in 1991, this regional convention's primary objectives are to promote cooperation in the areas of fisheries management and development and to achieve food self-sufficiency. The Convention applies to all fishery resources within its area of competence, parts of FAO Statistical Areas 34 and 47. Although not clearly defined, the Convention applies to those African states bordering the Atlantic. The members of the Convention are Angola, Benin, Cameroon, Cape Verde, the Congo, Gabon, Gambia, Guinea, Guinea Bissau, Equatorial Guinea, Côte d'Ivoire, Liberia, Morocco, Mauritania, Namibia, Nigeria, São Tomé and Principe, Senegal, Sierra Leone, Togo, and Zaire.

Western Central Atlantic Fishery Commission (WECAFC)

Established in 1973 by an FAO resolution under Article VI(1) of the FAO Constitution, WECAFC is concerned with all living marine resources in the Western Atlantic—FAO Statistical Area 31 and part of Area 41. The members of WECAFC are Antigua and Barbuda, Bahamas, Barbados, Belize, Brazil, Colombia, Costa Rica, Cuba, Dominica, France, Grenada, Guatemala, Guinea, Guyana, Haiti, Honduras, Jamaica, Japan, Korea, Mexico, the Netherlands, Nicaragua, Panama, Saint Christopher and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Spain, Suriname, Trinidad and Tobago, the United Kingdom, the United States, and Venezuela.

WECAFC's primary objectives are coordination of research, and assisting and advising member nations in the rational management of living marine resources that are of interest to two or more countries. Although WECAFC has no regulatory power, it can advise members on fishery management.

Indian Ocean Fishery Commission (IOFC)

The IOFC was established in June 1967 under the FAO. Its area of competence is the Indian Ocean—FAO Statistical Areas 51 and 57. With the establishment of the Indian Ocean Tuna Commission (see below), the IOFC's activities will likely decrease considerably. IOFC's members are: Australia, Bahrain, Bangladesh, Comoros, Cuba, Djibouti, Egypt, Ethiopia, France, Greece, India, Indonesia, Iran, Iraq, Israel, Japan, Jordan, Kenya, Korea, Kuwait, Madagascar, Malaysia, the Maldives, Mauritius, Mozambique, Myanmar, the Netherlands, Norway, Oman, Pakistan, Portugal, Qatar, Saudi Arabia, the Seychelles, Somalia, Spain, Sri

Lanka, Sudan, Sweden, Tanzania, Thailand, the United Arab Emirates, the United Kingdom, the United States, and Vietnam.

The objectives of the IOFC are to promote national programs of fishery development and conservation as well as research and development, and to examine management problems, particularly regarding offshore resources. Three sub-regional Committees may manage fishery resources.

Indian Ocean Tuna Commission (IOTC)

In March 1996, the Agreement establishing the IOTC came into force with the receipt of the tenth instrument of acceptance. Within FAO Statistical Areas 51 and 57, the IOTC promotes cooperation among members regarding appropriate management, conservation, and optimum utilization of the following species: Yellowfin Tuna *Thunnus albacares*, Skipjack Tuna *Katsuwonus pelamis*, Bigeye Tuna *Thunnus obesus*, Albacore *Thunnus alalunga*, Southern Bluefin Tuna *Thunnus maccoyii*, Longtail Tuna *Thunnus tonggol*, Kawakawa *Euthynnus affinis*, Frigate Tuna *Auxis thazard*, Bullet Tuna *Auxis rochei*, Narrow-barred Spanish Mackerel *Scomberomorus concolor*, Indo-Pacific King Mackerel *Scomberomorus guttatus*, Indo-Pacific Blue Marlin *Makaira mazara*, Black Marlin *Makaira indica*, Striped Marlin *Tetrapturus audax*, Indo-Pacific Sailfish *Istiophorus platypterus*, and Swordfish *Xiphias gladius*. The IOTC is open to members of FAO that are coastal States, are responsible for international relations of territories in the area, or regularly engage in fishing in the area, as well as regional economic integration organizations. Upon approval, other members of the United Nations may become members if they engage in fishing in the area.

Western Indian Ocean Tuna Organization (WIOTO)

Established in 1991 by the Western Indian Ocean Tuna Convention, WIOTO's objectives include the harmonization of fisheries policies, fisheries development, improving relations with distant water fishing nations, surveillance and enforcement, and assuring access to members' EEZs. WIOTO has no regulatory power. WIOTO's area of competence coincides with FAO statistical area 51. Like the IOTC, WIOTO also covers swordfish and billfish in addition to tuna. The members of WIOTO are the Seychelles, Mauritius, Comoros, and India.

Asia Pacific Fishery Commission (APFC)

Established in 1948 by an agreement made pursuant to Article XIV of the FAO Constitution, APFC covers all living marine resources, including inland aquatic resources. APFC's area of competence is referred to as the Asia-Pacific area, but is not defined by latitude and longitude. The members of APFC are Australia, Bangladesh, Cambodia, China, France, India, Indonesia, Japan, Korea, Malaysia, Myanmar, Nepal, New Zealand, Pakistan, the Philippines, Sri Lanka, Thailand, the United Kingdom, the United States, and Vietnam.

APFC's objective is to promote full utilization of living aquatic resources through management of fishing, processing, and marketing. Although APFC has no regulatory power it does have the ability to recommend conservation and management measures.

North Pacific Marine Science Organization (PICES)

The Convention creating the North Pacific Marine Science Organization (PICES) came into force in March 1992. The Convention covers all marine species within the temperate and Sub-Arctic region of the North Pacific Ocean—FAO Statistical Area 67 and parts of areas 61 and 77. Current members are Canada, Japan, the People's Republic of China, the Republic of Korea, the Russian Federation, and the United States.

PICES was established to promote and coordinate marine scientific research, and to promote the collection and exchange of information and data. PICES does not recommend regulatory measures, but does provide scientific advice.

South Pacific Commission (SPC)

The agreement establishing the SPC came into force in 1948 and has been amended and supplemented by protocols several times since. The geographical area of competence of the SPC, which carries out activities in fisheries as well as agriculture, rural development, and education, is not defined but generally coincides with part of FAO Statistical Areas 71 and 77. Current members include American Samoa, Australia, the Cook Islands, the Federated States of Micronesia, Fiji, France, French Polynesia, Guam, Kiribati, the Marshall Islands, Nauru, New Caledonia, New Zealand, Niue, the Northern Mariana Islands, Palau, Papua New Guinea, the Pitcairn Islands, the Solomon Islands, Samoa, Tokelau, Tonga, Tuvalu, the United Kingdom, the United States, Vanuatu, and Wallis and Futuna.

The main objective of the SPC is to encourage international cooperation in promoting economic and social welfare in the South Pacific region. While SPC does not recommend management measures on fisheries to its members, it does provide scientific advice on the status of exploited fish populations. It also collects and analyzes data regarding high seas fisheries and conducts research on tuna and billfish.