Report to Congress Pursuant to the Shark Finning Prohibition Act of 2000 (Public Law 106-557)

Prepared by the National Marine Fisheries Service
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1. Introduction

Sharks are fish in the class Chondrichthyes, or cartilaginous fishes. As a group, sharks (and other elasmobranchs, such as skates and rays) present an array of issues and challenges for fisheries management and conservation. They are generally at the top of the food chain and their abundance is relatively small compared to groups at lower trophic levels. They are often characterized by late age of maturity and relatively slow growth and reproductive rates. Historically, compared to many bony fishes, sharks have had relatively low economic value, and thus have been a lesser priority for fisheries research and management.

In recent years, however, there has been increasing concern about the status of shark stocks and the sustainability of their exploitation in world fisheries. As the commercial value of some species and/or shark products has grown, there have been increased international fishing efforts directed at sharks and there is increasing evidence of overfishing. In turn, several international initiatives have been undertaken to promote greater understanding of sharks in the ecosystem and greater efforts to conserve the many species taken in world fisheries.

On December 21, 2000, President Clinton signed into law the Shark Finning Prohibition Act (Act). Section 3 of the Act amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to prohibit any person under U.S. jurisdiction from (i) engaging in the finning of sharks; (ii) possessing shark fins aboard a fishing vessel without the corresponding carcass; and (iii) landing shark fins without the corresponding carcass. Section 9 of the Act defines finning as the practice of taking a shark, removing the fin or fins from a shark, and returning the remainder of the shark to the sea. The Act also requires the National Marine Fisheries Service (NMFS) to promulgate regulations to implement the prohibitions of the Act (Section 4), initiate discussion with other nations to develop international agreements on shark finning and data collection (Section 5), provide Congress with annual reports describing efforts to carry out the Act (Section 6), and establish research programs (Sections 7 and 8). This Report to Congress fulfills the requirements of Section 6 and provides a description of NMFS activities relative to other sections of the Act.

1.1 Management Authority in the United States

The Magnuson-Stevens Act is the primary domestic legislation governing management of marine fisheries in the U.S. Exclusive Economic Zone (EEZ). The Magnuson-Stevens Act calls for the conservation and management of resources and the marine environment, of which sharks, skates and rays (also called elasmobranchs) are a part. In 1996, the U.S. Congress re-authorized the Magnuson-Stevens Act and included new provisions that require fishery managers to halt overfishing; rebuild overfished fisheries; minimize bycatch and bycatch mortality to the extent practicable; and describe, identify, and conserve essential fish habitat (EFH). In addition, federal fisheries management must also be consistent with the requirements of other legislation including the Marine Mammal Protection Act, the Endangered Species Act (ESA), the National Environmental Policy Act, the Regulatory Flexibility Act, the Paperwork Reduction Act, the Coastal Zone Management Act, the High Seas Compliance Act, the Administrative Procedures Act, and other relevant Federal and State laws.

In general, waters under the jurisdiction of the individual states extend from the shoreline out to 3 miles (9 nautical miles off Texas, the west coast of Florida, and Puerto Rico), while U.S. waters under federal management continue from the outer edge of state waters to 200 miles offshore except where intercepted

by the EEZ of another nation but can extend into the high seas as with pelagic fisheries. Management of elasmobranchs in state waters usually falls under the authority of state regulatory agencies, which are typically the marine division of the state fish and wildlife departments. Each state develops and enforces its own fishing regulations for waters under its jurisdiction. Many times these state regulations complement, or are more restrictive than, federal regulations that address shark fishing in the EEZ. However, federally permitted commercial fishermen in the Atlantic are required to follow federal regulations regardless of where they are fishing as a condition of the permit, unless the state's requirements are more restrictive. Given that many shark nursery areas are located in waters under state jurisdiction, states play a critical role in effective shark conservation and management.

Cooperative management of the fisheries that occur in the jurisdiction of two or more states and federal waters may be coordinated by an interstate fishery management commission. Three interstate commissions exist: the Pacific States Marine Fisheries Commission (PSMFC), the Atlantic States Marine Fisheries Commission (ASMFC), and the Gulf States Marine Fisheries Commission (GSMFC). While states set fishery regulations in their own waters, they are encouraged to adopt compatible regulations between state and Federal jurisdictions. The Atlantic Coast Fisheries Cooperative Management Act (ACFCMA) established a special management program between NMFS, the Atlantic coast states, and the ASMFC.

In summary, numerous management entities govern fisheries in which sharks are directed catch, incidental catch, and/or bycatch. The Magnuson-Stevens Act forms the basis for management in federal waters and requires NMFS and the Councils to take specified actions. States agencies and Commissions are bound by state regulations and, in the Atlantic region, by ACFCMA.

1.2 Current Management of Sharks in the Atlantic Ocean

Development of fishery management plans (FMPs) is the responsibility of one or more of the eight regional fishery management councils, except in the case of Atlantic highly migratory species (defined as tunas, marlins, oceanic sharks, sailfish, and swordfish). Since 1990, shark fishery management in Federal waters of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea (excluding dogfishes, skates, and rays) has been the responsibility of the Secretary of Commerce, delegated to NMFS. Dogfish, skates, and rays in the Atlantic Ocean are managed by the New England Fishery Management Council (NEFMC), the Mid-Atlantic Fishery Management Council (MAFMC), the South Atlantic Fishery Management Council (SAFMC), the Gulf of Mexico Fishery Management Council (GMFMC), or the Caribbean Fishery Management Council (CFMC).

Atlantic sharks have traditionally been separated into three species groups for stock abundance assessments: large coastal sharks (22 species), small coastal sharks (7 species), and pelagic sharks (10 species). The 1999 FMP for Atlantic Tunas, Sharks and Swordfish further divided the large coastal shark group into ridgeback and non-ridgeback species for more effective management, shifted several species from the large coastal sharks, small coastal sharks, and pelagic management sub-units to the prohibited species sub-unit, and established an additional management unit (see Table 1.2). Thirty-three shark species that were previously included only for data reporting are now included in the shark management unit called "Deepwater and Other Sharks."

Finning of large coastal sharks, small coastal sharks, and pelagic sharks has been prohibited for Federal shark permit holders in waters of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea since 1993.

Finning of the "Deepwater and Other Sharks" category was prohibited in the 1999 FMP for Atlantic Tunas, Sharks and Swordfish, and the finning of spiny dogfish in this region was prohibited in 2000.

A Small Coastal Shark Stock Assessment was completed in March 2002 and a Large Coastal Shark Stock Assessment was completed in September 2002. NMFS expects to do a rulemaking soon based on the results of these stock assessments. Information on Atlantic shark fisheries is updated annually in the Stock Assessment and Fishery Evaluation (SAFE) Report for Atlantic Highly Migratory Species (HMS). The Atlantic HMS Management Division maintains a website at www.nmfs.noaa.gov/sfa/hmspg.html. This website includes links to current fishery regulations (50 CFR 635), shark landings updates, the U.S. National Plan of Action (NPOA) for Sharks, the Atlantic HMS SAFE Report, and a Brochure for Recreational Shark Fishing.

Table 1.2 Atlantic Sharks in the Management Unit by Species Groups

Prohibited Species

Sand tiger bigeye	*Odontaspis taurus*
Sand tiger	*Odontaspis noronhai*
Whale	*Rhincodon typus*
Basking	*Cetorhinu's maximus*
White	*Carcharodon carcharias*
Dusky	*Carcharhinus obscurus*
Bignose	*Carcharhinus altimus*
Galapagos	*Carcharhinus galapagensis*
Night	*Carcharhinus signatus*
Caribbean reef	*Carcharhinus perez*
Narrowtooth	*Carcharhinus brachyurus*
Caribbean sharpnose	*Rhizoprionodon porosus*
Smalltail	*Carcharhinus porosus*
Atlantic angel	*Squatina dumerili*
Longfin mako	*Isurus paucus*
Bigeye thresher	*Alopias superciliousus*
Sevengill	*Heptranchias perlo*
Sixgill	*Hexanchus griseus*
Bigeye sixgill	*Hexanchus vitulus*

Large Coastal Sharks

(Some species in the large coastal sharks management unit are characterized by a mid- dorsal ridge that is easily identified even after the fish has been headed, gutted, and finned. This mid-dorsal ridge is useful as a diagnostic characteristic for management and enforcement purposes.)

Ridgeback Species

Sandbar	*Carcharhinus plumbeus*
Silky	*Carcharhinus falcifonnis*
Tiger	*Galeocerdo cuvieri*

Non-Ridgeback Species

Blacktip	*Carcharhinus limbatus*
Spinner	*Carcharhinus brevipinna*
Bull	*Carcharhinus leucas*
Lemon	*Negaprion brevirostris*
Nurse	*Ginglymostoma cirralum*
Scalloped hammerhead	*Sphyrna lewini*
Great hammerhead	*Sphyrna mokarran*
Smooth hammerhead	*Sphyrna zygaena*

Small Coastal Sharks

Atlantic sharpnose	*Rhizoprionodon terraenovae*
Finetooth	*Carcharhinus isodon*
Blacknose	*Carcharhinus acronotus.*
Bonnethead	*Sphyrna tiburo*

Pelagic Sharks

Shortfin mako	*Isurus oxyrinchus*
Porbeagle	*Lamna nasus*
Thresher	*Alopias vulpinus*
Oceanic whitetip	*Carcharhinus longimanus*
Blue	*Prionace glauca*

Deepwater Sharks and Other Species

Iceland cat shark	*Apristurus laurussoni*
Smallfin cat shark	*Apristurus parvipinnis*
Deepwater cat shark	*Apristurus profundorum*
Broadgill cat shark	*Apristurus riveri*
Marbled cat shark	*Galeus arae*
Blotched cat shark	*Scyliorhinus meadi*
Chain dogfish	*Scyliorhinus retifer*
Dwarf cat shark	*Scyliorhinus torrei*
Japanese gulper shark	*Centrophorus acuus*
Gulper shark	*Centrophorus granulosus*
Little gulper shark	*Centrophorus uyato*
Kitefin shark	*Dalatias Ucha*
Flatnose gulper shark	*Deania profundorum*
Portuguese shark	*Cetrosqymnus coelolepis*
Greenland shark	*Somniosus microcephalus*
Lined lanternshark	*Etmopterus bullisi*
Broadband dogfish	*Etmopterus gracilispinnis*
Caribbean lanternshark	*Etmopterus hillianus*
Great lanternshark	*Elmopterus princeps*
Smooth lanternshark	*Etmopterus pusillus*
Fringefin lanternshark	*Etmopterus schultzi*
Green lanternshark	*Etmopterus virens*
Cookiecutter shark	*Isistius brasiliensis*
Bigtooth cookiecutter	*Isistius plutodus*
Smallmouth velvet dogfish	*Scymnodon obscurus*
Pygmy shark	*Squaliolus laticaudus*
Roughskin spiny dogfish	*Squalus asper*
Blainville's dogfish	*Squalus blainvillei*
Cuban dogfish	*Squalus cubensis*
Bramble shark	*Echinorhinus brucus*
American sawshark	*Pristiophorus schroederi*
Florida smoothhound	*Mustelus norrisi*
Smooth dogfish	*Mustelus canis*

1.3 Current Management of Sharks in the Pacific Ocean

In the Pacific, three regional councils are responsible for developing fishery management plans: the Pacific Fishery Management Council (PFMC), the North Pacific Fishery Management Council (NPFMC), and the Western Pacific Fishery Management Council (WPFMC).

The PFMC's area of jurisdiction is the EEZ off the coasts of California, Oregon, and Washington. Development of a Pacific Council HMS FMP is underway. Following completion and hearings on a December 2001 public review draft, the Council instructed the HMS Plan Development Team to complete a decision draft FMP that would address the review comments and associated policy issues. The management unit will include common thresher and shortfin mako, sharks that are targeted in the west coast-based fisheries, as well as blue sharks (a frequently encountered bycatch species) and bigeye and pelagic thresher (incidental catch). The decision draft will include proposals for harvest guidelines for common thresher and shortfin mako. These would be precautionary to prevent localized depletion, which would take a long time to correct given the biological characteristics of the species. Final adoption of the HMS FMP is scheduled for November 2002. Updated information on the FMP is available on the Council's website: http://www.pcouncil.org/HMS/hms.html.

The NPFMC manages fisheries in federal waters off Alaska. Sharks are managed under the "other species" category in the Gulf of Alaska (GOA) Groundfish FMP and the Bering Sea/Aleutian Island (BSAI) Groundfish FMP. "Other species" comprises taxonomic groups that currently are of slight economic value and are not generally targeted. The category includes sharks, sculpins, skates, and octopus (and squid in the GOA). These species have economic potential or are important ecosystem components, but sufficient data are lacking to manage each separately; therefore, an aggregate annual quota limits their catch. Accordingly, a single quota applies to this category as a whole. There is currently little, if any, directed fishing on any component of the "other species" category in Alaska. Catch of the whole category must be recorded and reported.

Seven shark species are included in the GOA groundfish management unit, and six are in the BSAI management unit. The three shark species most often encountered in Alaska fisheries are the Pacific sleeper shark, *Somniosus pacificus*, the piked or spiny dogfish, *Squalus acanthias*, and the salmon shark, *Lamna ditropis*. They are taken incidentally in target fisheries for groundfish and are monitored inseason by NMFS. Sharks are the only group in the complex that are consistently identified to species in catches by fishery observers. Most of the shark bycatch occurs in the midwater trawl pollock fishery and in the hook and line fisheries for sablefish, Greenland turbot, and Pacific cod along the outer continental shelf and upper slope areas.

Sharks are top predators, so fluctuations in their populations may have significant effects on community structure. Estimates of shark bycatch in the GOA and BSAI groundfish fisheries from 1997-2000 have ranged from 1,040 - 2,390 metric tons (mt) and 370 - 590 mt, respectively. Future catches of sharks are more dependent on the distribution and limitations placed on target fisheries.

Allowable biological catch levels for BSAI sharks are set equal to 75 percent of the average catch of the complex between 1978-1995 (Tier 6 of the Council's overfishing level (OFL) criteria). The OFLs are set equal to average catch over the same period. The GOA FMP does not allow for determination of an OFL or ABC for the GOA "other species" category. The complex is managed by a aggregate quota equal to 5 percent of the combined quotas for GOA target species.

An increasing recognition exists of the need to better understand and manage fishery impacts on species that are not targeted by fisheries since the initial implementation of the FMPs. Managers will be challenged to cultivate a management system that maintains healthy non-target species stocks, protects these species from overfishing, and allows target fisheries for these species to develop only when sufficient information is available to provide sustainable populations, as more emphasis is placed on protecting biodiversity and ecosystem structure and function.

In 1998, the State of Alaska closed directed commercial fishing of sharks and placed a daily sport harvest limit of one shark per day and an annual sport statewide harvest limit of two sharks per year. The state sportfish regulations apply in the EEZ off Alaska, since sport fisheries for "other species" are not currently defined in the FMPs or federal regulations. Alaska banned shark finning in 2000. The Council has been considering alternatives to manage sharks, and the entire "other species" category as a bycatch, rather than a target category since the state recommended that the Council take complementary action to close directed shark fishing in 1998. Proposed measures previously included a prohibition on finning, but this proposal was superceded by other Federal action. Development of adequate stock assessments for sharks and the remaining groups in the "other species" complex has been hampered by the lack of basic biological information on these species in Alaska waters and has delayed final action.

A large number of other shark species (as well as some rays) are taken in other federally and state-managed fisheries, including leopard, Pacific angel, soupfin, and dogfish. Many of these are incidental catch that is retained in setnet fisheries; others are bycatch that are discarded. NMFS and state observer programs have collected or are collecting additional information on these catches and associated landings and possible discard mortality. However, there are few formal control programs in effect at this time. It is noteworthy that state laws essentially prohibit the catch and retention of great white, megamouth and basking sharks (except for scientific collections and displays) due to their special standing and/or depressed stock status.

Table 1.3 Shark Species Included as Pelagic Management Unit Species

Common Name	**Scientific Name**
Blue shark	*Prionace glauca*
Shortfin mako shark	*Isurus oxyrinchus*
Longfin mako shark	*Isurus paucus*
Oceanic white tip shark	*Carcharhinus longimanus*
Tiger shark	*Galeocerdo cuvier*
Common thresher shark	*Alopias vulpinu*
Pelagic thresher shark	*Alopias pelagicus*
Bigeye thresher shark	*Alopias*
Silky shark	*Carcharhinus falciformis*
Salmon shark	*Lamna ditropis*

1.4 U.S. Regulations to Implement the Shark Finning Prohibition Act

On June 28, 2001, NMFS published a proposed rule to implement the Shark Finning Prohibition Act of 2000 [66 FR 34401]. This rule proposed the prohibition of: (1) any person on a U.S. fishing vessel from engaging in shark finning in waters seaward of the inner boundary of the U.S. exclusive economic zone (EEZ); however, U.S. fishermen would not be prohibited from removing and retaining fins from a shark, provided the corresponding carcass is retained on board the vessel; (2) any person on a U.S. fishing vessel from possessing shark fins harvested in waters seaward of the inner boundary of the U.S. EEZ on board a fishing vessel without corresponding shark carcasses; (3) any person on a U.S. vessel from landing shark fins harvested in waters seaward of the inner boundary of the U.S. EEZ without corresponding carcasses; and (4) any person on a foreign fishing vessel from engaging in finning in the U.S. EEZ and from landing shark fins in or inside the U.S. EEZ without the corresponding carcass. In addition, the rule proposed a requirement that all shark fins and carcasses be landed and weighed at the same time, once landing of shark fins and/or shark carcasses has begun. The prohibition on landing shark fins without the carcasses extends to any vessel (including a cargo or shipping vessel) that obtained those fins from another vessel at sea.

NMFS held two public hearings and considered all public comments, on the proposed rule. NMFS specifically requested advice on two matters: whether the prohibitions in the Act should be applied in State waters, and whether or how to define "wet" weight in considering whether sharks fins are being landed in excess of the allowable amount, relative to shark carcasses. Responses to public comments are provided in the preamble to the final rule. The final regulations were published on February 11, 2002. This document is available on the Office of the Federal Register's website at http://www.access.gpo.gov/ecfr/.

1.5 NMFS Enforcement Actions Pertaining to the Shark Finning Prohibition Act

During 2002, the NMFS Office for Law Enforcement has been engaged in several actions involving the seizure of numerous tons of shark fins believed to have been taken in violation of the Shark Finning Prohibition Act.

During August and September 2002, NMFS agents seized well over 13 tons of shark fins from containers that had been off loaded by foreign fishing vessels in Guam. These shipments were in clear violation of the 5 percent rule and, in fact, contained very few actual shark carcasses.

Another seizure of over 32 tons of shark fins was made in August 2002, following a U.S. Coast Guard boarding and inspection approximately 350 miles southeast of Acapulco, Mexico. The seized fins were found aboard a U.S. flagged fishing vessel (home port Honolulu, Hawaii) that had been stripped all of its fishing gear and was clearly transshipping for other vessels. The vessel was carrying an extensive cargo of shark fins with only a few carcasses on board, clearly in violation of the shark finning ban. The vessel was then escorted to San Diego where NMFS agents took custody of the vessel and its cargo.

In all of these cases, the fins were bundled and apparently intended for shipping to foreign markets where fins can ultimately bring extremely high prices and profits. The fins in these cases are being stored temporarily until they can be valued. They will then be bonded out by the companies involved with proceeds held until all legal proceedings are resolved. NMFS agents will continue their investigations and will file appropriate charges dictated by the information generated.

In addition, biologists with the NMFS Southwest Fisheries Science Center cooperated with NMFS Enforcement and molecular biologists at Nova Southeastern University in Florida to obtain DNA samples of the large shipment of illegal shark fins confiscated in the Pacific off Acapulco, Mexico, in August 2002. The fins were sampled while being held in temporary freezer storage in San Diego, California. A large portion of the shipment appeared to be composed of blue shark, but a shark fin dealer also identified seven other species in the shipment, including various species of thresher shark, mako shark, oceanic whitetip, and silky shark. The mix of fin types suggests that most if not all of the sharks were caught in the oceanic pelagic zone. Thirty-seven biopsy samples were taken and will be sent to Nova Southwestern for genetic analysis to confirm species identification.

2. U.S. Imports and Exports of Shark Fins in 2001

2.1 Imports of Shark Fins

Tables 2.1 and 2.2 are based on information submitted by importers and exporters to the U.S. Customs Service and the Bureau of Census as reported in the USITC Trade database (http://dataweb.usitc.gov). At the time this Report to Congress was prepared, 2002 data were available only from January through July. Data are provided for the same time frame in 2001 for purposes of comparison. It appears that imports declined slightly in both weight and value while exports of shark fins have tripled in weight and doubled in value for the same time period.

Most imports of sharks fins were unloaded at the following ports in recent years: New York City, Miami, San Diego, San Francisco, and Los Angeles. Other ports where lesser amounts of shark fins were unloaded include Maine; Chicago; and Nogales, Arizona. In 2002, countries of origin in order of importance are China, Mexico, India, Japan, Argentina, Hong Kong, and with lesser amounts from Australia, Canada, Singapore, Madagascar, Namibia, and Bangladesh (see Table 2.1). It should be noted that due to the complexity of the shark fin trade, fins are not necessarily produced close to or even in the same country as those from which they are exported. In the United States, factors such as availability of labor, overseas contacts, and astute trading all can play a role in determining the locale from which exports are sent.

2.2 Exports of Shark Fins

In 2001, the exports of dried shark fins from the United States to Asia totaled 319 mt down from 365 mt in 2000, and still more than three times the 107 mt exported in 1999, and two and a half times more than the 141 mt (exported in 1998). In 2001, the U.S. Customs District recording the most exports to Asia was San Francisco with 280 mt and Los Angeles was second with 26 mt, followed by New York City with 13 mt. Guam, the Northern Mariana Islands, and American Samoa are not included under direct U.S. Customs jurisdiction, as each entity is responsible for monitoring exports and imports in their respective jurisdictions.

The vast majority of shark fins exported in 2002 (based on available data from January-July, 2002) were sent from the United States to: Hong Kong, Canada, Korea, and Mexico, followed by Taiwan and Japan, (see Table 2.2). Based on unadjusted data for the January-July 2002 time period, it appears that exports tripled weight and doubled in value.

Table 2.1 Weight and Value of Shark Fins imported into the United States, by Country of Origin (Source:U.S. Customs Service Data, and USITC Database)

	YEAR_2001		YTD_2001		YTD_2002	
COUNTRY	**Kilos**	**Dollars**	**Kilos**	**Dollars**	**Kilos**	**Dollars**
Argentina	7,656	$ 102,787.00	6,612	$ 82,091.00	-	$ -
Australia	-	$ -	-	$ -	1,018	$ 15,283.00
Bangladesh	-	$ -	-	$ -	52	$ 5,686.00
Brazil	2,200	$ 54,314.00	600	$ 49,104.00	-	$ -
Canada	6,811	$ 54,513.00	6,262	$ 24,403.00	375	$ 35,868.00
China	1,204	$ 34,323.00	1,203	$ 28,166.00	3,566	$ 90,143.00
Costa Rica	756	$ 23,418.00	756	$ 23,418.00	-	$ -
Ecuador	2,634	$ 10,180.00	66	$ 3,366.00	-	$ -
Hong Kong	2,300	$ 406,450.00	2,300	$ 406,450.00	1,036	$ 48,699.00
India	7,488	$ 36,209.00	1,872	$ 12,304.00	1,872	$ 10,299.00
Japan	5,728	$ 222,997.00	4,258	$ 215,918.00	1,100	$ 87,709.00
Madagascar	-	$ -	-	$ -	190	$ 8,161.00
Mexico	7,306	$ 109,955.00	4,130	$ 63,921.00	2,760	$ 34,456.00
Namibia	-	$ -	-	$ -	130	$ 8,000.00
Panama	4,218	$ 28,756.00	4,218	$ 28,756.00	-	$ -
Peru	38	$ 2,940.00	-	$ -	-	$ -
Singapore	2,200	$ 13,293.00	-	$ -	318	$ 19,479.00
S. Africa	125	$ 8,963.00	125	$ 8,963.00	-	$ -
Totals	**50,664**	**$ 1,109,098.00**	**$ 32,402.00**	**$ 946,860.00**	**12,417**	**$ 363,783.00**

Table 2.2 Weight and Value of Shark Fins Exported from the United States, by Destination

COUNTRY	Kilos YEAR_2001	Dollars YEAR_2001	Kilos YTD_2001	Dollars YTD_2001	Kilos YTD_2002	Dollars YTD_2002
Canada	-	$ -	-	$ -	34,461	$ 213,386
France	13,344	$ 133,170	503	$ 2,962	-	$ -
Hong Kong	307,064	$ 2,863,157	82,591	$ 732,602	237,270	$ 1,635,863
Japan	500	$ 8,500	-	$ -	500	$ 8,925
Korea	-	$ -	-	$ -	12,939	$ 28,525
Malaysia	2,245	$ 82,584	-	$ -	-	$ -
Mexico	2,756	$ 16,250	2,756	$ 16,250	7,889	$ 55,120
South Africa	132	$ 8,575	132	$ 8,575	-	$ -
Taiwan	9,224	$ 54,392	9,224	$ 54,392	3,100	$ 18,283
Total	**335,265**	**$ 3,166,628**	**95,206**	**$ 814,781**	**296,159***	**$ 1,960,102**

*The increase in U.S. exports of shark fins is likely associated with two activities: (1) shark fins store very cheaply (dried) and may have been held in a U.S. inventory in a speculation effort to wait for a higher price on the open market; and (2) evidence based on recent seizures indicate that U.S. vessels are engaged in smuggling shark fins (without corresponding carcasses) into the United States from other countries (such as Mexico) for subsequent legal export. The magnitude of this problem is not yet known, but the most recent confiscation totaled 120,000 pounds of shark fins. Since fins typically represent approximately 5 percent of the total weight of a shark, this number demonstrates a great deal of shark mortality.

3. International Efforts to Advance the Goals of the Shark Finning Prohibition Act

Consistent with the provisions of Section 5 of the Shark Finning Prohibition Act, the Department of Commerce and the Department of State have initiated an ongoing consultation regarding the development of international agreements consistent with the Act. Discussions have focused on possible bilateral, multilateral, and regional agreements with other nations. The law calls for us to pursue an international ban on sharkfinning, but also to push for improved data collection (including biological data, stock abundance, and bycatch levels, and information on the nature and extent of shark finning and trade). Determining the nature and extent of shark finning is the first step toward reaching agreements that will decrease the incidence of finning worldwide.

3.1 Bilateral Efforts

Bilateral diplomatic contact provides an opportunity to communicate with other countries, but this is not necessarily a mechanism for immediate policy results. Thus far in 2002, the United States has held formal bilateral meetings with China (May 2002), the European Community (July 2002), Canada (August 2002), Chile (September 2002), and Russia (September 2002). Implementation of the Shark Finning Prohibition Act was included on the agenda for each of these bilateral meetings. In addition, the United States has consulted informally with Japan during 2002 regarding U.S. implementation of the Act.

The initial emphasis in these bilateral contacts has been on information collection and exchange, including requests for data such as shark and shark fin landings, transhipping activities, and the value of trade. In addition, the U.S. continues to encourage other countries to implement the United Nations Food and Agriculture Organization (FAO) International Plan of Action (IPOA) for the Conservation and Management of Sharks, by finalizing their own national plans of action (NPOAs) (see Section 3.3.1 for additional information). Few countries have yet developed an NPOA, despite the FAO directive to complete this activity prior to February 2001.

3.2 Regional Efforts

The U.S. Government will continue to work within regional fishery management bodies to facilitate shark research, monitoring, and management initiatives, as appropriate. Possible avenues for the development of international initiatives that support the conservation of sharks include a number of regional fishery management organizations. The following sections describe recent activities in these international fora to provide a context for consideration of future actions.

3.2.1 Northwest Atlantic Fisheries Organization (NAFO)

NAFO's mission is: (1) to provide for continued multilateral consultation and cooperation with respect to the study, appraisal, and exchange of scientific information and views relating to fisheries of the Convention Area, and (2) to conserve and manage fishery resources of the Regulatory Area (i.e., that part of the Convention Area that lies beyond the areas in which coastal states exercise fisheries jurisdiction). The Convention Area is located within the waters of the Northwest Atlantic Ocean roughly north of 35 degrees north latitude and west of 42 degrees west latitude.

In 1998, NAFO agreed that its Scientific Council (SC) should: (1) undertake analyses of distribution and abundance elasmobranchs in the Convention Area; (2) continue efforts to harmonize NAFO and FAO catch data; and 3) include an expanded list of elasmobranchs (by individual species) for NAFO reporting. Additionally, NAFO Parties agreed to encourage training in identification and reporting of elasmobranchs sharks. Available catch statistics on elasmobranchs in NAFO indicated a high level of potential fishing opportunities as well as danger of overfishing if scientific advice was not made available.

In 1999, the Fisheries Commission (FC) requested that the SC: (1) summarize all available information from the Convention Area on catches of elasmobranchs (by species and geographical range); (2) review available information from research vessels surveys on relative elasmobranch biomass, geographical distribution, and extent of exploitation; and (3) initiate work to develop precautionary reference points for these resources.

In September 2000, the NAFO SC presented the results of the 1999 FC request as it related to skates and dogfish in the NAFO Convention Area. A further request was then made that the SC review all available information from both research vessels surveys and commercial catches on the relative biomass and geographical distribution of black dogfish and thorny skates specifically. It was also agreed that the NAFO SC would convene a symposium on elasmobranch fisheries in conjunction with the 2002 annual meeting. Additionally, NAFO has developed an identification poster for sharks, skates, and rays of the North Atlantic that complements the deepwater shark identification poster developed in 1998. The FC also adopted a U.S. proposal that Contracting Parties reports to the FAO regarding implementation of the IPOAs on Sharks, Seabirds and Capacity should also be circulated within NAFO.

The 2001 NAFO Annual Meeting was cancelled. However, the June 2001 SC meeting did take place and responses were developed to standing questions on elasmobranchs (including black dogfish and thorny skate). The results were submitted to NAFO Parties in the 2001 Report of the Scientific Council, but were not addressed by the FC during 2001.

During September 2002, the NAFO SC hosted an International Symposium on Elasmobranch Fisheries. The symposium, which was attended by 119 participants from 22 countries, considered current research, advances and impacts of elasmobranch fisheries throughout the world in the context of four themes: life history and demographic analysis; stock identity; stock assessment and harvest strategies; and biodiversity maintenance. The symposium papers (56 oral presentations and 30 posters) will be published in the *NAFO journal of Northwest Atlantic Fishery Science*. The United States holds a number of leadership roles in the NAFO SC (including that of SC Chair) and played a strong role in the success of this symposium.

At the 2002 Annual Meeting, the United States tabled a proposal for a precautionary quota on thorny skates in conjunction with a request that the SC further examine the status of this species in the Regulatory Area and provide advice regarding a possible total allowable catch (TAC). Although the U.S. proposal for precautionary TAC management was not adopted, the request for scientific advice will provide further information in 2003, likely increasing the chances for TAC management of this ailing stock. This sets the stage for similar action with regard to other shark species found in the NAFO Regulatory Area.

3.2.2 Inter-American Tropical Tunas Commission (IATTC)

The IATTC was established to "(1) study the biology of the tunas and related species of the eastern Pacific Ocean with a view to determining the effects that fishing and natural factors have on their abundance, and (2) to recommend appropriate conservation measures so that the stocks of fish can be maintained at levels which will afford maximum sustainable catches." The Commission's duties were broadened in 1976 to include work on the problems arising from the tuna-dolphin relationship in the eastern Pacific. IATTC also collects and disseminates data on catch and effort of tuna fishing fleets in waters under its purview and collects information on implementation of and compliance with IATTC recommendations.

At its 66th meeting in June 2000, the IATTC agreed that minimizing bycatch of non-target species, including sharks, was important to maintaining healthy ecosystems overall and may require modified or new procedures, techniques, or management measures. The IATTC recommended a pilot program to require fishermen on purse-seine vessels to release promptly and unharmed, to the extent practicable, all sharks and other non-target species and to encourage fishermen to develop techniques and equipment to facilitate rapid and safe release. Member nations are implementing this recommendation, which originally was to carry through 2002 but has been extended to run through 2004. The IATTC also supported development of a program to research bycatch reduction and evaluate management measures to reduce bycatch such as time and area closures, limits on fishing effort, catch limits, and gear modifications. Depending on the effectiveness of the pilot program, the United States could propose a recommendation more specifically directed at data collection for or conservation of sharks, similar to the resolution adopted by ICCAT in 1994.

The United States also is participating in the effort to renegotiate the IATTC convention to incorporate current agreements and principles associated with international fisheries management. NMFS is strongly supporting the Department of State’s efforts to ensure that the species covered under the convention will include sharks.

3.2.3 International Commission for the Conservation of Atlantic Tunas (ICCAT)

ICCAT was established to provide an effective program of international cooperation in research and conservation in recognition of the unique problems related to the highly migratory nature of tunas and tuna-like species. The Convention area is defined as all waters of the Atlantic Ocean, including the adjacent seas. The Commission is responsible for providing internationally coordinated research on the condition of the Atlantic tuna and tuna-like species, and their environment, as well as for the development of regulatory recommendations. The objective of such regulatory recommendations is to conserve and manage species of tuna and tuna-like species throughout their range in a manner that maintains their population at levels that will permit the maximum sustainable catch. While ICCAT does not actively manage sharks at the present time, it has adopted some non-binding measures regarding sharks.

At the 1994 ICCAT meeting, the Parties agreed to expand the Commission's research activities to include collection of bycatch statistics in tuna fisheries, including shark bycatch. The Standing Committee on Research and Statistics (SCRS) established a working group that concluded that information on shark bycatch was insufficient. The SCRS recommended that efforts be undertaken to estimate bycatch for

incorporation into ICCAT's statistical databases and to obtain more empirical evidence, such as through scientific observer programs.

In 1995, the Commission adopted a resolution encouraging cooperation with FAO on the study of shark stock status and bycatch. Since that time, the SCRS Sub-Committee on Bycatch has noted that limited progress has been made on data collection. The low level of reporting may have been a reflection of the relatively low priority that countries place on monitoring the catches and bycatches of sharks. Improved data on sharks taken in both directed fisheries as well as bycatch in other fisheries is critical to scientific evaluations of shark stock status. However, undertaking research and management of pelagic shark species will be a significant expansion of ICCAT's work.

In 1999, the United States introduced a non-binding resolution on sharks that encouraged: (1) improved data collection and reporting, (2) submission of NPOAs on sharks to FAO Committee of Fisheries (COFI), (3) adoption of domestic measures to prohibit shark finning and to protect juvenile sharks, (4) live release of juvenile sharks, and (5) consideration of ICCAT's role in the management of sharks. This resolution was not adopted although it focused additional attention to the issue internationally.

In 2000, the SCRS recommended that ICCAT take the lead in conducting stock assessments for Atlantic porbeagle *(Lamna nasus)*, blue *(Prionace glauca)*, and mako *(Isurus oxyrinchus)* sharks and that the initial stock assessment evaluations be scheduled for 2002. The SCRS further recommended that the Commission require that total catches and landings (including estimates of dead discards) of these three shark species be reported to SCRS. The SCRS has also recommended that all Parties be asked to supply other related data, such as tagging databases and databases resulting from genetic studies to ICCAT.

A data preparatory meeting was held in September 2001 to review the available catch statistics. The objective of this meeting was to review in detail the statistics for Atlantic pelagic sharks (with an emphasis on blue, porbeagle, and shortfin mako), with a view towards planning an assessment. At that time, the database included incomplete catch data from 1982-2000. Not all countries have sent data for the entire time series. For example, in 2000, only 25 of more than 80 countries had reported any catch data for sharks, and very few reported catch and effort or size frequency data. Many of the data that are reported are not classified by species. Another problem is that some countries submit their data in terms of number of fish, others in round weight, and others in dressed weight.

In light of these difficulties, the SCRS working group recommended that (1) national scientists who have not already done so should carry out the analyses necessary to estimate historical catches of sharks and report them to ICCAT; (2) conversion factors for round weight, dressed weight and numbers of fish should be developed and adopted by the SCRS; and (3) observer programs could be augmented to improve information on dead discards of sharks. The group also suggested that one possible way to fill the information gaps, in the absence of official reporting, is to extrapolate based on estimates of the ratio of shark catches to the catches of directed tuna or swordfish fisheries.

The working group considered two assessment methods, both of which are general enough to utilize much of the available data for any species (e.g. catch, abundance indices, tagging, length frequencies, sex-specific data). Both models essentially are age-structured production models that can potentially be applied in a variety of situations, from data-poor to data-rich. Other alternative methods (e.g. non-equilibrium stock production models and direct estimation of mortality rates from tagging and catch statistics) may also be explored. It was suggested that the focus of a future assessment be on stocks that

have not been assessed elsewhere, such as blue or shortfin mako sharks. The group concluded that 2004 would be a reasonable target date for a shark assessment.

At the 2001 ICCAT meeting, the United States again pursued measures for improved data collection for pelagic sharks taking into account the scientific advice. Specifically, the measure called for the submission of all catch and effort data, including dead discard estimates, for porbeagle, shortfin mako, and blue sharks. The non-binding proposal also established that scientific stock assessments for shortfin mako and blue sharks would be conducted in 2004 and encouraged that (1) live sharks taken incidentally in tuna fisheries be released; (2) waste and discards from shark catches be minimized; and (3) parties voluntarily agree not to increase fishing effort targeting porbeagle, shortfin mako, and blue sharks until sustainable levels of harvest can be determined through stock assessments. The shark proposal was provisionally agreed by ICCAT in 2001 and received final approval from the Commission in early 2002.

In October 2002, the SCRS updated its shark database with 2001 catches. In addition, the ICCAT Secretariat and some SCRS scientists attended a meeting of the International Council for the Exploration of the Seas (ICES) in January 2002 to discuss the possibility of carrying out assessments of blue sharks. This meeting reviewed possible analytical methods and their data requirements, and the availability of relevant data on blue shark in the North Atlantic. While ICCAT is currently planning an assessment in 2004, the participants noted that it was unclear whether or not the data will be sufficient to support an assessment at that time. Recognizing the trans-Atlantic distribution of blue sharks and the variety of fisheries in which they are caught, the group underscored the need for continued collaboration between ICES and ICCAT experts. The ICES Study Group on Elasmobranch Fishes held a meeting at ICES Headquarters in Copenhagen in May 2002 to carry out and review preliminary assessment of various elasmobranch species, including blue sharks. ICCAT provided relevant data to ICES for this meeting. The analyses conducted are seen as a step in the development of stock assessments for elasmobranch species, but there is no expectation that they will provide a basis for management advice in themselves.

3.2.4 Multilateral High-level Conference on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific (MHLC)

On September 4, 2000, the United States and 24 other states and Taiwan concluded negotiations on the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Westem and Central Pacific Ocean ("MHLC"). The Convention was adopted by 19 states voting in favor; Japan and Korea voting against; and China, France, and Tonga abstaining. (Tonga has since signed the treaty). Eleven states, including the United States, signed the Convention on September 5, 2000. The United States has been working with the other participants to encourage those states that objected to the adoption of the Convention or which have not yet signed it to do so.

The Convention will establish a Commission to conserve and manage highly migratory species in the vast area of the western and central Pacific west of 150 - meridian of west longitude. The Convention Area encompasses one of the last major areas of the world's oceans not covered by a fisheries management regime. This region produces more than half the world's annual tuna catch, with an annual landed value of between $1.5 to $2 billion. The tuna harvested by U.S. vessels operating in the region has a landed value of between $200-250 million annually, and an annual contribution to the U.S. economy of between $250 million to $500 million. The Convention establishes an effective system for ensuring the conservation and long-term sustainability of the highly migratory fish stocks of the region

throughout their range. The Convention also accommodates the basic interests of the states fishing in the region, as well as those of the coastal states of the region, in a fair and balanced way.

The Pacific Island states control access to the fishing grounds where the majority of the purse seine catches occur. These states provide access to their exclusive economic zones through bilateral agreements with distant water fishing states. For many of the Pacific Island nations, these fish stocks are the only significant renewable natural resource and a key to their economic development aspirations. The United States has been cooperating with them since 1987 under the South Pacific Tuna Treaty (SPTT); the new Commission is expected to harmonize the terms and conditions under which fishing will occur within the convention area for all fleets in a manner similar to that agreed to under the SPTT. These include observer coverage, a vessel monitoring system, restrictions on transshipment, and catch and fishing effort reporting. The new Convention is fully consistent with the 1995 United Nations Fish Stocks Agreement and other recent global fisheries agreements. For instance, Article 5 "Principles and measures for conservation and management" flows directly from the UN Fish Stocks Agreement and includes provisions for the adoption of measures to minimize catch of non-target species.

The Convention will enter into force after ratification by three states situated north of 20 degrees north latitude (primarily the distant water fishing states) and by seven states south of 20 - north latitude (primarily the Pacific Island states). In the meantime, a Preparatory Conference will begin administrative preparations for the entry into force of the Convention, such as drafting internal rules and procedures for adoption by the future Commission. Considerable work must be done within NMFS in the next 2 years to become prepared to implement U.S. scientific, management, and enforcement obligations under the new Convention. Various participants in the MHLC process have demonstrated a commitment to shark conservation, and may be willing to help build support in this region.

It should be noted that while sharks are an important bycatch in the region, there are few fisheries within the Convention area that specifically target sharks, especially within the insular Pacific. Within the MHLC Convention area shark bycatch is believed to be greatest among the pelagic longline fleets. Many of these fleets utilize and retain various shark parts. However, there is a continuing absence of comprehensive information on the composition of the catch, processing, value, and marketing. Efforts to bridge these gaps are needed.

During the MHLC Prepcon period, there is little likelihood that sharks will emerge as a critical area of emphasis; sharks are not specifically mentioned in the MHLC Convention. Rather, sharks and other bycatch issues (e.g. turtles and marine mammals) will be addressed through data collection and reporting requirements. There may also be efforts to regionalize and expand current stock assessments. Therefore, the United States should focus on ensuring that sharks are included in all reporting requirements and preparing to make a meaningful contribution to regional stock assessment efforts when these issues eventually emerge.

3.2.5 Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America (South Pacific Tuna Treaty - SPTT)

The SPTT entered into force in 1988. After an initial 5-year agreement, the SPTT was renewed in 1993 and then again in 2002 for a third 10-year extension (concluding in 2013). The current agreement allows access for up to 50 U.S. purse seiners, with an option for five more if agreed to by all parties, to the Exclusive Economic Zones of the following countries: Australia, Cook Islands, FSM, Fiji, Kiribati,

Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu, Samoa. The overall SPTT area is 10 million square miles.

The treaty is not a management arrangement, and as a result, does not include any conservation and management provisions for the target or non-target fish species. The treaty sets out operational requirements for U.S. purse seine vessels fishing within the treaty area and the terms of access for waters under the Pacific Island Parties' national jurisdiction. It has been viewed as a model of international and fishery cooperation. Issues that arise typically are addressed in formal annual consultations between U.S. Government and Pacific Island states representatives, or during informal discussions that also have taken place on an annual basis for the last 5 years. The Department of State has specific authority to act for the United States.

Sharks are a bycatch in the western and central Pacific purse seine fishery. Historically, the U.S. fleet in this area has never retained sharks for anything other than the fins or the occasional jaw. Typically the lower paid deck crew would fin high valued species after normal fishing operations. Any revenue obtained was never part of the vessels' overall fiscal operation. In late 1999, the U.S. tuna purse seine industry operating in the western and central Pacific, under the auspices of the United States Tuna Foundation, invoked a voluntary code of conduct that essentially banned the practice of shark finning on all vessels.

Sharks are not specifically mentioned within the current treaty language. However, shark catches must be reported on regional catch and effort log sheets. It is believed that current reporting and operational actions of the U.S. vessels allow for sustainable harvests and no additional action should be invoked by the United States absent information to the contrary.

3.2.6 International Council for the Exploration of the Sea (ICES)

The International Council for the Exploration of the Sea (ICES) is the oldest oceanographic organization in the North Atlantic and is the premier body for advice at the international level on scientific and policy matters relating to fisheries, pollution, and other marine environmental issues. ICES provides advice on pollution matters to the London, Oslo, and Helsinki Conventions for Marine Pollution, and on fisheries matters to the Convention for the Conservation of Salmon in the North Atlantic Ocean; the United States is a party to all of these conventions. ICES also advises the North-East Atlantic Fisheries Commission and the International Baltic Sea Fishery Commission. ICES has strong formal ties to the Intergovernmental Oceanographic Commission, to which the United States belongs, and the annual ICES meeting is the major forum for coordinating research on living marine resources in the North Atlantic.

In 1997, the Study Group on Elasmobranch Fishes met to analyze data on the distribution of species, conduct analytical assessments and evaluate the effects of exploitation, and prepare identification sheets for deepwater sharks, skates, and rays. The Study Group recommended: (1) publishing identification guides to sharks, skates, and rays; (2) initiating data collection and biological sampling to improve knowledge on biology and exploitation patterns; (3) exploring alternative methods to evaluate the status of elasmobranch stocks; (4) sending an ICES representative to FAO and meetings associated with the

Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES); and (5) keeping a register of available data on shark fisheries. While ICES has been suggested as a possible forum for conducting stock assessments for sharks, this organization does not have the authority to establish management measures.

3.2.7 Asia Pacific Economic Cooperation (APEC) and the Convention on Migratory Species

At its July 2000 meeting, the Fisheries Working Group of the Asia Pacific Economic Cooperation (APEC) approved a U.S.-initiated project for the conservation and management of sharks. This project seeks to facilitate regional implementation of the FAO IPOA for the Conservation and Management of Sharks and is being organized by a steering committee composed of the United States, Mexico, and Japan. APEC approved $91,000 for this project and the United States will contribute another $10,000 to the effort, due to be completed by December 2002. The project includes three parts: (1) a survey of regional implementation of the FAO Shark IPOA; (2) the production of a Technical Manual for Policy Makers on Effective Techniques in Shark Fisheries Management; and (3) a regional conference on sharks to review the survey and technical manual and explore the possibility of a regional approach to shark conservation and management. Parts one and two of the project have been completed, and the APEC Workshop on Shark Conservation and management will be held December 3-6, 2002, in Mexico. This workshop is envisioned by the organizers to be a springboard to further regional activities on sharks, not necessarily confined to the APEC process.

APEC member economies continue to consider options for a Pacific-wide shark conservation and management regime. One possible option for such a regime could be negotiation of a protocol under the Convention on Migratory Species (CMS). Though the United States is not a party to CMS, the Convention allows for non-party range state participation in species-specific protocols. Thus, the United States would in no way be bound to any other part of the Convention. Another benefit of operating under CMS is that agreements negotiated under its rubric can be of either a binding or non-binding nature as the parties to the specific negotiation decide. Additionally, working under CMS allows countries to take advantage of the infrastructure of the CMS Secretariat without the need for creating a new international bureaucracy from scratch. Negotiating a new protocol on sharks does have the potential to require additional resources for activities conducted under it, depending on the nature of the agreement that is finalized. With the Pacific divided among several regional fisheries management organizations, none of which are specifically concerned with sharks, a region-wide agreement giving basic steps that countries agree to take with respect to shark conservation and management could prove beneficial to the long-term sustainability of shark stocks.

3.2.8 North Pacific Interim Scientific Committee for Tuna and Tuna-like Species (ISC)

The ISC was formed by the United States and Japan in January 1995. The purposes of ISC are: (1) to enhance scientific research and cooperation for conservation and rational utilization of the species of tuna and tuna-like fish that inhabit the North Pacific Ocean during all or part of their life cycle; and (2) to establish the scientific groundwork, so at some future time a multilateral regime for the conservation and rational utilization of the region's pelagic fish stocks may be created. Membership in the ISC is open to all coastal States of the region, as well as States whose vessels fish for tuna or tuna-like species in the region. Canada, China, Taiwan (Chinese Taipei), Japan, Korea, Mexico, the United States, and several regional organizations have participated in past meetings.

On a practical level, the ISC regularly assesses and analyzes fishery and other information, prepares reports, formulates research proposals, and to the extent possible, coordinates international and national research programs on the relevant species. Although not a management organization, the ISC has expressed concern over the bycatch of blue sharks in longline fisheries.

3.2.9 Sub-Saharan Africa

In May 2001, representatives from governments, NGOs, and academia met in Capetown, South Africa, for the International Fund for Animal Welfare African Shark Conservation and Management Workshop. The workshop recommended, *inter alia,* that all sharks, whether caught in directed fisheries or as bycatch, should, wherever possible, be landed with their fins and tails still attached, landing of fins without the corresponding carcasses should be prohibited, and that the Food and Agriculture Organization (FAO), and particularly the richer fishing nations and shark product-consuming countries, as well as others, should provide financial and technical assistance to developing countries to enforce these prohibitions and develop and implement NPOAs for Sharks in Africa. The United States will seek opportunities directly and through partnering with other interested countries and NGOs to encourage the implementation of these recommendations by coastal African states.

3.2.10 Department of State Regional Environmental Hub Program

To address transboundary environmental issues, the Department of State has established Regional Enviromnental Hubs, located in 12 embassies around the world. The Hubs are predicated on the idea that transboundary environmental problems can best be addressed through regional cooperation. The regional environmental officer's role complements the traditional bilateral Environment Science and Technology officers stationed in embassies around the world. Rather than dealing with a single country on environmental issues, regional environmental officers will took at transboundary issues from a regional perspective. Hubs are located in: Addis Ababa, Ethiopia; Amman, Jordan; Ankara, Turkey; Bangkok, Thailand; Abidjan, Cote d'Ivoire; Brasilia, Brazil; Budapest, Hungary; Copenhagen, Denmark; Gaborone, Botswana; Kathmandu, Nepal; San Jose, Costa Rica; and Tashkent, Uzbekistan. These Hub Officers will be important in the development and implementation of regional approaches to sharks and in particular in the building of support for anti-finning legislation and subsequent enforcement.

3.3 Multilateral Efforts

3.3.1 Food and Agriculture Organization of the United Nations (FAO) Committee on Fisheries (COFI)

The FAO was founded in October 1945 with a mandate to raise levels of nutrition and standards of living, to improve agricultural productivity, and to better the condition of rural populations. COFI, a subsidiary body of the FAO Council, was established by the FAO Conference at its Thirteenth Session in 1965. The Committee presently is the preeminent global inter-governmental forum where major international fisheries and aquaculture problems and issues are examined and recommendations addressed to governments, regional fishery bodies, NGOs, fishworkers, FAO and international community, periodically on a worldwide basis. COFI has also been used as a forum in which global agreements and non-binding instruments were negotiated.

In March 1997, a proposal was made at the 22nd Session of COFI that FAO organize an expert consultation to develop *Guidelines for a Plan of Action* for the improved conservation and management of sharks. This proposal culminated in the decision in February 1998 (FAO, 1998) to prepare an IPOA for the Conservation and Management of Sharks, through the meetings of the Technical Working Group on the Conservation and Management of Sharks in Tokyo from April 23 - 27, 1998, a preparatory meeting held in Rome from July 22 - 24, 1998, and the Consultation on Management of Fishing Capacity, Shark Fisheries, and Incidental Catch of Seabirds in Longline Fisheries, held in Rome from October 26 - 30, 1998.

In February 1999, COFI endorsed the *International Plan of Action for the Conservation and Management of Sharks* (available at www.fao.org). This plan was commended by the March 1999 FAO Fisheries Ministerial, endorsed by the June 1999 FAO Council, and adopted by the November 1999 FAO Conference. The IPOA builds upon the FAO *Code of Conduct for Responsible Fisheries,* encompasses all elasmobranch fisheries (commercial and recreational), and calls on all member nations to implement, voluntarily, the IPOA through the development of a national plan of action. Thus, the IPOA provides a valuable framework for data collection and information sharing.

The objective of the IPOA is to ensure the conservation and management of sharks and their long-term sustainable use. In the IPOA, member nations have agreed voluntarily to develop, implement, and monitor a national plan of action if their vessels conduct directed fisheries for sharks or if their vessels regularly catch sharks in non-directed fisheries. As stated in paragraph 22 of the 1POA, shark plans should aim to:

- Ensure that shark catches from directed and non-directed fisheries are sustainable;
- Assess threats to shark populations, determine and protect critical habitats, and implement harvesting strategies consistent with the principles of biological sustainability and rational long-term economic use;
- Identify and provide special attention in particular to vulnerable or threatened shark stocks;
- Improve and develop frameworks for establishing and coordinating effective consultation involving stakeholders in research, management, and educational initiatives within and between member Nations;
- Minimize unutilized incidental catches of sharks;
- Contribute to the protection of biodiversity and ecosystem structure and function;
- Minimize waste and discards from shark catches in accordance with article 7.2.2. (g) of the *Code of Conduct for Responsible Fisheries* (for example, requiring the retention of sharks from which fins are removed);
- Encourage full use of dead sharks;
- Facilitate improved species-specific catch and landings data and monitoring of shark catches; and
- Facilitate the identification and reporting of species-specific biological and trade data.

Additionally, national plans of action are to be implemented by FAO members in a manner consistent with the FAO (1995) *Code of Conduct for Responsible Fisheries* and any applicable rules of international law, and in conjunction with relevant international organizations.

The U.S. National Plan of Action for the Conservation and Management of Sharks (NPOA) was developed by NMFS, in consultation with stakeholders, and finalized in February 2001. The NPOA includes provisions for: assessing levels of directed and incidental catch and bycatch of elasmobranchs, data collection (including collection of habitat and bycatch data), outreach and education of fishermen, exchange of information on shark fisheries and studies, and assessing the effectiveness of management measures. For federally managed fisheries, the Magnuson-Stevens Act provides the basis and authority for these provisions. As such, these provisions are consistent with the Magnuson-Stevens Act and its National Standards and, therefore, should already be encompassed in existing FMPs or addressed in the development of FMPs or IMP amendments. The United States NPOA for the Conservation and Management of sharks is available at www.nmfs.noaa.gov . This report constitutes an update of the NPOA.

3.3.2 International Union for Conservation of Nature and Natural Resources (IUCN)

The International Union for Conservation of Nature and Natural Resources (IUCN) is an umbrella organization of the world's conservation agencies and institutions. It includes both governmental and non-governmental members. The IUCN actively supports the conservation of biological diversity and the sustainable use of living resources. The IUCN has six Commissions, including the Species Survival Commission (SSC), the largest and most active unit. Within the SSC is a series of specialist groups composed of conservation experts that promote action to arrest the loss of the world's biological diversity and to restore threatened species to safe and productive population levels. The Shark Specialist Group (SSG) and its regional shark specialist groups are composed of elasmobranch specialists willing to donate their time in identifying the problems associated with the maintenance of elasmobranch stocks in their regions. The United States has many scientists, Federal Government employees, and conservationists active in SSG activities.

The goals of the SSG include:

- To promote, catalyze, and document conservation activities on behalf of chondrichthyans;
- To undertake research, conservation, management, and education activities in fulfillment of our mission; and,
- To provide and improve technical information and advice on the conservation of chondrichthyans to a number of constituents including government agencies and user groups.

The SSG is currently consolidating regional status reports into a global Action Plan for the conservation of sharks. The Action Plan will highlight global and regional problem areas and is anticipated to be a useful tool in attracting funding to support needed elasmobranch research programs. Similar Action Plans generated by other SSC Specialist Groups have proven to be valuable documents that have guided the direction of conservation and aided in the procurement of research funding.

In the past year, the SSG has prepared a document to be submitted at the 12th conference of the parties to CITES in November 2002. This document, *The ole of CITES in the Conservation and Management of Sharks*, concludes that the concerns expressed in 1994 by CITES regarding the over-exploitation of some shark species to meet the demand for sharks and shark products in international trade, have not yet been

addressed effectively through improved shark fishery management and trade monitoring measures by shark fishing and trading nations. Furthermore, the SSG recommends that CITES take a more active role in the conservation and management of shark species and to urge FAO to encourage implementation of the IPOA by States.

With lack of data on biological and catch information of shark species a central obstacle to sustainable shark fisheries, the work of the SSG is central to the goals of the Shark Finning Prohibition Act. One problem facing the SSG is that many of the regionals have very sparse or sometimes no participation. The United States has contributed funds to the SSG in recent years, and subject to availability of funds, will continue to do so. In addition, through diplomatic and other channels, we will make every effort to broaden and deepen participation in the SSG to help ensure that its work is as complete and accurate as possible. A truly worldwide network of shark specialists will prove invaluable, first in the formulation of, and second in the creation of broad-based support for implementation of new international policies and initiatives on shark conservation and management.

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

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a multilateral treaty that regulates international trade in selected animal and plant species. Although CITES is legally binding on the Parties (signatory countries) -- in other words they have to implement the Convention -- it does not take the place of national laws. Rather, it provides a framework to be respected by each Party, which has to adopt its own domestic legislation to implement CITES at the national level. In the United States, this is accomplished through the Endangered Species Act and implemented by the U.S. Fish and Wildlife Service (USFWS).

No species protected by CITES has become extinct as a result of trade since the Convention entered into force in 1975 and, for many years, CITES has been among the largest conservation agreements in existence, with now over 150 Parties. CITES works by subjecting international trade in specimens of selected species to certain controls. These require that all import, export, reexport, and introduction from the sea (trading in specimens from the high seas) of species covered by the Convention has to be authorized through a licensing system.

The species covered by CITES are listed in three appendices, according to the degree of protection they need:

> Appendix I includes species threatened with extinction. Trade in specimens of these species is permitted only in exceptional circumstances.
>
> Appendix II includes species not necessarily threatened with extinction, but in which trade must be controlled in order to avoid over-utilization.
>
> Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade.

Each Party to the Convention must designate one or more Management Authorities in charge of administering the licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species. A specimen of a CITES-listed species may be imported into or exported

(or re-exported) from a State party to the Convention only if the appropriate document has been obtained and presented for clearance at the port of entry or exit. Aquatic species comprise a relatively small proportion of CITES-listed taxa, but include heavily traded groups like sturgeon and their caviar (Order Acipenseriformes), queen conch (*Strombus gigas*), corals (Orders Scleractinia, Antipatharia, and others), and giant clams (Family Tridacnidae).

There are no inconsistencies between the CITES treaty and the Shark Firming Prohibition Act (Act). None of the CITES permitting provisions would violate or contradict the provisions of the Act, and none of the Act's requirements violate CITES protocol. There are two species of sharks listed in Appendix III: great white *(Carcharodon carcharias)* by Australia, and basking shark *(Cetorhinus maximus*) by the United Kingdom. Neither of these species can be landed in most of the United States because of Federal and state management measures, and CITES allows such stricter domestic measures. Both of these CITES listings are supported by the United States.

In the future, other sharks may benefit from CITES protection because increasing international trade in sharks and shark products is contributing substantially to declining stocks. With respect to international trade, the international shark fin market, centered in Asia, represents a lucrative and growing industry that may threaten the long-term viability of many shark populations around the world. As discussed below, the protection and trade monitoring afforded by CITES may prove useful for conserving these species on a global scale.

A majority of CITES Parties have seen the potential benefits of listing shark species in Appendix II (the sustainable use Appendix of the treaty). At the last CITES conference, three Appendix II shark listing proposals (great white, whale shark, and basking shark) gained a majority of Parties' votes but failed to gain the required two-thirds to be formally adopted. At the conference, the United States proposed the whale shark *(Rhincodon typus*) for listing, cosponsored the great white proposal with Australia, and supported the United Kingdom's proposal for basking shark. The United States took these positions because it believes that CITES offers numerous benefits for marine species conservation. These include enhanced and systematic trade monitoring, encouragement of national fishery management plans to bolster permit issuance, and regular reviews of trade Patterns.

At the upcoming CITES Conference of Parties (November 2002), the United States will once again support Appendix II listings for basking and whale sharks. Additionally, the United States will support proposed CITES resolutions encouraging continued monitoring of the FAO Shark IPOA process and further FAO/CITES coordination on sharks.

The United States acknowledges that there are some obstacles, although surmountable, to efficient shark listings under CITES. These include lack of clear guidelines for permitting specimens taken on the high seas ("introduced from the sea" in CITES parlance), timely permit issuance for perishable shark products, and problems with product identification. Failure to address these problems before and after any shark listing will compromise the effectiveness of CITES for those taxa, and diminish future interest in listing species in need of protection.

The United States remains engaged on all of the issues listed above, and is striving to resolve problems by industry consultation, Federal agency cooperation, and international discussion. The Introduction from the Sea problems were discussed at length at the last CITES conference, and advances were made to clarify the treaty's intent with respect to high seas fishery products, including sharks. Permit timeliness

has been improved through U.S. experiences with caviar, biomedical samples, and the live pet trade. Product identification has been improved at ports of entry by use of the United Kingdom's shark fin identification manuals, and the USFWS National Fish and Wildlife Forensics Laboratory is ready to assist in developing DNA markers for product identification.

A primary argument of many of those countries arguing against the listing of sharks is that CITES should defer dealing with marine species to other international organizations, in particular the FAO, which is the global body with the technical expertise and mandate to deal with commercial fisheries. While steadfastly supporting the right of CITES to consider all species for listing that meet the biological criteria, the United States also recognizes the important role that FAO can play in ensuring that CITES has the best expertise available when considering marine species for listing. FAO and CITES have recently embarked on a new era of cooperative dialogue that the United States believes could lead to a resolution of some of the issues discussed above. If successful, this initiative will improve the abilities of both organizations to contribute to the effective conservation and management of marine fish species. The United States is a strong advocate of coordination between CITES and FAO and will work for that cooperation to continue as part of this strategy.

Developing countries also pose a challenge, as they often need assistance to effectively implement CITES for sharks or other taxa. This is currently addressed through several parallel processes, including the CITES Secretariat's capacity building program, overseas CITES training sessions, and training grants issued by various Federal agencies. As per the mandates of CITES, the United States consulted with all range countries prior to proposing whale sharks and great white sharks at the last CITES conference. Such consultations provide an opportunity to gauge the will and interest of developing countries in implementing shark listings, and allows the United States to identify those with particular training/funding needs. Recognizing the increased demands that a listing of a commercially exploited shark species would place on the CITES system, the United States has an obligation when supporting such listings to contribute resources and technical expertise to effectively monitor trade, particularly if developing countries are impacted by the listing.

Sharks are unique species that are vulnerable to overexploitation, as evidenced by stock declines in every ocean. CITES trade controls can be an effective supplement to traditional regional management measures, or could provide the sole source of protection in many cases. Contrary to some countries' perceptions, the CITES treaty was designed to address marine species, as evidenced by language in Article XV Par. 2(b) that requires consultation with bodies administering RFMPs or IPOAs. The United States continues to support the concept of CITES as an effective conservation tool for sharks, but understands that several implementation issues must be addressed concomitantly with any listing actions.

3.3.4. World Summit on Sustainable Development (WSSD)

The World Summit on Sustainable Development was held in Johannesburg, South Africa, August 26 - September 4, 2002. The WSSD was intended as a follow-on to the Earth Summit held in Rio de Janeiro 10 years earlier. Although the primary documents that emerged from WSSD – the Johannesburg Declaration and the Plan of Implementation – do not specifically address sharks, the Plan of Implementation does call for States to ratify (where applicable) and implement the United Nations Fish

Stock Agreement, the FAO Code of Conduct for Responsible Fisheries, and the FAO International Plans of Action, including the one for the conservation and management of sharks. It, therefore, provides additional impetus for the international community to respond positively to the conservation needs of sharks in terms of directed harvests and incidental catches.

4. NMFS Research on Sharks

4.1 Data Collection and Quality Control, Biological Research, and Stock Assessments

Southwest Fisheries Science Center (SWFSC) Honolulu Laboratory

Data Collection and Quality Control: Market data from the shoreside sampling program containing detailed biological and economic information. This data was collected from the United Fishing Agency (UFA), a public fish auction. Almost all of the landings from the Hawaii-based longline fishery is unloaded and sold at this site. This data contains individual weights and prices as well as manner of processing (i.e., headed and gutted, whole, etc.) of the catch. Data collection at this site began in 1987 and is ongoing. Market data was also collected from seafood brokers who handled longline catch in Honolulu. Coverage of the market data was estimated close to 90 percent during the late 1980s and early 1990s but dropped to about 30 percent thereafter due to implementing and maintaining the mandatory longline logbook program. Electronic submission of market data by UFA in 2001 increased the market sample coverage to near complete.

Longline vessel operators are required to submit daily longline logbook data to NMFS after concluding each trip. This data contains detailed information on vessel operations, area of fishing, effort, and catch. Longline logbook data collection began in November 1990 and is ongoing. Coverage of logbook data is estimated to be almost 100 percent.

The Hawaii Longline Observer Program, which was developed to monitor interactions between the longline fishery and protected species, particularly marine turtles, initiated activities in March 1994. In addition to their primary monitoring responsibilities, the observers record species-specific tallies of the catch and environmental and operational details from each set. Approximately 6,200 longline sets had been observed as of January 1, 2002. The coverage rate for longline sets from the outset of the program through December 1999 was 5 percent, followed by increases to 11 percent in 2000 and 22 percent in 2001.

Logbook data quality control studies for blue shark and other incidentally taken species were conducted at the Honolulu Laboratory under the sponsorship of the Pelagic Fisheries Research Program, University of Hawaii. A series of statistical studies has been undertaken to determine and improve the accuracy of logbook reports. The methodology involves fitting statistical models to fishery observer data, applying the fitted coefficients to the values of the corresponding predictor variables in the logbook reports describing unobserved sets, and then seeking patterns of agreement or disagreement between the predictions and observations that provide insight into reporting behavior on individual or fishery-wide scales. Work with blue shark was recently published as two papers in *Fisheries Research* (Walsh and Kleiber, 2001; Volume 53:115-131; Walsh et al., 2002; Volume 58:115-131). This research is significant because it demonstrated that a model fitted to observer data can be used as a "surrogate observer" and thereby extend the actual observer coverage fishery-wide.

Pacific Oceanic Shark Population Biology: This project began with a literature review to provide biological information needed for stock assessment of pelagic shark species taken by foreign and U.S. longline fisheries in the central North Pacific and also for simulation models of shark populations and their ecosystem relationships. Aside from the predominant blue shark, other oceanic shark species are poorly documented in fisheries statistics, inviting novel approaches to assessment including simulations of productivity based on an understanding of differences in life history characteristics and ecology.

A demographic technique formulated to compare the intrinsic rate of population increase in sharks was used across disparate taxonomic groups to evaluate its potential in creating a theoretical index of concern for pelagic shark species in the central Pacific Ocean. These rates are a theoretical measure of a species ability to recover from population declines caused by overharvesting or other anthropogenic mortality. The method is useful in application to species where little documentation exists as to life history, migration patterns, and stock characteristics. Biological information on female age at maturity, maximum reproductive age, and average fecundity were the only parameters used in this density dependent population model to estimate a theoretical rebound potential for each species. The rebound potential (expressed as a doubling time of a population) for pelagic sharks ranged from 10-36.2 years. The doubling time for large bodied, low fecundity, long-lived mammals ranged from 20.6-37.3 years. Relatively fast growing, fecund, short-lived mammals and fish ranged from 5-10.7 years. These results were presented at the 52nd Annual Tuna Conference in Lake Arrowhead, California, May 21-25, 2001, (Curran, D.S., and C.H. Boggs. 2001. The Use of Intrinsic Rebound Potential Indices in Comparing Disparate Species Groups. Abstract.).

Ecosystem modeling, focusing on the role of sharks as predators, was conducted using ECOPATH and ECOSIM models. Preliminary (2000) results indicated that removal of sharks from the pelagic system, predominantly by longline fisheries, had little effect on simulated trophic structure or the abundance of the other dominant taxa in the system. The preliminary model did suggest that decreased shark mortality due to a simulated Pacific-wide ban on shark finning could have a deleterious effect on turtle populations via increased predation from large sharks. The ECOSIM model was reexamined in January 2001, using more realistic estimates of turtle mortality, and found that cessation of longline fishing had little influence on turtle populations because fishing mortality and mortality due to removed sharks was roughly balanced.

A whole shark size estimation relationship that can be applied via monitoring of fins was developed for blue shark based on samples collected during many years of longline research on the NOAA Ship *TOWNSEND CROMWELL*, since shark catches are poorly reported in many fisheries and fins are frequently the only identifiable portion of shark catches that ever reach shore. With the advent of a ban on shark finning in the Hawaii longline fleet, collection of sufficient fin versus whole shark data from the commercial fishery for use in developing similar relationships for other shark species was abandoned.

Analyses of shark catch-per-unit- effort (CPUE) in relation to fishing depth and subsurface temperature structure provided from field studies deploying time-depth-temperature recorders (TDTRs) on commercial fishing vessels were completed. These analyses provide information for CPUE standardization methods based on the overlap between fishing hook depths and the vertical distribution of the preferred habitat of oceanic shark species. Habitat, movement, and postrelease mortality data will also be obtained through archival tagging of sharks. Such data will help identify the range of shark stocks for assessment purposes and help in estimating a mortality rate for the huge number of sharks that are discarded alive from longlines. A longline research cruise conducted in April of 2001 resulted in the

successful attachment of 14 blue sharks and one oceanic white-tip shark with popup archival tags, while biological samples and morphometric measurements were obtained from dead or moribund sharks caught on the cruise. A study of the geopositioning capabilities of the archival tags was also completed (Musyl, M.K., R.W. Brill, D.S. Curran, J.S. Gunn, J.R. Hartog, R.D. Hill, D.W. Welch, J.P. Eveson, C.H. Boggs, and R.E. Brainard. 2001. Ability of archival tags to provide estimates of geographical position based on light intensity. Blue sharks tagged with pop-off satellite archival tags will also enable researchers to examine stock identification, dispersal, fishery interactions, pupping areas, and possible genetic structuring. Reviews in Fish Biology.

Blue Shark Assessments: This project is a collaborative effort between scientists at the Honolulu Lab and at the National Research Institute for Far Seas Fisheries in Shimizu, Japan, to conduct an assessment of blue sharks in the north Pacific. New input data are being processed so that Taiwanese and Korean longlines can be added to the mix of fisheries considered in the original analysis. A comprehensive report on the methods and results of the analyses is in preparation, and a presentation is planned for the upcoming National Stock Assessment Workshop titled "Estimating Shark CPUE in Longline Fisheries When Most Fishermen Don't Report Shark Catch."

Northwest Fisheries Science Center (NWFSC)

The Groundfish Fisheries Management Plan (FMP) of the Pacific Fishery Management Council includes three shark and three skate species. Several Northwest Fisheries Science Center data collection programs and academic collaborations are providing limited information on these species, which will lead to an initial assessment of the status of these and other Pacific coast elasmobranch species. The goal of these assessments will be to determine, to the extent possible, whether the level of total fishing mortality of sharks, skates, and rays is sustainable. However, available information is primarily from multi-species data collection programs, so may not be sufficient to provide much precision in these assessments, and may not support any quantitative assessment of some species.

There are three primary sources of ongoing information: trawl surveys, fishery landings, and fishery observers. Bottom trawl surveys collect information on abundance of all encountered species, including elasmobranchs. This multi-species survey may sufficiently cover the habitats of some shark, skate, and ray species to provide a useful index of their abundance. The most recent survey was conducted in summer 2001, and was used as an opportunity to collect additional age and maturity data for spiny dogfish. Landings of elasmobranchs are recorded on state landings receipts, although exact species information is not always recorded. A new fishery observer program was initiated in September 2001. It will provide information on elasmobranch bycatch on fishing trips that target other groundfish and information on trips that target sharks and skates. Collectively, these three sources of data may provide, for some elasmobranch species, the basis for tracking trends in abundance, amount of total and retained catch, and areas of encounter.

In 2001, a collaborative stock assessment improvement program with the University of Washington provided sponsorship for a student to begin a spiny dogfish population investigation that will form the basis of a stock assessment within a couple of years. This collaboration has enabled placement of students on the NMFS trawl surveys to collect additional biological information on sharks, and has helped to initiate collaborative work with Washington Department of Fish and Wildlife, the University of Washington, and others to investigate sixgill sharks in Puget Sound and adjacent waters.

An update of the characterization of essential fish habitat for Pacific coast groundfish is to be completed in 2003. This update will include information on the shark and skate species included in the groundfish FMP, and will provide general information on the habitat utilized by other semidemersal elasmobranchs found off the U.S. Pacific coast.

Alaska Fisheries Science Center

Shark Research and Assessments: Current at-sea research has focused on possible predation by sleeper sharks (*Somniosus pacificus*) on Steller sea lions (*Eumetopias jubatus*). During May 2002, the second of two cruises was conducted to sample sleeper sharks adjacent to four Steller sea lion rookeries in the central Gulf of Alaska. The primary objectives were to assess possible predation of sea lions by sleeper sharks and to collect sleeper shark biological data essential for future stock assessments. Stomach contents of 99 sleeper sharks were sampled, and 24 were released with archival satellite tags. The biological data are being analyzed, with results expected by spring 2003. Partial tagging results will be available by fall 2003. The initial stock assessment work is focusing on determining shark abundance trends based on standardized multi-agency trawl and longline surveys and commercial fishery bycatch. Results will be available by November 2002 to be followed by an expanded stock assessment, possibly by fall 2003. Center scientists will provide assessments for BSAI sharks as part of the Other Species Chapter of the SAFE. They will incorporate new information from the RACE summer shelf and slope surveys.

Northeast Fisheries Science Center (NEFSC)

Fishery-Independent Surveys: The NEFSC conducts a bi-annual fishery-independent survey of Atlantic large and small coastal sharks in U.S. waters from Florida to Delaware to: (1) monitor the species composition, distribution, and abundance of sharks in the coastal Atlantic; (2) tag sharks for migration studies; (3) collect biological samples for age and growth, feeding ecology, and reproductive studies; (4) tag sharks whenever feasible for age validation studies; and 5) collect morphometric data for other studies. The time series of abundance indices (CPUE) from this survey are critical to the evaluation of coastal Atlantic shark species. This survey will be conducted in 2003.

Life History Studies: Biological samples of coastal and pelagic sharks in the Atlantic for age and growth, feeding ecology, and reproductive studies have been collected on research surveys and cruises and at recreational fishing tournaments since the early 1960s. The collection and analysis of these data are critical for input into species and age specific population and demographic models for shark management.

Age and Growth of Pelagic Sharks: Re-examination of the age and growth of the shortfin mako, *Isurus oxyrinchus*, and preliminary studies on age and growth of the thresher shark, *Alopias vulpinus*, and white shark, *Carcharodon carcharias*, are being conducted. Vertebrae, length-frequency data, and tag/recapture data collected between 1962 and 2001 are being analyzed on each of these species to obtain von Bertalanffy growth function parameters. Methodology and the problems associated with validation and verification of age estimates of highly migratory species are being addressed.

Biology of the Porbeagle Shark: Life history studies of the porbeagle shark, *Lamna nasus*, continued under a cooperative U.S./Canada research program and a paper on the validated age and growth of the porbeagle shark in the western North Atlantic Ocean was published in 2002. Two other manuscripts on

the population dynamics and the reproduction of the porbeagle are in press, and information on their feeding ecology was summarized for an ICES document. In addition, a preliminary analysis of porbeagle tagging and recapture data was begun using information from U.S., Canadian, and Norwegian sources.

Predator-Prey Interactions Between Shortfin Mako and Bluefish: The objective of this research is to quantify whether the level of dependence of shortfin mako and other shark species on bluefish, *Pomatomus saltatrix*, has changed from historic levels. Analyses will determine the relationship between bluefish distribution and abundance and the distribution and abundance of species of sharks that prey on, or compete with, bluefish for food.

Cooperative Shark Tagging Program (CSTP): The Cooperative Shark Tagging Program involving over 6,500 volunteer recreational and commercial fishermen, scientists, and fisheries observers conducted since 1962, continued to tag large coastal and pelagic sharks and provide information to define essential fish habitat for shark species in U.S. Atlantic and Gulf of Mexican waters.

Atlantic Blue Shark Life History and Assessment Studies: A collaborative program to examine the biology and population dynamics of the blue shark, *Prionace glauca*, in the North Atlantic is ongoing. An age and growth study conducted cooperatively with Massachusetts Division of Marine Fisheries staff has been completed and a manuscript is in press. Research on the food and feeding ecology of the blue shark is being conducted cooperatively with University of Rhode Island staff with a manuscript under revision. Recent focus is on the population dynamics in the North Atlantic with the objectives of constructing a time series of blue shark catch rates (CPUE) from research surveys, estimation of blue shark migration and survival rates, and the development of an integrated tagging and population dynamics model for the North Atlantic for use in stock assessment. This research is a collaboration between NMFS scientists in the NEFSC, Apex Predators Program, Narragansett, Rhode Island; the NMFS, Fisheries Statistics Division, Silver Spring, Maryland; and scientists at the School of Aquatic and Fishery Sciences, University of Washington. Progress to date includes the preliminary recovery of historical research survey catch data, size composition, and biological sampling data on pelagic sharks and two manuscripts describing Atlantic-wide movements and migrations and stock structure based on tag and release data from the NMFS CSTP. Preparation of standardized catch rate and size composition data compatible with pelagic longline observer data is the next step in this data recovery process. As part of this comprehensive program, cooperative research is underway with the Irish Marine Institute and Central Fisheries Board on mark-recapture databases including coordination of formats and programs with the NMFS CSTP for joint data analyses.

Blacktip Shark Migrations: Movements of the blacktip shark, *Carcharhinus limbatus*, in the western North Atlantic and Gulf of Mexico based on release and recapture data were analyzed and utilized at the 2002 Shark Evaluation Workshop with general migration patterns and exchange between and within regions of U.S. and Mexican waters discussed.

Cooperative Atlantic States Shark Pupping and Nursery Survey (COASTSPAN): NEFSC, Apex Predators Program staff manage and coordinate this project that uses researchers in each major coastal Atlantic state from Florida to Delaware to conduct a cooperative, comprehensive, and standardized investigation of valuable shark nursery areas. This research identifies which shark species utilize coastal zones as pupping and nursery grounds, gauges the relative importance of these areas, and determines migration and distribution patterns of neonate and juvenile sharks.

Monitoring and Assessment of Delaware Bay Sandbar Shark: NEFSC staff conduct this part of the COASTSPAN monitoring and assessment project for the juvenile sandbar shark, *Carcharhinus plumbeus,* population in the Delaware Bay nursery grounds using monthly longline surveys from June to September each year. A random stratified sampling plan based on depth and geographic location is ongoing to assess and monitor the juvenile sandbar shark population during the nursery season. In addition, the tagging and recapture data from this project are being used to examine the temporal and spatial relative abundance and distribution of sandbar sharks in Delaware Bay.

Habitat Utilization and Monitoring of Delaware Bay Sandbar Shark: This research is a study of the movements of juvenile sandbar sharks in Delaware Bay, a known nursery area, to quantify their habitat use and activity patterns using acoustic techniques. Acquired data allows quantification of home range (minimum area required) and, when coupled with environmental data, information on preferred habitat. This information is an important contribution towards understanding essential fish habitat and provides information necessary for nursery ground management and rebuilding of depleted shark populations.

Investigations into Nurse Shark Mating and Nursery Grounds in the Florida Keys: An analysis of the reproductive biology and habits of the nurse shark, *Ginglymostoma cirratum*, is ongoing in the Dry Tortugas, Florida, to understand its life history and ecology. Information from this research will be utilized to define essential fish habitat and manage this coastal shark species.

Overview of Gulf and Atlantic Shark Nurseries: Due to the requirement for a better understanding of shark nursery habitat in U.S. coastal waters, NEFSC, Apex Predators Program staff co-convened a symposium at the 2002 American Fisheries Society Annual Meeting in Baltimore, Maryland, titled "Shark Essential Fish Habitat: Towards Ecosystem Management" and are editing a report describing Atlantic and Gulf of Mexico coastal shark nursery ground and habitat studies.

Southeast Fisheries Science Center (SEFSC)

The NMFS Southeast Fisheries Science Center in Panama City, Florida, is responsible for the assessment of shark populations in U.S. waters from the northwest Atlantic Ocean and Gulf of Mexico. Its main activities include stock assessment and demographic modeling through a variety of modeling approaches. Data collection includes fisheries and biological work in support of these activities. Fishery work includes an observer program designed to monitor catch and bycatch in the directed shark gillnet fishery, an ongoing inshore fishery independent survey on shark distribution and abundance, and essential fish habitat requirements for sharks. Biological studies focus on age and growth, but also include other aspects of the life history of sharks such as reproduction, feeding, distribution and movement patterns, and delineation and characterization of nursery areas. Quantitative experiments include gillnet and longline selectivity studies.

Shark Drift Gillnet Observer Program: The observer program for the shark drift gillnet fishery, which operates in coastal waters of the southeast United States, obtains estimates of catch, bycatch, and bycatch mortality rates of sharks, protected species, and other fish species in the southeast U.S. coastal directed shark gillnet fishery. Fishing fleet data (e.g. number of vessels, gear type, areas fished, effort) for this fishery is updated bi-annually. This is an ongoing program. Technical reports are produced following each right whale and non-right whale season.

Fishery-Independent Survey on Shark Abundance, Characterization of Nursery Areas, and Information on Essential Fish Habitat: A fishery-independent assessment of coastal shark populations in U.S. waters of the northeast Gulf of Mexico is conducted monthly during April-October. Data obtained through this survey provide information on catch rates, nursery utilization and characterization, essential fish habitat requirements, and life history. Publications from this ongoing program have been produced intermittently since its inception in 1996.

Life History Studies: Biological samples have been obtained since 1993 through research surveys and cruises, recreational fishers, and through collection by onboard observers on commercial fishing vessels. Age and growth rates and other life history aspects of selected species are investigated following standard methodology. This information is essential as input to population models incorporating variation and uncertainty in estimates of life-history traits to predict the productivity of the stocks and ensure that they are harvested at sustainable levels.

Stock Assessments of Small and Large Coastal Sharks: Stock assessments are conducted on small and large coastal sharks from the U.S. Atlantic, Gulf of Mexico, and Caribbean. The assessments include estimation and analysis of catches and landings (species-specific, some data are gear- and region-specific); collection, analysis, and standardization of catch rate (CPUE) information from fishery-dependent and fishery-independent sources through Generalized Linear Modeling approaches; analysis of abundance trends; and analytical stock assessment using Bayesian and frequentist simulation of the effects of fishing on single species and/or species complexes, with risk analysis. A stock assessment of small coastal sharks was completed in March 2002 (Cortés, E. 2002. Stock assessment of small coastal sharks in the U.S. Atlantic and Gulf of Mexico. NMFS/SEFSC Sustainable Fisheries Division Contribution SFD-01/02-152). The main conclusion from this assessment was that stocks of small coastal sharks, including the small coastal shark complex and four individual species (Atlantic sharpnose, bonnethead, blacknose, and finetooth shark) are not overfished, but that overfishing may be occurring for the finetooth shark. A Shark Evaluation Workshop was conducted at the Panama City Laboratory in June 1992 in preparation for a stock assessment of large coastal sharks. The workshop focused on the available inputs for updating the last stock assessment conducted in 1998. A final report of the meeting was produced (Final meeting report of the 2002 Shark Evaluation Workshop. NOAA/NMFS/Panama City Laboratory, June 24-28, 2002). The ensuing stock assessment of the status of the large coastal shark complex, sandbar, and blacktip sharks is about to be completed at the time of this writing.

Demographic Modeling of Sharks Under Uncertainty: A study on demographic modeling of sharks under included estimation of natural mortality rates of sharks through indirect life history methods, and incorporated uncertainty in vital rates on demographic analyses of sharks. Monte Carlo simulation was used to incorporate uncertainty into life tables and matrix population models and estimate population statistics and elasticities (proportional sensitivities) for 41 shark populations. Correlation analysis was also used in concert with elasticity analysis to identify which vital rates explained most of the variation on population growth rates and provide advice for conservation and management. This study was recently published (Cortés, E. 2002. Incorporating uncertainty into demographic modeling: application to shark populations and their conservation. Conservation Biology 16:1048-1062).

Update on Shark Catches and Catch Rates of Pelagic Sharks: Each year, an update on catches and catch rates of pelagic sharks in U.S. Atlantic, Gulf of Mexico, and Caribbean waters is generated. This work compiles commercial and recreational landings and discard estimates of pelagic sharks from several

sources, updates catch rate information, and analyzes catch rate trends for pelagic sharks. This information on pelagic sharks, which are transoceanic and harvested by fishers from several nations, is required for multinational assessment of these resources through the International Commission for the Conservation of Atlantic Tunas (ICCAT).

Population Dynamics of Finetooth Shark: The life history and population dynamics of the finetooth shark were studied by determining age, growth, size-at-maturity, natural mortality, productivity, and elasticity of vital rates of the population. Results suggest the finetooth shark exhibits life-history traits and population parameters that fall between those of the blacktip shark and those of other small coastal species. Population analysis indicates management actions should focus preferentially on protection of juveniles and adults rather than age-0 individuals. A publication on this study is currently in press (Carlson, J.K, Cortés, E., and D. Bethea. In press. Fishery Bulletin. Life history and population dynamics of the finetooth shark, *Carcharhinus isodon*, in the northeastern Gulf of Mexico).

Ecosystem Modeling: Ecosystem modeling, focusing on the role of sharks as top predators, was conducted using a dynamic mass-balance model (ECOPATH-ECOSIM). Preliminary (2002) results using the bonnethead shark as a model species indicated the removal of bonnetheads from the coastal nursery areas, predominantly by fisheries and habitat loss, had little effect on trophic structure or the abundance of other marine organisms in the ecosystem. Further analyses on the ecological interactions between other shark species, and sharks and fisheries will be undertaken as new data are incorporated into the model. Results were presented at the Shark Essential Fish Habitat: Towards Ecosystem Management Symposium,132nd Annual American Fisheries Society meeting, in August 2002 (Carlson, J.K. Predatory demands and the impact of sharks in coastal nursery areas: application of bioenergetic and ecosystem models).

Density-Dependent Population Regulation in Sharks: Biological and analytical work was performed to test the hypothesis of density-dependent population regulation in sharks. Current biological information for the Atlantic sharpnose shark in the Gulf of Mexico was compared to data collected in 1979-1984 to test for potential changes due to density-dependent responses. The observed decrease in length and age at maturity and increased growth rate lends support to the hypothesis of a compensatory response, although it could not be determined whether the response was due to differences in methodology among studies, anthropogenic influences, or natural causes. Results were presented at the Elasmobranch Fisheries: Managing for Sustainable Use and Biodiversity Symposium in Santiago de Compostela, Spain, in September 2002 (Carlson, J.K. and I. Baremore, Changes in biological parameters of Atlantic sharpnose shark, *Rhizoprionodon terraenovae*, in the Gulf of Mexico: Evidence for density-dependent regulation?). A publication is expected in the summer of 2003.

An Update on the Status of the Night Shark, Carcharhinus Signatus, a Federally Prohibited Species: This proposed project (pending funding) is planned for FY 2003-FY 2006. Because of the precautionary approach to fisheries management and the limited ecological and fishery information on several species, the night shark is currently listed as a prohibited species under the Fishery Management Plan of the Atlantic tunas, swordfish, and sharks. To assess the status of this species and its validity as a prohibited species, biological information (age, growth, size-at-maturity) will be collected and updated using data

derived from the SEFSC/Pelagic Observer Program and contracted fishers. Evaluation of landings and discard estimates from several sources, updates to catch rate information, and analysis of catch rate trends for night sharks will also be performed. Updated biological information will be used as an input to population models to predict the productivity of the stock.

Habitat Utilization of Large Coastal Sharks in Coastal Nursery Areas: This proposed project is planned to start in FY 2003 as funds permit. Movements and activity patterns of juvenile large coastal sharks will be quantified using acoustic telemetry techniques. Temporal and spatial distributions will be correlated with environmental data and activity patterns from other species to provide information on preferred habitat and trophic interactions. Information collected will be provided as updates to the Essential Fish Habitat Designations in the Stock Assessment and Fisheries Evaluation Annual Report.

4.2 Incidental Catch Reduction

Southeast Fisheries Science Center

Gillnet Selectivity for Small Coastal Sharks: Despite the importance of gillnet selectivity in fisheries assessment and management, there are few estimates for sharks. Goals of this study were to develop selectivity parameters for four species of sharks from the small coastal aggregate. Information from this study will aid in recommendations to maximize or minimize the catch on certain shark sizes and be used as inputs to age-structured stock assessment on sharks. Results of this study will be published later this year (Carlson, J.K. and E. Cortés. 2002. Gillnet selectivity of small coastal sharks off the southeastern United States. Fisheries Research 1439:1-10).

Hook Selectivity and Mortality of Sharks Associated with Longline Gear: The goal of this proposed research is to provide information on hook selection and mortality rates of sharks caught on longline gear. Experiments will be designed to measure the selective properties of hooks currently used in the shark longline fishery, with an additional three hook sizes tested that are thought to reduce mortality and increase survivorship. In addition, experiments will be conducted on fishing practices that have the potential to reduce mortality and increase survivorship after release. The results of this planned activity will address several of the priorities listed in the Secretary of Commerce's research program for atlantic sharks for data collection and research as authorized by Section 7 of the Shark Finning Prohibition Act (Public Law 106-557-Dec 21, 2000). The intended start date for this project is Fiscal Year 2003 as funds permit.

4.3 Post-Release Survival

Southwest Fisheries Science Center

The Survival Rates of Blue Sharks Captured and Released from Commercial Longline Fishing Gear: The survival rates of blue sharks captured and released from commercial longline fishing gear are being examined using pop-up satellite archival tags. The morbidity of released fish will also be determined by examination of diel horizontal and vertical movement patterns. Results from this study will be correlated to work through a second study (described below) designed to develop biochemical and physiological predictors of long-term survival in released blue sharks.

Developing Biochemical and Physiological Predictors of Long Term Survival in Released Blue Sharks: Even when recreational anglers and commercial fisherman practice good catch-and-release fishing, delayed mortality is a distinct possibility. Tag-and-release programs are important tools to assessing post-release survival, but they can be difficult and expensive to implement. Conclusions from tag-and-release studies are rarely extrapolated to other species because of the many factors (e.g. size, water temperature, fight time, and fishing gear) that may influence survivability or mortality. This study uses a novel approach to study the basis of post-release mortality. Rather than assessing how many fish survive, we try to understand why fish die. A set of diagnostic tools is being developed to assess the biochemical and physiological status of sharks caught by longline on scientific cruises. These tools will be used in combination with pop-off satellite archival tag (PSAT) data to establish correlates of survival or mortality.

This work has focused on assessing the extent of tissue damage arising from capture using comprehensive analyses of ions, metabolites and proteins. For example, the damage to myocardial tissue upon a heart attack causes release of proteins such as creatine phosphokinase and troponin I into the plasma. Properties of blood cells themselves are also being used to assess the extent of systemic oxidative damage. Under stressful conditions, a series of genes are induced leading to synthesis of messenger ribo nucleic acid and protein corresponding to the heat shock proteins (hsp). Hsp70 induction has been used in a number of fish models as an index of cellular damage.

Northeast Fisheries Science Center

Post-Release Recovery and Survivorship Studies in Sharks -- Physiological Effects of Capture Stress: This research is directed towards the sandbar shark, *Carcharhinus plumbeus*, and is being conducted cooperatively with Massachusetts Division of Marine Fisheries biologists. The study utilizes blood and muscle sampling methods in addition to acoustic tracking to obtain physiological profiles of individual sharks to characterize stamina and to determine ultimate post release survival. These analyses are requisite in view of the extensive current and proposed catch and release management strategies for coastal and pelagic shark species.

4.4 Education and Outreach

The U.S. NPOA for the Conservation and Management of Sharks states that each U.S. management entity (i.e., NMFS, Regional Fishery Management Councils, Interstate Marine Fisheries Commissions, and States) should cooperate with regard to education and outreach activities associated with shark conservation and management. In an effort to implement the NPOA, NMFS and other U.S. shark management bodies have: (1) developed training tools and programs in elasmobranch identification (such as identification posters and color guidebooks); (2) developed information and materials to raise awareness among recreational fishermen, commercial fishermen, fishing associations, and other relevant groups about the need and methods to reduce bycatch mortality and increase survival of released elasmobranchs where bycatch occurs; and (3) attempted to raise awareness among the non-fishing public about the ecological benefits from elasmobranch populations, detrimental effects of habitat destruction (e.g., coastal development, coastal pollution), and appropriate conservation measures to avoid, minimize or mitigate adverse effects on necessary habitats.

4.5 Fishing Capacity

There are a number of management tools in use in U.S. fisheries designed to reduce capacity, including: limited entry, vessel and permit buybacks, and exclusive quota programs (e.g., individual fishing quotas, community development quotas, and cooperatives). However, capacity reduction is still being investigated as an effective method for increasing the sustainability of elasmobranch fisheries. NMFS is currently assessing levels of fishing capacity in Federally managed commercial fisheries in the United States as part of the development of an NPOA on the Management of Fishing Capacity, due out by the end of 2002. U.S. management entities are participating in this study.

5. Conclusion

The management of shark species poses a considerable challenge due to the biological characteristics that make these stocks vulnerable to overfishing, and their highly migratory nature, which necessitates the coordination of management across political boundaries. NMFS is committed to ongoing research efforts domestically, as well as international efforts in cooperation with the Department of State, in order to address the need for shark conservation on a global scale.