2004 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, skates, and rays are within the Class Chondrichthyes, the cartilaginous fishes, and the subclass Elasmobranchii. Sharks are an ancient and diverse group of fishes presenting an array of issues and challenges for fisheries management and conservation due to their biological and ecological characteristics. Most sharks are predators at the top of the food chain whose abundance is often low relative to organisms at lower trophic levels. In addition, many shark species are characterized by relatively late maturity, slow growth, and low reproductive rates.

Sharks have not been a major priority for fisheries management agencies because the volume and value of shark landings were considerably less than commonly exploited commercial fishes. 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 demand for some shark species and shark products has grown, there has been increased international fishing effort 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 of 2000. Section 3 of the Shark Finning Prohibition 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. In addition, Section 3 of the Shark Finning Prohibition Act contains a rebuttable presumption that any shark fins landed from a fishing vessel or found on board a fishing vessel were taken, held, or landed in violation (of the Act) if the total weight of shark fins landed or found on board exceeds 5 percent of the total weight of shark carcasses landed or found on board. Section 9 of the Shark Finning Prohibition 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 Shark Finning Prohibition Act requires the National Marine Fisheries Service (NMFS) to promulgate regulations to implement its prohibitions (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 Shark Finning Prohibition 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 Shark Finning Prohibition Act. This 2004 report also provides an update to the prior year's reports, and includes complete information for 2003 activities plus additional information from the current year.

1.1 Management Authority in the United States

The Magnuson-Stevens Act and other legal authorities for management entities governing U.S. fisheries in which sharks are directed catch, incidental catch, or bycatch are discussed in the previous reports to Congress. The Magnuson-Stevens Act forms the basis for fisheries

management in federal waters, and requires NMFS and the eight regional fishery management councils to take specified actions. State agencies and interstate fishery management commissions are bound by state regulations and, in the Atlantic region, by the Atlantic Coast Fisheries Cooperative Management Act.

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, swordfish, billfish and sharks). 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. The New England Fishery Management Council (NEFMC) has the lead, and it consults with the Mid-Atlantic Fishery Management Council (MAFMC), in the management of spiny dogfish for the entire U.S. Atlantic Coast pursuant to the Spiny Dogfish Fishery Management Plan which became effective in February, 2000.

In 1993, NMFS implemented the Fishery Management Plan (FMP) for Sharks of the Atlantic Ocean, which established three management units: large coastal sharks (LCS), small coastal sharks (SCS), and pelagic sharks (Table 1.2.1). Under the FMP, species groups were not managed on a regional basis. NMFS identified LCS as overfished, and therefore, implemented commercial quotas for LCS, and established recreational harvest limits for all sharks. At this time, NMFS also banned finning of all sharks in the Atlantic Ocean.

In April 1999, NMFS published the Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks (HMS FMP), which included numerous measures to rebuild or prevent overfishing of Atlantic sharks in commercial and recreational fisheries. The HMS FMP replaced the 1993 FMP and the implementing regulations were published on May 28, 1999 (64 FR 29090). The HMS FMP addressed numerous shark management measures, including: reducing commercial LCS and SCS quotas; establishing a commercial quota for blue sharks and a species-specific quota for porbeagle sharks; expanding the list of prohibited shark species; implementing a limited access permitting system in commercial fisheries; and establishing season-specific over- and under-harvest adjustment procedures. The HMS FMP also partitioned the LCS complex into ridgeback and non-ridgeback categories but did not include regional quota measures. Due to litigation, many management measures in the HMS FMP were not implemented.

On December 24, 2003, the final rule implementing Amendment 1 to the HMS FMP was published in the Federal Register (68 FR 74746). This final rule revised the shark regulations based on the results of the 2002 stock assessments for SCS and LCS. Results of these stock assessments indicate the SCS complex is not overfished (e.g. depleted in abundance) and overfishing is not occurring; the LCS complex continues to be overfished, and overfishing is occurring; sandbar sharks are not overfished, but overfishing is occurring; blacktip shark stocks are rebuilt and healthy; and finetooth sharks are not overfished, but overfishing is occurring. In

Amendment 1 to the HMS FMP, NMFS revised the rebuilding timeframe for LCS to 26 years from 2004, and implemented several new regulatory changes. Management measures enacted in the amendment included: re-aggregating the large coastal shark complex; using maximum sustainable yield (MSY) as a basis for setting commercial quotas; eliminating the commercial minimum size restrictions; implementing trimester commercial fishing seasons effective January 1, 2005; imposing gear restrictions to reduce bycatch; implementing a time/area closure off the coast of North Carolina effective January 1, 2005; and establishing three regional commercial quotas (Gulf of Mexico, South Atlantic, and North Atlantic) for LCS and SCS management units. The regions include the Gulf of Mexico (Texas through the west coast of Florida), the South Atlantic (the east coast of Florida through North Carolina including the Caribbean Sea), and the North Atlantic (Virginia north). As a result of using the MSY as a basis for setting quotas and implementing a new rebuilding plan, the overall quota for LCS in 2004 of 1,017 metric tons (mt) dressed weight (dw) (2.24 million lbs dw) was lower than both the 2002 LCS quota of 1,285 mt dw (2.83 million lbs dw) and the 2003 LCS quota of 1,714 mt dw (3.78 million lbs dw). The overall LCS quota in 2005 will remain at the current level of 1,017 mt dw. The SCS and pelagic shark quotas remain unchanged from the HMS FMP.

Most of the regulations in Amendment 1 to the HMS FMP became effective on February 1, 2004, however, the change in commercial quotas, removal of the commercial minimum size, establishment of regional quotas, and increase in recreational bag and size limit became effective on December 30, 2003. The time/area closure off of North Carolina and the trimester seasons will become effective January 1, 2005. In additon, as of November 15, 2004, directed shark vessels with gillnet gear onboard, regardless of location, will be required to have a VMS installed and operating during right whale calving season (November 15 – March 31); and, as of January 1, 2005, directed shark vessels with bottom longline fishing gear onboard, located between 33° and 36° 30' N latitude, will be required to have a VMS installed and operating during the mid-Atlantic shark closure period (January 1 – July 31). The VMS requirement was finalized on December 24, 2003 (68 FR 74746), and was delayed pending a type-approval notice published on April 15, 2004 (69 FR 19979). The final rule announcing the effective date for the VMS requirement was published on August 17, 2004 (69 FR 51010). The dehooking device requirements are delayed pending type approval notices. Information on Atlantic shark fisheries is updated annually in the Stock Assessment and Fishery Evaluation (SAFE) Report for Atlantic Highly Migratory Species (HMS).

The second semi-annual commercial shark fishing season for all species groups and all regions opened on July 1, 2004, and closed for LCS on July 15, 2004, in the North Atlantic; August 15, 2004, in the Gulf of Mexico; and September 30, 2004, in the South Atlantic. Closure dates for all other species groups will be determined as necessary. Fishery closures are necessary to ensure the semiannual fishing quotas are not exceeded. During a closure of a particular region, retention of, fishing for, possessing or selling LCS in the region are prohibited for persons fishing aboard vessels issued a limited access permit under 50 CFR 635.4. In addition, in a closed region, the sale, purchase, trade, or barter of carcasses or fins of LCS harvested by a person aboard a vessel issued a permit under 50 CFR 635.4 are prohibited, except for those harvested; offloaded; and sold, traded, or bartered prior to the closure and held in storage by

a dealer or processor. The quotas were adjusted to account for any over- or under-harvest in the second semiannual season of 2003. The semi-annual quotas in metric tons dressed weight (mt dw) and pounds (lbs) and closure dates are shown in Table 1.2.2. Landings data for Atlantic sharks for the 2004 second semi-annual season (July through December, 2004) are also shown in Table 1.2.2.

Table 1.2.1 Atlantic sharks in the management unit by species groups.

Large Coastal Sharks (LCS)	
Sandbar	*Carcharhinus plumbeus*
Silky	*Carcharhinus falciformis*
Tiger	*Galeocerdo cuvieri*
Blacktip	*Cancharhinus limbatus*
Spinner	*Carcharhinus brevipinna*
Bull	*Carcharhinus leucas*
Lemon	*Negaprion brevirostris*
Nurse	*Ginglymostoma cirratum*
Scalloped hammerhead	*Sphyrna lewini*
Great hammerhead	*Sphyrna mokarran*
Smooth hammerhead	*Sphyrna zygaena*

Small Coastal Sharks (SCS)	
Atlantic sharpnose	*Rhizoprionodon terraenovae*
Finetooth	*Carcharhinus isodon*
Blacknose	*Carcharhinus acronotus*
Bonnethead	*Sphyrna tiburo*

Prohibited Species	
Sand tiger	*Carcharias taurus*
Bigeye sand tiger	*Odontaspis noronhai*
Whale	*Rhincodon typus*
Basking	*Cetorhinus maximus*
White	*Carcharodon carcharias*
Dusky	*Carcharhinus obscurus*
Bignose	*Carcharhinus altimus*
Galapagos	*Carcharhinus galapagensis*
Night	*Carcharhinus signatus*
Caribbean reef	*Carcharhinus perezii*
Narrowtooth	*Carcharhinus brachyurus*
Caribbean sharpnose	*Rhizoprionodon porosus*
Smalltail	*Carcharhinus porosus*
Atlantic angel	*Squatina dumeril*
Longfin mako	*Isurus paucus*
Bigeye thresher	*Alopias superciliosus*
Sevengill	*Heptranchias perlo*
Sixgill	*Hexanchus griseus*
Bigeye sixgill	*Hexanchus vitulus*

Pelagic Sharks	
Shortfin mako	*Isurus oxyrinchus*
Common thresher	*Alopia vulpinus*
Porbeagle	*Lamna nasus*
Oceanic whitetip	*Carcharhinus longimanus*
Blue	*Prionace glauca*

Table 1.2.2. 2003 preliminary shark landings estimates in metric tons (mt) dressed weight (dw) for the Atlantic shark commercial fisheries. 2003 was the only year in which LCS were split between ridgeback and non-ridgeback species.

Open Dates	Quota (mt dw)	Preliminary Landings (mt dw)
Jan. 1 - April 15 (Ridgeback LCS) Jan.1 - May 15 (Non-ridgeback LCS)	391.5 (Ridgeback LCS) 465.5 (Non-ridgeback LCS)	1,659
July 1 - Sept. 15 (All LCS)	424 (Ridgeback LCS) 498 (Non-ridgeback LCS)	
Small Coastal Sharks	326	243
Blue sharks	273	102
Porbeagle sharks	92	
Pelagic sharks other than blue or porbeagle	488	

Table 1.2.3. 2004 preliminary shark landings estimates in metric tons (mt) dressed weight (dw) for the Atlantic shark commercial fisheries. These landings estimates include landings reports received as of October 29, 2004. Beginning January 1, 2004, quotas were divided among three regions, and LCS quotas were no longer split between ridgeback and non-ridgeback.

Species Group	Region	Quota (mt dw)	Preliminary Landings (mt dw)
Large Coastal Sharks- i.e., sandbar, silky, tiger, blacktip, spinner, bull, lemon, nurse, hammerheads	Gulf of Mexico	477.7	465.8
	South Atlantic	614.2	525.5
	North Atlantic	47.6	41.6
Small Coastal Sharks- i.e., Atlantic sharpnose, finetooth, blacknose, bonnethead	Gulf of Mexico	21.4	16.5
	South Atlantic	445.4	117.1
	North Atlantic	69.7	.44
Blue sharks	No regional quotas	273	72.6
Porbeagle sharks		92	
Pelagic sharks other than blue or porbeagle		488	

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).

Pacific Fishery Management Council (PFMC)

The PFMC's area of jurisdiction is the Exclusive Economic Zone (EEZ) off the coasts of California, Oregon, and Washington. In late October 2002, the PFMC adopted its Fishery Management Plan for U.S. West Coast Highly Migratory Species (HMS) Fisheries (FMP). This FMP's management area also covers adjacent high seas waters for fishing activity under the jurisdiction of the HMS FMP. The final rule implementing the HMS FMP was published in the Federal Register on April 7, 2004 (69 FR 18443). This FMP manages several sharks as part of the management unit including the common thresher, *Alopias vulpinus,* and shortfin mako, *Isurus oxyrinchus*, sharks valued but not primarily targeted in the west coast-based fisheries, as well as blue sharks, *Prionace glauca,* (a frequent bycatch species), bigeye thresher, *Alopias superciliosus,* and pelagic thresher, *Alopias pelagicus,* (incidental catch) sharks. The HMS FMP also designated some shark species as prohibited because of their special status. If intercepted, these species including the great white shark, megamouth shark, and basking shark, must be released immediately, unless other provisions for their disposition are established.

The FMP proposed precautionary annual harvest guidelines, for common thresher and shortfin mako sharks, to prevent localized depletion, which could take decades to correct given the biological characteristics of the species. The common thresher shark and the shortfin mako shark are considered vulnerable to overexploitation due to their low fecundity, long gestation periods, and relatively high age at maturation. Shortfin makos are thought to be mature between 7 and 8 years, however, age determination methods are still being validated, and predicted gestation lasts 15-18 months. Fisheries off the west coast of the United States mainly take juvenile and subadult shortfin makos of age 3 or less, of unknown proportion to the overall stock (California's Living Marine Resources: A Status Report. California Department of Fish and Game: Resources Agency). Off southern California, common thresher shark females mature at length 8.5-10 ft at a still unknown age, have a litter size from 2-6 pups, and may live from 15-19 years. The FMP also establishes a formal requirement for fishery monitoring and annual SAFE reports as well as a full FMP effectiveness review every two years. This should ensure new information would be collected and analyzed so additional conservation action can be taken if any species is determined to need further protection.

The Pacific Coast Groundfish FMP includes several shark species (e.g., leopard, soupfin and spiny dogfish) in the groundfish management unit. Under regulations promulgated for 2003 and likely to be in effect for some time, a "rockfish conservation area" has been established closing large areas to fishing for groundfish, including sharks, by most gear types that catch groundfish. In addition, the Pacific Coast Groundfish FMP manages its shark species with a combined

annual harvest guideline for all "other fish," which includes sharks, skates, ratfish, morids, grenadiers, kelp greenling, and some other groundfish species. This harvest guideline is reduced by a precautionary adjustment of 50 percent from the acceptable biological catch (ABC). Table 1.3.1 lists landings (round weight equivalent in metric tons) for various sharks from fisheries off California, Oregon, and Washington from 1992 through 2003.

Table 1.3.1 Shark Landings (mt) for California, Oregon, and Washington, 1992-2003, Organized by Species Group. Source: NWFSC fishticket data and the Pacific States Marine Fisheries Commission, PacFIN Database, Report # 307, September 2004, www.psmfc.org/pacfin/data .

Species Name	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Bigeye thresher shark	22	44	37	31	20	32	11	6	5	2	--	5
Blue shark	1	<1	12	5	1	1	3	<1	1	2	42	1
Common thresher shark	292	276	330	270	319	320	361	320	295	373	301	294
Leopard shark	19	24	11	10	8	11	15	14	13	12	13	10
Other shark	8	12	4	1	2	3	5	6	5	38	4	20
Pelagic thresher shark	<1	<1	0	5	1	35	2	10	3	2	2	4
Shortfin mako	142	122	128	95	96	132	100	63	80	46	82	69
Soupfin shark	46	40	55	44	65	63	54	75	48	45	32	35
Spiny dogfish	1,100	1,270	1,392	367	249	425	462	514	624	564	875	447
Unspecified shark	6	5	6	16	5	7	7	13	6	3	4	3
Pacific angel shark	112	61	21	18	16	31	50	48	34	28	22	17

North Pacific Fishery Management Council (NPFMC)

The NPFMC (Council) 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 of slight economic value and are not generally targeted. The category includes sharks, skates, octopi, and sculpins in the BSAI and sharks, octopi, squid, and sculpins 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. Aggregate catch of the whole category must be recorded and reported. In the BSAI a survey is conducted biannually for the "other species" category, most recently in 2004. The BSAI Plan Team recommends to the Council annually OFL (overfishing level) and ABC (Allowable Biological Catch) amounts for the "other species" category based on the best available and most

recent scientific information. The Council recommends Total Allowable Catch (TAC) levels for "other species" in the BSAI. In the GOA assessments for the "other species" category are not conducted, thus the GOA Plan Team does not recommend OFL and ABC amounts for the "other species" category in the GOA. The annual TAC for the "other species" category in the GOA is set by regulation at 5 percent of the sum of all other TACs established for assessed species.

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 in season by NMFS. Sharks are the only group in the complex consistently identified to species in catches by fishery observers. Most of the shark incidental catch 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. The most recent estimates of the incidental catch of sharks in the North Pacific are from 2004. These data are included for the BSAI and GOA in Appendix C to the November 2004 SAFE report. Estimates of the incidental catch of sharks in the GOA and BSAI groundfish fisheries from 1997-2001 have ranged from 850-2,390 metric tons (mt) and 370-760 mt, respectively. In the Gulf of Alaska incidental catch of sharks in 2001 totaled 853 metric tons (down from 1,118 metric tons in 2000) and incidental catch of skates in 2001 totaled 1,828 metric tons (down from 3,238 metric tons in 2000). In the Bering Sea and Aleutian Islands Area incidental catch of sharks in 2001 totaled 763 metric tons (up from 590 metric tons in 2000) and incidental catch of skates in 2001 totaled 20,570 metric tons (up from 18,876 metric tons in 2000). Due to limited catch reports on individual species and larger taxonomic groups in the "other species" category estimates of the incidental catch of sharks in the BSAI and GOA are largely based on NMFS survey results and observer data.

The recreational/sport fishery consists almost entirely of spiny dogfish, salmon shark, and Pacific sleeper shark. No current reports of sport-caught sharks being finned and discarded were reported. The total estimated number of sharks harvested in the sport fishery in Southeast and South Central Alaska was 979 in 2001 (up from 753 in 2000). No sport harvest of sharks was reported in the Arctic-Yukon-Kuskokwim region. In state waters, Alaska Department of Fish and Game (ADF&G) has imposed a severe bag limit on sport caught sharks and expressly forbid the finning of sharks. To commercially target sharks in state waters, fishermen must obtain a special permit from Alaska's Commissioner of Fish and Game. To date, no special permits have been issued by the state to commercially fish for sharks.

The following comes from the summary for the November 2004 Shark Appendix to the SAFE report, sharks in the Gulf of Alaska, Eastern Bering Sea, and Aleutians:

There is no evidence to suggest overfishing is occurring for any shark species in the GOA or BSAI. There are no directed commercial fisheries for shark species in federal or state managed waters of the GOA or BSAI and most incidentally captured sharks are not retained. Spiny

dogfish are allowed to be retained as incidental catch in some ADF&G managed salmon fisheries, and salmon sharks are targeted in some ADF&G managed sport fisheries. Incidental catches of shark species in the GOA and BSAI fisheries have been very small compared to catch rates of target species. Preliminary comparisons of incidental catch estimates with available biomass estimates suggest current levels of incidental catches are low relative to available biomass for spiny dogfish and Pacific sleeper sharks in the GOA and for Pacific sleeper sharks in the BSAI. There is also an increasing trend in bottom trawl survey biomass estimation (used here as an index of relative abundance) for Pacific sleeper sharks and perhaps for spiny dogfish in the GOA. An independent analysis of NMFS AFSC bottom trawl surveys in the GOA also found Pacific sleeper shark abundance had significantly increased in the Central GOA during 1984 - 1996. Salmon sharks are rarely captured in the GOA and BSAI in either the fishery or the bottom trawl surveys. However, a recent demographic analysis suggests salmon shark populations in the eastern and western North Pacific are stable at this time. Spiny dogfish are rarely captured in the BSAI in either the fishery or the bottom trawl surveys. Other shark species are rarely captured and incidental catches are not likely to play a significant role in their stock structure because catches were small and generally occurred near the edge of their ranges.

It should be clear from this assessment that data limitations are severe, and further investigation is necessary to be sure shark species are not adversely affected by groundfish fisheries. Salmon sharks in particular, and other less common pelagic sharks such as blue sharks, are not likely to be effectively sampled by bottom trawl surveys. In addition, the catchability of sharks in bottom trawl gear is unknown. Bottom trawl survey biomass estimates for shark species should be considered a relative index of abundance at best. If target fisheries develop for any shark species, effective management will be extremely difficult with the current limited information. Regardless of management decisions regarding TAC and the future structure for "other species" management category, it is essential to continue to improve shark species survey sampling and biological data collection to ensure their continued conservation through effective management.

Western Pacific Fishery Management Council (WPFMC)

In 1998, the WPFMC developed Amendment 9 to its Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region for the purpose of conserving and managing sharks in the western Pacific region. The amendment proposed an annual harvest guideline for blue sharks, a trip limit for non-blue sharks, prohibition on the use of bottom-longline gear to target sharks around the Hawaiian Islands, and re-designation of shark management unit species in the pelagics fishery management plan. A re-designation of shark management species was accomplished through implementation of Amendment 10 to the Pelagics FMP in conjunction with the Coral Reef Ecosystem FMP (69 FR 8336; February 24, 2004).

With the enactment of the Shark Finning Prohibition Act and implementing regulations, the WPFMC has been reevaluating the need for certain initially proposed management measures under Amendment 9, while continuing to monitor the impact of the ban on shark finning on the

Hawaii-based pelagic longline fishery. Amendment 9 has not yet been submitted to the Secretary for approval.

Shark catch by the Hawaii-based longline fishery peaked at 6.3 million pounds (28576.3 mt) in 1999 due, in large part, to the practice of finning blue sharks. Most recent landings data show shark catch remained low in 2002 at 390,000 pounds. The shark catch in 2001 and 2002 was not marketed as dried fins but as fresh shark fillets and steaks in supermarkets and restaurants. Fresh shark meat was also exported to the U.S. mainland.

The American Samoa Department of Marine and Wildlife Resources (DMWR) reports catch data from commercial and recreational fishing to the Western Pacific Fishery Information Network (WPacFIN). These data, (taken from the WPacFIN website), indicate in 2003, a reported 10,968 sharks were caught in American Samoan fisheries. Of this total number, the majority (71 percent) were blue sharks, followed by white-tip, other sharks, thresher, and mako sharks. The total number of sharks reported in 2003 was up slightly from 2002's catch of 10,539 however, this is a great increase from prior years with 2001's reported catch of 3,690 and 2000's reported catch of 497.

Table 1.3.2 Pacific Sharks in the Pelagic Management Unit by Species (as amended in March 2004)

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

1.4 NMFS Enforcement Actions Pertaining to the Shark Finning Prohibition Act

During 2003 and 2004, NMFS agents continued to investigate several actions involving the finning of sharks, or the illegal offload of shark fins in U.S. ports. The NOAA Office of General Counsel for Enforcement and Litigation has instituted several enforcement actions for violations of the Shark Finning Prohibition Act (SFPA). The most significant cases during this period were:

- In August 2002, the U.S. Coast Guard intercepted the Honolulu-based vessel, King Diamond II, and seized 32 tons of shark fins for unlawful possession of fins by a U.S. fishing vessel under the Shark Finning Prohibition Act. The King Diamond II had received the fins from 25 Korean-flagged longline fishing vessels and one transshipment vessel in various locations throughout the Central Pacific. NOAA Fisheries Special Agents took possession of the fins and conducted an investigation. NOAA General Counsel and the U.S. Department of Justice pursued a forfeiture action for the value of the fins ($775,000) and NOAA issued a civil penalty for $620,000 against the vessel owner and crew for the violations of the SFPA. On January 19, 2005, the U.S. District Court in San Diego, CA, ruled on a separate, but related, issue to the forfeiture action regarding the definition of "fishing vessel" under the SFPA. The court upheld NOAA's assertion that a US-flagged vessel that only purchased shark fins from another vessel was still a "fishing vessel" for purposes of the federal ban on possession of shark fins without the carcasses. In this case, the vessel KING DIAMOND II purchased over 60,000 pounds of shark fins on the high seas from foreign fishing vessels for subsequent sale, presumably in Asian markets where shark fins are a delicacy. This ruling will aid NOAA in its efforts to protect sharks from being overfished.

- In July 2004, in Guam, two crew members of a foreign-flagged fishing vessel arrested by an OLE special agent, pleaded guilty in U.S. District Court on September 7, 2004, to violations of the SFPA and the Lacey Act. This is the first United States arrest, charge, and conviction for federal criminal violations of the Lacey Act, with underlying violations of the SFPA, since the shark finning ban was implemented in 2002. The crew of a Japanese-flagged fishing vessel, illegally offloaded approximately 520 pieces of shark fins from their fishing vessel while in Apra Harbor, Guam, on July 13, 2004. With their guilty pleas, the crew members, admitted they attempted to smuggle the shark fins out of the port in Guam in an attempt to transport the shark fins to the Philippines where they would be sold. The Shark Finning Prohibition Act makes it illegal for a foreign vessel to offload any shark fins into a U.S. port, unless they offload the rest of the shark carcass with the fins. This Act is aimed at drastically reducing the number of sharks finned and carcasses discarded at sea. In this case, fins were off loaded illegally in the U.S. In December 2004, the defendants were sentenced to 146 days in custody (time served) and were then deported.

- In November 2004, NMFS OLE investigated a case involving a foreign fishing vessel in Guam that failed to weigh the amount of fins/carcasses being offloaded to determine

compliance with the 5% ratio required by the Shark Finning Prohibition Act. This case has been referred to the NOAA Office of General Counsel for enforcement action.

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

Summaries of U.S. imports and exports of shark fins in Tables 2.1 and 2.2 are based on information submitted by importers and exporters to the U.S. Customs and Border Protection Data, and U.S. Census Bureau as reported in the National Marine Fisheries Service Trade database. Data for 2004 were available only from January through July. Data are provided for the same period in 2002 and 2003 for purposes of comparison. Exports of shark fins far exceed imports of shark fins in both weight and value. In 2003, imports declined in both weight and value from those of 2002, however, in 2004, import amount and values increased due to the addition of imports from Panama commanding an average of nearly $39.00 per kilo. In 2004, during the period from January to July, exports of shark fins continued to decline slightly in weight, compared with the same time period in 2003.

2.1 Imports of Shark Fins

Most imports of shark 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 2003, countries of origin in order of importance were India, Hong Kong, Australia, Vietnam, Argentina, and with lesser amounts from Taiwan and Brazil (see Table(s) 2.1). It should be noted, 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.

Table 2.1.1 Weight and Value of Shark Fins Imported into the United States, by Country of Origin (Source: U.S. Customs and Border Protection Data and U.S. Census Bureau)

U.S. Imports of Shark Fins Dried 2003		
Country	**Kilos (lbs)**	**Value**
ARGENTINA	450 (992)	$7,425
AUSTRALIA	475 (1,047)	$9,675
BRAZIL	353 (778)	$2,001
CHINA - HONG KONG	1,157 (2,551)	$41,017
PHILIPPINES	998 (2,200)	$3,383

INDIA	5,686 (12,535)	$30,000
VIETNAM	1,918 (4,228)	$11,849
TAIWAN	200 (441)	$4,796
Total: SHARK FINS DRIED	**11,237 (24,773)**	**$110,146**

Table 2.1.2 Weight and Value of Shark Fins Imported into the United States, by Country of Origin from January to July each year, 2002 through 2004 (Source: U.S. Customs and Border Protection Data and U.S. Census Bureau)

U.S. Imports of Shark Fins Dried (January to July) 2002 to 2004

Country	2002 Kilos	2002 Value	2003 Kilos	2003 Value	2004 Kilos	2004 Value
ARGENTINA	0	$0	450	$7,425	0	$0
AUSTRALIA	1,018	$12,232	475	$9,675	28	$2,592
BANGLADESH	52	$5,303	0	$0	0	$0
BRAZIL	0	$0	353	$2,001	0	$0
CANADA	375	$35,114	0	$0	0	$0
CHINA	3,566	$88,142	0	$0	0	$0
CHINA - HONG KONG	1,036	$47,835	453	$10,677	712	$26,513
INDIA	1,872	$9,167	5,686	$30,000	2,808	$16,500
JAPAN	1,100	$86,964	0	$0	0	$0
MADAGASCAR	190	$7,441	0	$0	0	$0
MEXICO	2,760	$34,370	0	$0	0	$0
NAMIBIA	130	$7,450	0	$0	0	$0
PANAMA	0	$0	0	$0	4,119	$160,034
SINGAPORE	318	$16,095	0	$0	0	$0
TAIWAN	0	$0	200	$4,796	0	$0
VIET NAM	0	$0	50	$7,500	551	$10,767
Total: SHARK FINS DRIED	**12,417**	**$350,113**	**7,667**	**$72,074**	**8,218**	**$216,406**

2.2 Exports of Shark Fins

The vast majority of shark fins exported in 2003 were sent from the United States to: Hong Kong, Canada, Japan, Mexico, and Taiwan followed by Korea and Portugal (see Table 2.2.1).

Table 2.2.1 Weight and Value of Shark Fins Exported from the United States to Destinations (Source: U.S. Customs and Border Protection Data and U.S. Census Bureau).

U.S. Exports of Shark Fins Dried 2003		
Country	**Kilos (lbs)**	**Value**
CANADA	4,723 (10,412)	$524,687
CHINA - HONG KONG	35,542 (78,357)	$3,382,851
CHINA - TAIPEI	1,041 (2,295)	$52,947
JAPAN	2,447 (5,395)	$42,150
MEXICO	1,334 (2,941)	$9,702
PORTUGAL	97 (214)	$3,029
SOUTH KOREA	809 (1,784)	$22,400
Total: SHARK FINS DRIED	**45,993 (101,397)**	**$4,037,766**

Table 2.2.2 Weight and Value of Shark Fins Exported from the United States to Destinations from January to July each year, 2002 through 2004 (Source: U.S. Customs and Border Protection Data and U.S. Census Bureau).

U.S. Exports of Shark Fins Dried (January to July) 2002 to 2004						
Country	**2002 Kilos**	**2002 Value**	**2003 Kilos**	**2003 Value**	**2004 Kilos**	**2004 Value**
CANADA	34,461	$213,386	2,647	$285,969	1,515	$169,663
CHINA - HONG KONG	22,824	$1,635,863	16,194	$1,359,892	12,842	$1,003,461
JAPAN	500	$8,925	0	$0	0	$0
MEXICO	7,889	$55,120	1,334	$9,702	0	$0
PORTUGAL	0	$0	97	$3,029	0	$0
SOUTH KOREA	12,939	$28,525	809	$22,400	0	$0
TAIWAN	3,100	$18,283	361	$18,299	1,359	$69,292
Total: SHARK FINS DRIED	**81,713**	**$1,960,102**	**21,442**	**$1,699,291**	**15,716**	**$1,242,416**

In 2004, quantity and value of shark fin exports decreased by 5,726 kilos (5.7 mt) and $456,875 from the same time period in 2003 (see Table 2.2.2). The mean value per kilo has increased a substantial amount, however, from 2002, most notably in the Hong Kong market. Using data from Table 2.2.2, mean values of dried shark fins, for all countries combined, increased from approximately $24/kilo in 2002, to approximately $79/kilo in 2003 and 2004. Hong Kong's significantly higher dollar value to quantity, as compared to shark fin trade with other countries, is associated with the higher quality demanded in Hong Kong's inelastic market, and historically high consumption patterns based on ethnic food consumption behavior patterns.

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 Shark Finning Prohibition Act. Discussions have focused on possible bilateral, multilateral, and regional agreements with other nations. The law calls for the United States to pursue an international ban on shark finning and to advocate improved data collection (including biological data, stock abundance, 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 to decrease the incidence of finning worldwide.

3.1 Bilateral Efforts

In 2004, NMFS participated in bilateral discussions with Canada, Chile, the European Union, Iceland, Japan, Mexico, and Russia, which included the implementation of the Shark Finning Prohibition Act. Emphasis in these bilateral contacts has been on the collection and exchange of information, including requests for data such as shark and shark fin landings, transshipping activities, and the value of trade. In addition, the United States 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).

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 supporting the conservation of sharks include a number of regional fishery management organizations. Table 3.2 lists these regional fishery management organizations and regional programs, some with multilateral efforts.

Table 3.2 Regional Fishery Management Organizations and Programs

Northwest Atlantic Fisheries Organization (NAFO)
Inter-American Tropical Tunas Commission (IATTC)
International Commission for the Conservation of Atlantic Tunas (ICCAT)
Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific (WCPFC)
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)
International Council for the Exploration of the Sea (ICES)
Asia Pacific Economic Cooperation Forum (APEC) and the Convention on Migratory Species
North Pacific Interim Scientific Committee for Tuna and Tuna-like Species (ISC)
Sub-Saharan Africa
Department of State Regional Environmental Hub Program

Of the list in Table 3.2, the activities or planning of three organizations are discussed below as a supplement to last year's report to Congress.

3.2.1 North Atlantic Fisheries Organization (NAFO)

At its 26th Annual Meeting in September 2004, the NAFO Fisheries Commission became the first regional fisheries management organization in the world to establish a catch limit for a directed elasmobranch fishery. For each of the year's 2005-2007, the total allowable catch (TAC) for skates in Division 3LNO (the "nose" and "tail" of the Grand Bank) will be 13,500 metric tons. This TAC was higher than the United States had supported, but the U.S. delegation joined the consensus of which this measure was a part.

3.2.2 Inter-American Tropical Tunas Commission (IATTC)

At its 66th meeting in June 2000, the IATTC agreed 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. In each subsequent year to date, the IATTC has reaffirmed and strengthened this action. Member nations (including the United States through regulations) are implementing this recommendation, which originally was to carry through 2002 but has been extended to run through 2004.

The United States also participated in the effort leading to adoption, in 2003, of a revised IATTC convention to incorporate current agreements and principles associated with international fisheries management. NMFS supported the Department of State's efforts to ensure the species covered under the convention would include sharks and other species associated with tuna.

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

In 2000, the Standing Committee on Research and Statistics (SCRS) recommended ICCAT take the lead in conducting stock assessments for Atlantic porbeagle, *Lamna nasus*, blue, *Prionace glauca*, and mako, *Isurus oxyrinchus,* sharks. The SCRS 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). The working group suggested the focus of a future assessment be on stocks not assessed elsewhere, such as blue sharks and shortfin mako sharks.

In 2001, ICCAT adopted a non-binding resolution for sharks. The resolution includes measures for improved data collection for pelagic sharks, specifically, submission of all catch and effort data, including dead discard estimates, for porbeagle, shortfin mako, and blue sharks. The proposal also formally directed scientific stock assessments for shortfin mako and blue sharks (assessment of porbeagle was being undertaken by another organization) be conducted in 2004. Other measures provided for the release of incidentally caught live sharks, minimization of waste and discards, and a voluntary stay on fishing effort targeting porbeagle, shortfin mako and blue sharks until sustainable levels of harvest can be determined through stock assessments.

At the 2003 annual meeting, Japan introduced a resolution with four components to be required by all ICCAT parties:

1. Provide the Bycatch Working Group with information on sharks catches, effort by gear type, landings and trade of shark products;
2. Fully implement a NPOA in accordance with the IPOA for the Conservation and Management of Sharks adopted by FAO;
3. Deter, to the extent possible under domestic law, their residents from being engaged in or associated with the rapid expansion of the shark fishery by the use of flag-of-convenience vessels; and
4. Prevent rapid expansion of their shark fisheries in the Convention area.

The resolution was adopted, without paragraphs 3 and 4 (Res 03-10). Also at the 2003 meeting, Japan requested Taiwan provide the SCRS with information regarding their shark fishing activities in the Caribbean. This request was supported by the United States and Brazil.

In June 2004, the Subcommittee on Bycatch conducted stock assessments for shortfin mako and blue sharks. The activities of the subcommittee included a review of shortfin mako and blue shark biology and catch data, a description of the fisheries, analyses of the current status of the stocks and their outlook. The limited submissions of shark statistics indicated the overall volume of catch reported to ICCAT is not representative of the total removals. The size-, age-, and sex-composition of the reported removals were also very limited. Furthermore, a recent study using shark fin trade to produce annual estimates of the number and biomass of sharks represented in the global fin trade based on data from 1999-2001 suggested much higher shark landings as compared to the data submitted to ICCAT. While estimates from this study were not used in the assessment, they did confirm the need for the SCRS to construct a more accurate picture of shark catch and mortality in the Atlantic tuna fleets to use in future model applications.

Due to the uncertainty associated with the catch estimates, results from the model applications are considered very provisional. The results of the assessment for North and South Atlantic blue sharks suggest the current biomass is above the biomass at MSY. This result was considered highly conditional on the assumptions made, and could have shown a current stock level well below biomass at MSY if historic catches were actually higher than estimated by the working group. The results of the assessment for North Atlantic shortfin mako suggest some level of stock depletion and the SCRS could not rule out the possibility of the current stock being below biomass at MSY and possible depletions of fifty percent or more. For South Atlantic shortfin mako, the results suggest the stock may have decreased since 1971, but the magnitude of the decline appears less than in the North Atlantic.

The working group made a number of recommendations on shark statistics and research. The main recommendation suggests there is insufficient infrastructure dedicated to monitoring sharks and as such, improvement in the advice on the status of shark species requires larger monitoring and research investments by the Parties. Other research recommendations included: a) more research into stock assessment methodologies fully utilizing the available data, including data from tagging studies; (b) better use of historic effort patterns from the tuna fisheries; (c) provision of standardized CPUE patterns from major fishing fleets, (d) broader use of trade statistics (fins, etc.) and historic measures of relative abundance to extend the historical time series of estimates of removals; and (e) additional research on biological and stock characteristics. The Group also stressed the importance of regular participation from all major fishing nations (i.e. EC-Spain and EC-Portugal) during future assessments and other evaluations.

This year was highlighted by passage of a significant agreement marking the first time ICCAT has exerted management authority over sharks. In October 2004, the Chairman of ICCAT, Masa Miyahara of Japan, identified the issue of Pelagic Sharks on a list of priorities for the Commission, thus providing an opening for further discussion of shark conservation and

management. The United States hosted the 14th Special Meeting of ICCAT, November 15-21, 2004, in New Orleans, Louisiana. Adopting management measures for sharks was one of the priority positions for the United States at this meeting. The United States introduced a joint shark proposal, sponsored by Canada, the European Community, Japan, Mexico, Panama, South Africa, Trinidad and Tobago, and Venezuela, requiring full utilization of shark catches and prohibiting vessels in ICCAT fisheries from retaining on board, transshipping, or landing any shark fins that are harvested in contravention of the recommendation. Brazil and Namibia also expressed their strong support. On the final day of the meeting, this binding recommendation was adopted with consensus among all ICCAT members (representing a total of 63 nations).

The approved measure, requiring full utilization of shark catches, mandates fishermen retain all parts of the shark except the head, guts, and skins to the point of first landing. Countries are required to ensure their vessels retain onboard fins totalling no more than 5 percent of the weight of sharks onboard up to the first point of landing. Parties not requiring fins and carcasses to be offloaded together at the point of first landing must ensure compliance with the ratio through certification, monitoring, or other means. These requirements, which parallel current U.S. law, are significant because they provide the means to enforce the prohibition on finning even when there are no fishery observers aboard the vessel.

The 2004 agreement also (1) establishes requirements for data collection on catches of sharks, (2) calls for research on shark nursery areas, and (3) encourages the release of live sharks, especially juveniles. The SCRS will review the stock assessment of shortfin mako sharks in 2005 and also provide scientific advice on the 5 percent fin-to-body ratio. The Commission may consider additional management measures in 2005. In addition, the status of blue shark and shortfin mako shark populations will be reassessed by the SCRS no later than 2007.

ICCAT adopted this historic measure just days after the United Nations General Assembly passed a resolution urging nations to work together through regional fishery management organizations such as ICCAT to manage sharks. While the United States has already implemented a ban on finning domestically, the ICCAT agreement will require other countries fishing in the Atlantic Ocean and Mediterranean Sea to take similar measures.

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

The APEC Fisheries Working Group (FWG) sponsored a workshop on shark conservation and management in Mexico on December 3-6, 2002. This workshop produced recommendations on steps to reduce waste of sharks, improve data collection, improve national and regional management, and better implement the FAO IPOA on Sharks. In an effort to assist APEC FWG Economies in implementing these recommendations, the FWG (with NGO and academic assistance) has produced a Technical Manual on Elasmobranch Fisheries Management Techniques. In addition, work on shark conservation and management continues through planned workshops focusing on policy makers and fisheries managers in economies in Latin

America. These workshops will seek to assist countries in implementing effective management of their elasmobranch fisheries and facilitate implementation of the FAO International Plan of Action for the Conservation and Management of Sharks.

3.3 Multilateral Efforts

The U.S. Government will also continue to work within multilateral fora to facilitate shark research, monitoring, and management initiatives, as appropriate. Table 3.3 lists these multilateral fora.

Table 3.3 Other Multilateral Fora

Food and Agriculture Organization of the United Nations (FAO) Committee on Fisheries (COFI)
International Union for Conservation of Nature and Natural Resources (IUCN)
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
World Summit on Sustainable Development (WSSD)
United Nations General Assembly (UNGA)

Of the list in Table 3.3, the activities or planning of four organizations are discussed below as a supplement to last year's Report to Congress.

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

NMFS prepared and submitted a major status report on the implementation of its National Plan of Action for the Conservation and Management of Sharks (NPOA) to the February 2003 meeting of COFI.

3.3.2 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

At the 13th meeting of the Conference of the Parties (CoP13), Australia and Madagascar proposed to include the great white shark, *Carcharodon carcharias*, in Appendix II, including an annotation stating a zero annual export quota be established. Prior, at CoP11, a proposal to include the great white shark, *Carcharodon carcharias*, in Appendix I was submitted by Australia and the United States of America. This proposal was amended at CoP11 to include the

species in Appendix II, but was rejected. Australia subsequently listed this species in Appendix III in October, 2001.

In 2002, CITES listed two shark species in Appendix II-whale shark, *Rhincodon typus,* and basking sharks, *Cetorhinus maximus*. The United States supported these proposals because it believes 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. In 2004, CITES adopted a proposal to list the great white shark on Appendix II. In addition, the United States supports proposed CITES resolutions encouraging continued monitoring of the FAO Shark IPOA process and further FAO/CITES coordination on sharks.

3.3.3 United Nations General Assembly (UNGA)

On November 24, 2003, the UNGA adopted by consensus a resolution on "Oceans and the Law of the Sea: Sustainable Fisheries, including through the 1995 Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks, and related instruments." The resolution, strongly supported by the United States, includes important provisions to encourage shark conservation and discourage finning. It calls for: the implementation of the FAO International Plan of Action for Sharks, including through the implementation of NPOAs; ensuring the conservation and management of sharks and their long-term sustainable use, including banning directed shark fisheries conducted solely for the purpose of harvesting shark fins and taking measures for other fisheries to minimize waste and discards from shark catches and encouraging full use of dead sharks; providing assistance to developing states so they can address shark conservation needs; and inviting the FAO to prepare a study of the impact on shark populations of shark catches from directed and non-directed fisheries, on ecologically related species, and to update its 1999 FAO Technical Paper 389 on shark utilization, marketing and trade.

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

At its 2004 World Congress in Bangkok, Thailand, IUCN – the World Conservation Union, made up of over 1000 governmental and non-governmental organizations from over 140 countries adopted a recommendation urging all states to ban shark finning and require shark fins to be landed attached to their bodies. The United Nations estimates over 100 million sharks are killed each year and studies show shark populations have declined by 90 percent around the world in the last 50 years. The IUCN's shark specialist group hopes the recommendation will encourage governments and organizations around the world to consider this, and related policies of CITES, when adopting national and regional programs for the conservation and sustainable management of sharks.

4. NMFS Research on Sharks

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

Pacific Islands Fisheries Science Center (PIFSC), Honolulu Laboratory

Data Collection and Quality Control: Market data from the shoreside sampling program contains detailed biological and economic information on the Hawaii-based longline fishery since 1987. These data are primarily collected from the United Fishing Agency (UFA), a public fish auction on Oahu, which handles nearly 100 percent of the longline catch sales. The State of Hawaii now classifies the UFA as a dealer and requires it to submit sales/transaction data to the State. The UFA has been providing near complete electronic submission of the market data since 2001. Other dealers in Hawaii are also required to report to the state. The Western Pacific Fishery Information Network (WPacFIN) is a federal and state partnership collecting, processing, analyzing, sharing, and managing fisheries data from American island territories and states in the Western Pacific. Within WPacFIN's data collection, over 100 dealers report monthly and 10 of the largest seafood dealers in Hawaii are utilizing electronic means to file their reports in a timely and efficient manner. The WPacFIN program has also assisted other U.S. island's fisheries agencies in American Samoa, Guam, and the Northern Mariana Islands to modify their data collecting procedures to collect bycatch information documenting more shark interactions with fishing gear.

For several years, the Hawaii Longline Observer Program has collected tissue samples from pelagic and common thresher and longfin mako in support of NMFS' Southwest Region research to identify stocks and better understand basic shark biology and movement. Shortfin mako was recently added.

Insular Shark Surveys: Densities of insular sharks have been estimated at most of the U.S. island possessions within the tropical central, Northern and Equatorial Pacific on (bi-) annual surveys since the year 2000. These include the ten major shallow reefs in the Northwestern Hawaiian Islands (NWHI) within the Hawaiian Archipelago (2000, 2001, 2002, 2003, 2004); the Pacific Islands Remote Island Areas (PRIAs) of Howland and Baker in the Phoenix Islands and Jarvis Island, and Palmyra and Kingman Atolls in the Line Islands (2000, 2001, 2002, 2004); and American Samoa including Rose Atoll and Swains Reef (2002, 2004). Similar surveys at Guam, the Commonwealth of the Northern Marianas Islands (CNMI), and Johnston Atoll in the Line Islands were conducted during Summer 2003 and Winter 2004, respectively. To date, the surveys have established that: (1) shark stocks appear healthy at most reefs in the NWHI and PRIAs, and (2) shark stocks are noticeably sparse and small-bodied at most reefs in American Samoa and the southern Marianas Archipelago.

The most significant result to date relating to sharks at Pacific Island reefs has been the contrast in densities of sharks and other large-bodied apex predator fishes between the largely unfished NWHI and the heavily fished Main Hawaiian Islands (MHI). Surveys conducted in the NWHI and MHI during 2000 encountered apex predator stocks averaging 100-fold less dense in the MHI

(Friedlander AM and EE DeMartini. 2002. Contrasts in density, size, and biomass of reef fishes between the northwestern and the main Hawaiian Islands: the effects of fishing down apex predators. Marine Ecology Progress Series 230:253-264). Observations made in the NWHI during 2001-2004 have generally affirmed the greater abundances of sharks and other apex predators in the NWHI relative to the MHI.

In the Marianas Archipelago, sharks were found to be more than an order of magnitude less dense around the southern inhabited islands (e.g., Guam, Saipan), compared to the remote northern most islands (Schroeder, et al. Submitted. Status of fishery target species on coral reefs of the Marianas Archipelago. 10 ICRS, Okinawa, 2004).

Stock Assessment of Pelagic Sharks: Pelagic shark stock assessment work was initiated in the year 2000 as a collaborative effort with scientists at the National Research Institute for Far Seas Fisheries (NRIFSF). A report was produced (Kleiber, P., Y. Takeuchi, and H. Nakano. 2001. Calculation of plausible maximum sustainable yield (MSY) for blue sharks (*Prionace glauca*) in the North Pacific. Southwest Fisheries Science Center, Admin. Rep. H-01-02. 10p.), however, was not published in the peer reviewed literature. The report indicated the stock was not being overfished. PIFSC and NRIFSF scientists are renewing the collaboration to update the blue shark assessment with input of the latest Japanese and Hawaiian longline fishery data, as well as input of better estimates of Taiwanese and Korean catch and effort data. They hope to use information from the foreign shark fin trade to improve the quality of the catch estimates being used in the assessment, and to publish the results. In addition to updating the blue shark assessment, the hope is to conduct assessments on other shark species and to broaden the geographic scope to the whole of the Pacific.

Southwest Fisheries Science Center (SWFSC, La Jolla)

Juvenile Shark Survey: The 2004 shark survey was completed July 7, 2004. One to three fishing sets were conducted during each day. A total of 6,692 hooks were fished at the 38 sampling stations. Captured sharks were tagged with conventional spaghetti tags, satellite transmitting tags and tetracycline. Catch included 88 mako, 127 blue, 2 common thresher shark and 59 pelagic rays. The preliminary data indicate the overall catch rate was 0.399 per 100 hook-hours for mako and 0.499 per 100 hook-hours for blue sharks. The catch per-unit effort (CPUE) for mako was slightly higher than 2003 but continues a declining trend. The CPUE for blue sharks was slightly lower than in 2003 and also continues a declining trend.

In addition, 62 sharks were tagged with conventional tags for movement data, 61 marked with oxytetracycline (OTC) for age and growth studies, and 74 DNA samples were collected. Three adult blue sharks were tagged with a total of 6 satellite archival tags in a cooperative Tagging of Pacific Pelagics (TOPP) project to define the physical habitat of Pacific blue sharks. Four satellite pop up tags and 9 satellite transmitter tags were deployed on 10 individual mako sharks in a continuing series of habitat, migration and condition studies. Two common thresher sharks were also tagged with satellite pop up and transmitter tags. Early results indicate blue and mako sharks

surface briefly and data transmissions are providing temperature and location data. Five pelagic rays were collected by UCLA graduate students for age and growth studies. Monterey Bay Aquarium staff tested a new transport system designed to move live mako sharks to the Monterey Bay Aquarium for display purposes.

Essential Fish Habitat (EFH) and Pup Abundance Survey of Common Thresher Shark: Like many other sharks, the pups of the common thresher are found in nearshore waters. Such waters are Essential Fish Habitat for this shark, but the extent of this habitat is poorly defined. The purpose of this EFH/Pup Abundance survey is to (1) determine the continuity of thresher pup distribution along the Southern California Bight coast, and (2) to develop a pup abundance index. The first (pilot study) surveys were completed in September 2004. Sampling took place in inshore waters out to 200 fathoms from Point Conception south to San Diego, California, with many juvenile thresher sharks tagged and released, some with archival tags to record physical habitat preferences. Preliminary results of depth-stratified sampling indicate juvenile common thresher sharks prefer shallow water less than 25 fathoms deep.

Shark Feeding Habits: A new study has been completed comparing the common thresher shark's feeding during El Niño (1998-1999) and La Niña (1999-2000) conditions. This work, soon to be published in California Cooperative Oceanic Fisheries Investigations (CalCOFI) Reports, showed species comprising the threshers diet became more diversified in the warm water years as the production of preferred prey declined. A new feeding study was begun, which will compare the diets of shortfin mako, blue, and common thresher shark when these species co-occur together off the U.S. West Coast.

Leopard Shark <u>In Situ</u> Mating Behavior Described: In August 2003, mating behavior was observed in an aggregation of leopard sharks near the surf zone along a sandy beach in La Jolla, California. A resulting paper will provide the first documented observations of leopard sharks mating in the wild. Just as muddy bays, estuaries and sloughs serve as important habitat for this species in northern California, shallow, surf-protected areas along sandy beaches and coves may be similarly important to leopard sharks in Southern California for feeding, pupping, and mating.

Mako Aging: Marking of shortfin mako with tetracycline continues during the annual Juvenile Shark Survey. Recaptures will help validate the age-length relationship determined from examination of vertebrae. Accurate aging is essential for understanding this shark's productivity and resilience to exploitation. The capture locations of the specimens examined indicate a widespread ocean distribution of both juveniles and adults.

Harvest Guidelines for West Coast Common Thresher and Shortfin Mako Sharks: The SWFSC, working with the Pacific Fishery Management Council, estimates that 340 and 150 metric tons (round weight) of common thresher and shortfin mako, respectively, are precautionary harvest guidelines. In 2005, these guidelines and catch trends will be re-examined as part of the Pacific Council's periodic Stock Assessment and Fishery Evaluation (SAFE) process.

Ocean Explorations: Eastern Tropical Pacific (ETP) Pelagic Shark Cruise: The ETP Shark Cruise departed Acapulco Sept 21, 2004, and began fishing outside Mexico′s EEZ on Sept 22. The cruise plan was to travel roughly southwest toward Clipperton Island then north, fishing during the day and transiting during the night. Night transits covered roughly 100-120 miles and followed a stair-step pattern of alternate latitudinal and longitudinal transits between stations. Typically two, 4-hour deployments of up to 150 hooks over 1.5 miles of longline were made per day. In all 30 sets were made with over 15,000 hook hours. The gear worked well and caught a wide variety of tropical species with almost no mortality of target fish species and no bycatch of turtles, marine mammals or birds. Circle hooks and mackerel were used in accordance with NOAA′s bycatch reduction guidelines. Catch included silky, oceanic whitetip and pelagic thresher sharks, sailfish, striped marlin, mahi, and black skipjack. A total of three oceanic whitetip and four silky sharks were equipped with one or both types of satellite transmitters (SPOT and PAT tags). Almost all animals were given a conventional NMFS tag, an oxytetracycline injection for aging studies, and tissue samples for DNA and tissue culture were taken. The handling platform worked flawlessly and provided a safe and secure working environment for the scientists and the sharks. Worries about heat and hooking stress in tropical sharks appeared to be unfounded and most animals came up in excellent condition after the four-hour soak.

On the negative side, and in keeping with indications from directed fisheries, incidental take by sportfishing camps, purse seine bycatch records, and studies in other parts of the worlds oceans: we experienced low catch rates and encountered mostly small animals, including neonates. No adult animals capable of spawning were encountered for either silky or whitetip in either longline or directed bait fishing. A total of 25 sharks were captured in 30 sets. There are many possible explanations for low catch rates, and this was at best a preliminary study, but it is worrisome given the effectiveness of the gear off California.

To date, two of the three SPOT tags placed on oceanic whitetips are transmitting and providing the first location information of this type for ocean whitetips. In summary, the system of longline fishing with subsequent handling on the shark platform appears to be a safe and effective means of gathering information on the biology and population status of pelagic sharks in the ETP. This cruise demonstrates the feasibility of integrating this type of survey into ongoing studies of pelagic ecosystems should opportunities and resources permit.

Northwest Fisheries Science Center (NWFSC)

The NWFSC conducts and supports several activities addressing the monitoring and assessment of sharks along the west coast of the United States and in Puget Sound. As noted above, PacFIN serves as a clearinghouse for commercial landings data including sharks. In addition, the West Coast Groundfish Observer Program collects data on discards of all shark species on vessels selected for coverage by the program.

The NWFSC conducts periodic trawl surveys of the west coast designed primarily for the purpose of acquiring abundance data for west coast groundfish stocks. The tonnages of all shark species collected during these surveys are documented. In addition, the survey program has conducted numerous special projects in recent years to assist researchers in acquiring data and samples necessary for research on shark species. Since 2002, the survey has collected biological data from spiny dogfish, including dorsal spines, which can be used to age the fish. Tissue samples were also collected as part of a special project in 2003. Biological data and tissue samples were collected from leopard sharks during 2004 as part of another project. Biological data and tissue samples were collected from cat sharks during the 2003 survey.

In addition to these monitoring activities, the NWFSC is supporting graduate research at the University of Washington to assess the abundance of spiny dogfish. The status of spiny dogfish in the NE Pacific is being assessed through integrated modeling using all available data sources. Both a single stock model and a metapopulation model including movement between subpopulations are being developed. The effect of movement of dogfish between the US and Canada on the level of sustainable catch is being examined. Alternative management strategies for this long-lived, late-maturing species are also considered.

Sixgill Shark Abundance Increases: For decades (at least) the sixgill shark (*Hexanchus griseus*) was rare in Puget Sound, but in recent years, this species has shown dramatic increases in abundance. It is now commonly seen throughout Puget Sound and surrounding environments, with juveniles frequently observed near beaches, swimming piers and other shallow habitats in the region. Sixgill sharks grow to a large size, up to 3.3−4 m (10-12 feet) when mature. Males are sexually mature at about 2.3 m in length and 182-273 kg (400-600 pounds). Clearly, these large predators have the potential to be a major re-structuring force in the dynamics of the Puget Sound ecosystem. NWFSC scientists, in collaboration with researchers from the University of Washington and Washington Department of Fish and Game, have commenced a project to investigate the causes and consequences of the extraordinary increase in sixgill sharks.

In this project we are addressing a number of inter-related questions: (1) What habitats are juvenile sixgill sharks using, and is the south Puget Sound Region (near Tacoma) a critical pupping ground? (2) What role do sixgill sharks play in Puget Sound food webs? What are the food web consequences of their rise in abundance? (3) What is the relationship between spiny dogfish (a declining species in Puget Sound) and sixgill sharks? Are sixgill sharks directly or indirectly responsible for the local demise of dogfish? This project will rely on longline samples taken throughout the Sound, with special emphasis in this first year on shallow areas in south and central Puget Sound, and in deep trenches in the San Juan Islands (where mature adults are thought to occur). Upon capture, biological data (genetic samples, blood samples, gut contents, length/weight) will be collected. Sharks will then be tagged with numbered external tags, and a subset of sharks will be tagged with acoustic tags. A network of >100 acoustic receivers (deployed by NWFSC, NWIFC, USACOE) will be strategically placed in constrictions in Puget Sound and allow us to track the movements of sharks across habitats and over time. Such data will be crucial in

understanding where, when and (in concert with diet data and blood samples for isotopic analyses) why sharks use specific habitats.

Alaska Fishery Science Center Auke Bay Laboratory

Shark Research and Assessments: Research efforts are focused on the collection of data to support stock assessments of shark species subject to incidental harvest in Alaskan waters, food habits studies of Pacific sleeper sharks and salmon sharks, and tagging and life history studies of Pacific sleeper sharks and spiny dogfish.

Stock Assessments of Shark Species Subject to Incidental Harvest in Alaskan Waters: The collection and interpretation of existing fisheries incidental catch data and fishery independent bottom trawl survey biomass data from the Gulf of Alaska, Eastern Bering Sea and Aleutian Islands was begun to support stock assessments for Pacific sleeper sharks, *Somniosus pacificus*, piked or spiny dogfish, *Squalus acanthias*, and salmon sharks, *Lamna ditropis*, which are the three shark species most likely to be encountered in Alaskan fisheries. This work will be summarized in an appendix to the 2004 Stock Assessment and Fishery Evaluation Report for 2005.

Anecdotal information and research data suggest Pacific sleeper shark abundance is increasing. Existing Pacific sleeper shark catches from fishery independent longline surveys in the Gulf of Alaska, Eastern Bering Sea, and Aleutian Islands were analyzed to determine the trend in abundance. Relative population numbers (RPN's) of sleeper sharks captured in the NMFS domestic sablefish longline survey appeared to have a significant increase between the years 1990 and 2003. A peer-reviewed manuscript of the study is being prepared and information from this study will be incorporated into the shark species stock assessment report.

Pacific Sleeper Shark Predation of Steller Sea Lions: In August 2001 and May 2002, scientists at the Auke Bay Laboratory investigated the diet of Pacific sleeper sharks to test the hypothesis that sleeper sharks prey on Steller sea lions, *Eumetopia jubatus*. One hundred ninety-eight stomach samples were collected. Predominant prey items were walleye pollock, octopus, unidentified teleost fish, Pacific salmon, and marine mammal tissue appearing to be from cetaceans. Stomach content analysis found no direct evidence of sea lion predation. In addition to the diet study, data on the vertical and geographic movement of sleeper sharks was collected by tagging for comparison with the vertical distribution of Steller sea lions. Thirty-three sleeper sharks were tagged with archival satellite tags designed to transmit depth data and location to polar orbiting Argos satellites. Data from 25 satellite tags have been recovered. Based on tag endpoint locations, the sharks typically moved less than 100 kilometers from the release locations. Archived depth data shows some sleeper sharks regularly traverse depths at rates over 200 meters per hour and sometimes come to the surface at night. Two manuscripts from the study have been submitted for peer review.

Salmon Shark Movements and Diet: During the summers of 1998-2001 scientists at the Auke Bay Laboratory investigated the movements and diet of salmon sharks aggregating in Prince William Sound (PWS), Alaska. During the study 246 salmon sharks were tagged with conventional (spaghetti) tags and 16 salmon sharks with satellite transmitters. Movement data from satellite tag transmissions and conventional tag recoveries provided insights into the seasonal residency and movement patterns of salmon sharks in PWS and the eastern North Pacific Ocean. Observations suggest salmon sharks are attracted by Pacific salmon, *Oncorhynchus spp*., runs returning to the streams and hatcheries in PWS during summer months. In PWS, large salmon shark aggregations peaked with salmon spawning migrations during July and August. As the summer salmon runs declined in late summer, the sharks dispersed. Some continued to forage in PWS and the Gulf of Alaska into autumn and winter months, while others underwent rapid migrations hundreds to thousands of kilometers toward the west coasts of Canada and the United States. Fifty percent of the sharks tracked by this study traveled long distances.

Adult Pacific salmon (pink, *Oncorhynchus gorbuscha*, chum, *Oncorhynchus keta*, and coho, *Oncorhynchus kisutch*) were the principal prey as measured by both percent number (35 percent) and percent weight (76 percent). Even when adult salmon were locally abundant, salmon sharks had a varied diet including squid, *Teuthoidea spp*., sablefish, *Anoplopoma fimbria*, Pacific herring, *Clupea pallasi*, rockfish, *Sebastes spp*., Eulachon, *Thaleichthes pacificus*, capelin, *Mallotus villosus*, spiny dogfish, *Squalus acanthias*, arrowtooth flounder, *Atheresthes stomias*, and cods, *Gadidae*. Salmon sharks consumed at least 263,000 kg of prey in Port Gravina during a 45 day period of peak salmon shark abundance in 2000. Assuming the sharks consumed equal proportions of pink and chum salmon by weight the sharks would have consumed 116,000 pink salmon and 36,000 chum salmon. Based on Alaska Department of Fish and Game estimates of salmon escapement and commercial harvest for Port Gravina in 2000, the sharks would have consumed 12 percent and 29 percent of the pink and chum salmon runs, respectively. A manuscript has been accepted for publication in the Journal of Fish Biology.

Electronic Archival and Sonic Tagging of Pacific Sleeper Sharks: Scientists at the Auke Bay Laboratory deployed 45 electronic archival tags and 23 acoustic transmitting tags on Pacific sleeper sharks in the upper Chatham Strait region of Southeast Alaska. The recovery of temperature, depth, and location data from the electronic tags will aid in the identification of Pacific sleeper shark habitat utilization and distribution in Southeast Alaska and identify the potential for interactions between Pacific sleeper sharks and other species in this region.

The electronic archival tags were externally mounted and record temperature and depth every 10 seconds for up to 5 years and can save the data in memory for up to 10 years. Pacific sleeper sharks are occasionally captured as bycatch in commercial longline fisheries for halibut and sablefish (a.k.a. blackcod). The Auke Bay Laboratory is offering a $200 reward for the return of the electronic archival tags from the commercial fishery and has alerted the Alaska Department of Fish and Game and Southeast Alaska commercial longline fishing organizations regarding the reward program. One tagged Pacific sleeper shark has been recaptured in the commercial fishery

within 30 nautical miles of the release location, unfortunately, the electronic tag was no longer attached to the animal and was not recovered.

The acoustic tags were surgically implanted and transmit location and depth every 10 seconds for up to one year. Data from the acoustic tags is recovered with hydrophones deployed from charter vessels. A total of 12 of the acoustically tagged Pacific sleeper sharks have been acoustically relocated within 30 nautical miles of release.

Electronic Archival and Life History Studies of Spiny Dogfish: A joint study was initiated by scientists at the Auke Bay Laboratory and the University of Alaska Fairbanks School of Fisheries and Ocean Sciences, Juneau Center to investigate the life history and ecological role of spiny dogfish in the North Pacific.

Spiny dogfish were captured for tagging and biological sampling from a 30' sport-fishing boat chartered for 3 days, July 27-29, 2004 in Yakutat Bay, Alaska. A total of 59 spiny dogfish were tagged and released. Electronic archival tags were surgically implanted in 37 spiny dogfish. A flourescent pink disc tag with the words "reward for tag inside fish" was attached to the first dorsal fin of each electronically tagged spiny dogfish. The Auke Bay Laboratory will be offering a $200 reward for the return of electronic archival tags from spiny dogfish. Twenty-two spiny dogfish were tagged only with externally attached modified disc tags. The modified disc tags were uniquely numbered on one side and had the Auke Bay laboratory address printed on the other side.

During the annual longline survey of the upper continental slope a total of 110 spiny dogfish were taken for biological sampling of age, maturity, and diet: 96 females (80 - 110 cm), and 22 males (80-90 cm). Age will be determined from dorsal spines. Maturity and diet were examined on the boat. Most (80 percent) of the spiny dogfish examined were immature. One female was pregnant with 8 very young embryos. Most stomachs were empty but the few items found suggest spiny dogfish in the Yakutat region are opportunistic predators with a high incidence of preying on invertebrates. Items found in stomachs in order of incidence of occurrence included several species of jellyfish, razor clams, shrimp/krill, and unidentified forage fish species.

Northeast Fisheries Science Center (NEFSC)

Fishery Independent Survey for Coastal Sharks: The bi-annual fishery independent survey of Atlantic large and small coastal sharks in U.S. waters from Florida to Delaware was conducted from April 19 to June 1, 2004. The goals of this survey are 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. Results from the 2004 survey included 557 sharks representing eight species caught on 69

longline sets. The time series of abundance indices from this survey are critical to the evaluation of coastal Atlantic shark species.

Age and Growth of Coastal and Pelagic Sharks: A comprehensive aging and validation study for the shortfin mako, *Isurus oxyrinchus*, continued in conjunction with scientists at Moss Landing Marine Laboratories, California using bomb carbon techniques. Additional validation studies were begun on the sandbar shark, *Carcharhinus plumbeus,* dusky shark, *Carcharhinus obscurus,* tiger shark, *Galeocerdo cuvieri*, and white shark, *Carcharodon carcharias*. Age and growth studies on the tiger shark (with scientists at the University of New Hampshire), thresher shark, *Alopias vulpinus* (with scientists at the University of Rhode Island), night shark, *Carcharhinus signatus* (with NMFS scientists at the SEFSC Panama City Laboratory), and the bull shark, *Carcharhinus leucas* (with scientists with the Florida Division of Natural Resources) are underway. Collection, processing, photographing, and reading of samples are in various stages for these species including intercalibration of techniques, criteria, and band readings. This intercalibration process involves sharing samples and comparing counts between researchers including a researcher from the Natal Sharks Board, South Africa for joint work on shortfin mako, blue, and basking shark band periodicity. Collections of vertebrae took place at tournaments and on the biannual research cruise with 285 sharks injected with OTC for validation. Night and dusky sharks were prepared with gross sectioning to determine the best method for reading and all processing was initiated using histology. Readings were completed on the thresher and tiger sharks towards intercalibration to generate bias graphs. Vertebrae, length-frequency data, and tag/recapture data collected from 1962 to present are being analyzed on each of these species to obtain growth parameters.

Biology of the Thresher Shark: Life history studies of the thresher shark continued. Data collection was augmented to include reproductive and food habits, in addition to age and growth information.

Biology of the Porbeagle Shark: A cooperative U.S./Canada research program continued on the life history of the porbeagle shark, *Lamna nasus* with preliminary analysis of porbeagle tagging and recapture data using information from U.S., Canadian, and Norwegian sources.

Collection of Recreational Shark Fishing Data and Samples: Biological samples for age and growth, feeding ecology, and reproductive studies and catch data for pelagic sharks were collected at recreational fishing tournaments in the Northeast. Analysis of these tournament landings data was initiated by creating a database of historic information (1961-2004) and producing preliminary summaries of one long term tournament. The collection and analysis of these data are critical for input into species and age specific population and demographic models for shark management

Essential Fish Habitat and Shark Identification Updates: In cooperation with NMFS staff in the Highly Migratory Management Division (Silver Spring, MD), updates of essential fish habitat maps began for shark, tuna and billfish species using information from observer and tagging databases. In addition, a guide was published to aid in identification of these highly migratory species.

Cooperative Shark Tagging Program (CSTP): The Cooperative Shark Tagging Program involving over 6,500 volunteer recreational and commercial fishermen, scientists, and fisheries observers 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. Research on the food and feeding ecology of the blue shark is being conducted cooperatively with University of Rhode Island staff with additional samples collected and a manuscript under revision. A detailed reexamination of the reproductive parameters of the blue shark continued with collection of additional biological samples to determine if any changes have occurred since the 1970s. A manuscript on blue shark stock structure based on tagging data was completed detailing size composition and movements between Atlantic regions. In addition, research focus 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 continued in collaboration with 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 preliminary analysis of survival and movement rates for blue sharks based on tag and release data from the NMFS Cooperative Shark Tagging Program (CSTP). Preparation of standardized catch rate and size composition data compatible with pelagic longline observer data continued with a resulting ICCAT submission. As part of this comprehensive program, cooperative research continued 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.

Atlantic Shortfin Mako Life History and Assessment Studies: A collaborative program with students and scientists at the University of Rhode Island to examine the biology and population dynamics of the shortfin mako in the North Atlantic was continued. Ongoing research included an update on age and growth and reproductive parameters and an examination of the predator-prey relationships between the shortfin mako and its primary prey, the bluefish, *Pomatomus saltatrix.* A manuscript was completed comparing contemporary and historic levels of bluefish predation. Future research includes the estimation of shortfin mako migration rates and patterns and survival rates using CSTP mark/recapture data and satellite tags with movements correlated with AVHRR sea surface temperature data. Toward these goals, two shortfin mako sharks were tagged with pop-up archival transmitting tags.

Blacktip Shark Migrations: Analysis of movements of the blacktip shark, *Carcharhinus limbatus,* in the western North Atlantic and Gulf of Mexico based on release and recapture data is ongoing with the examination of general migration patterns and exchange between and within regions of United States and Mexican waters. Release and recapture data were analyzed for evidence of Atlantic and Gulf primary and secondary blacktip nursery grounds.

Cooperative Atlantic States Shark Pupping and Nursery Survey (COASTSPAN): NEFSC, Apex Predators Program staff manage and coordinate this project using researchers in major coastal Atlantic states 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.

Juvenile Shark Survey for Monitoring and Assessing Delaware Bay Sandbar Sharks: NEFSC staff conduct this part of the COASTSPAN monitor and assessment project for the juvenile sandbar shark 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, Food Habits, and Essential Fish Habitat of Delaware Bay Sandbar and Smooth Dogfish Sharks: The food habits portion of the study characterizes the diet, feeding periodicity, and foraging habits of the sandbar shark, and examines the overlap in diet and distribution with the smooth dogfish shark, *Mustelus canis*. Stomachs from over 800 sandbar sharks and over 200 smooth dogfish sharks have been sampled for contents through a non-lethal lavage method. Acquired data will be coupled with environmental data, providing 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.

Ecosystems Modeling: Ecosystem modeling, focusing on the role of sharks as top predators, will be conducted using ECOPATH - ECOSIM models, using the sandbar shark as a model species and examining the ecological interactions between sandbar and smooth dogfish sharks in Delaware Bay.

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 staff are editors for an American Fisheries Society symposium proceedings volume on U.S. Atlantic and Gulf of Mexico coastal shark nursery ground and habitat studies.

Southeast Fisheries Science Center (SEFSC)

Stock Assessments of Pelagic, Large Coastal, and Prohibited Sharks: The ICCAT Sub-Committee on Bycatches conducted a stock assessment of blue sharks and shortfin makos in Tokyo, Japan, in June 2004. All information available on biology, fisheries, stock identity, catch, CPUE, and size of these species was reviewed and an evaluation of the status of stocks conducted using surplus production, age-structured, and catch-free stock assessment models. Assessment results and

conclusions were considered to be very preliminary due to the limitations on quantity and quality of information available for the stock assessment of these two species. The Committee recommended increased research and monitoring efforts, particularly for sharks, and for other bycatch species in general, to improve the advice on their status as well as on the impacts of tuna fisheries on these species. In general, preliminary results for blue sharks indicate the current biomass in both the North and South Atlantic appears to be above the biomass that can support MSY. Current shortfin mako biomass may be below that producing MSY in the North Atlantic and above MSY in the South Atlantic, but results were highly conditional on the assumptions made and data available. U.S. scientists contributed eight working documents for this meeting on various aspects of shark biology and methods to assess stock status; SEFSC scientists participated in the assessment process and authored or coauthored six of those documents. A stock assessment of dusky shark, a prohibited species under the shark FMP and candidate for listing under the ESA, is under way with expected completion in late 2004. Biological and fishery information available for this species is being synthesized and stock status will be evaluated using multiple stock assessment methodologies. The next assessment of large coastal sharks is planned for FY 06, but data collection, synthesis, analysis, and preliminary stock evaluations will begin well in advance during FY 05.

Update on Catches of Atlantic Sharks: An update on catches of large and small coastal and pelagic sharks in U.S. Atlantic, Gulf of Mexico, and Caribbean waters was generated in FY 04 for inclusion in the 2004 SAFE Annual Report and future shark stock assessments (Cortés, E. 2003. Updated catches of Atlantic sharks. SFD Contribution SFD-2003-0031). Time series of commercial and recreational landings and discard estimates from several sources were compiled for the large coastal shark complex and sandbar and blacktip sharks. In addition, recent species-specific commercial and recreational landings were provided for sharks in the large coastal, small coastal, and pelagic groups. Species-specific information on the geographical distribution of commercial landings by gear type and geographical distribution of the recreational catches was also provided. Trends in length-frequency distributions and average weights and lengths of selected species reported from three separate recreational surveys and in the directed shark bottom-longline observer program were also included. Another update on catches of Atlantic sharks will be generated in FY 05 for FY 05.

Ecosystem Modeling: A dynamic mass-balance ecosystem model was used to investigate how relative changes in fishing mortality on sharks can affect the structure and function of Apalachicola Bay, Florida, a coastal marine ecosystem. Simulations were run for 25 years wherein fishing mortality rates from recreational and trawl fisheries were doubled for 10 years and then decreased to initial levels. In addition, effects of time/area closures on ecosystem components were tested by eliminating recreational fishing mortality on juvenile blacktip sharks. Simulations indicated biomass of sharks declined up to 57 percent when recreational fishing mortality was doubled. Simulating a time/area closure for juvenile blacktip sharks caused increases in their biomass but decreases in juvenile coastal shark biomass, a multi-species assemblage that is the apparent competitor. In general, reduction of targeted sharks did not cause strong top-down cascades. A manuscript from this study is currently in press.

Elasmobranch Feeding Ecology and Shark Diet Database: The current Fishery Management Plan for Atlantic Tunas, Swordfish, and Sharks gives little consideration to ecosystem function because there is little quantitative species-specific data on diet, competition, predator-prey interactions, and habitat requirements of sharks. Given this, several studies are currently underway describing the diet and foraging ecology, habitat use, and predator-prey interactions of elasmobranchs in various communities. In 2004, the diet of Atlantic sharpnose sharks (*Rhizoprionodon terraenovae*) was compared in two marine embayments of the northeast Gulf of Mexico. Results indicate variations in diet composition between areas and ontogenetic diet shifts within each location are likely due to differences in overall habitat structure and availability of potential prey species. A manuscript is currently in review. A database containing information on quantitative food and feeding studies of sharks conducted around the world has been in development for several years and presently includes over 200 studies. This fully searchable database will continue to be updated and fine-tuned in FY 05. The goal is to make this tool available to researchers in the relatively near future.

Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey (Gulfspan): The SEFSC Panama City Shark Population Assessment Group manages and coordinates a survey of coastal bays and estuaries between the Panhandle of Florida and Texas. Surveys identify the presence/absence of neonate and juvenile sharks and attempt to quantify the relative importance of each area as it pertains to essential fish habitat requirements for sharks. The SEFSC Panama City Shark Population Assessment Group also initiated a juvenile shark abundance index survey in 1996. The index is based on random, depth-stratified gillnet sets conducted throughout coastal bays and estuaries in northwest Florida monthly from April to October. The species targeted for the index of abundance are juvenile sharks in the large and small coastal management groups.

Angel Shark Life History: The Atlantic angel shark, *Squatina dumerili*, is a benthic species inhabiting deep waters of the Gulf of Mexico and the Atlantic Ocean. This species is listed as prohibited by the Fisheries Management Plan for Atlantic Tunas, Swordfish, and Sharks due to the lack of biological data and a precautionary approach for species thought to be highly susceptible to exploitation. Life history studies began in 2003. Samples are obtained from commercial fishers and fishery-independent surveys. Preliminary reproductive parameters were determined in 2004 and results presented at the annual American Elasmobranch Society meeting held in Norman, Oklahoma, in May 2004.

Life History Studies of Elasmobranchs: Biological samples are obtained 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 processed and data analyzed following standard methodology. This information is vital as input to population models incorporating variation and uncertainty in estimates of life-history traits to predict the productivity of the stocks and ensure they are harvested at sustainable levels. The age and growth parameters of bull shark, *Carcharhinus leucas*, and spinner shark, *C. brevipinna*, were completed and submitted for publication in 2004.

Utilizing Bioenergetics and Matrix Projection Modeling to Quantify Population Fluctuations in Long-lived Elasmobranchs: Tools for Fisheries Conservation and Management: Under the supervision of SEFSC scientists at the Panama City Laboratory, the NMFS-Sea Grant fellow in Population Dynamics and Resource Economics conducted research that sought to use a bioenergetics and matrix approach to examine the population dynamics of the cownose ray (*Rhinoptera bonasus*). The bioenergetics model was parameterized using field-collected data for the cownose ray, such as estimates of longevity and growth, information on reproductive capacity, and estimates of metabolism. The species-specific information was used in the development of a bioenergetics model examining individual growth. This model was then used to examine how small changes in biological and environmental parameters affect individual growth. Information derived from the bioenergetics model was used to parameterize age- and stage-based matrix models to investigate how those changes translate to the population level.

Cooperative Research-Definition of Winter Habitats for Blacktip Sharks in the Eastern Gulf of Mexico: A collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory is underway to define essential winter habitats for blacktip sharks (*Carcharhinus limbatus*). Deployment of archival PAT tags on sharks during January-February of FY 05 in the Florida Keys and north Florida will be executed with the cooperation of the charter boat industry. PAT tags will be programmed to detach from individuals during late spring and early summer when sharks have recruited to coastal areas.

Cooperative Research-Habitat Utilization among Coastal Sharks: Through a collaborative effort between SEFSC Panama City Shark Population Assessment Group and Mote Marine Laboratory, the utilization of coastal habitats by neonate and young-of-the-year blacktip and Atlantic sharpnose sharks will be monitored through an array of underwater acoustic receivers (VR2, Vemco Ltd.) placed throughout each study site. Movement patterns, home ranges, activity space, survival, and length of residence of individuals will be compared by species and area to provide information for better management of critical species and essential fish habitats.

Cooperative Research-Characterization of Bycatch in the Gulf Butterfish, Peprilus burti*, Trawl Fishery, with an Emphasis on Identification of Life History Parameters for several Potentially High-Risk Species*: A proposal with the SEFSC Panama City Shark Population Assessment Group and the University of Florida was submitted to MARFIN to quantify and qualify the elasmobranch bycatch in the butterfish, *Peprilus triacanthus*, trawl fishery in the Gulf of Mexico. Determination of life history parameters for the roundel skate, *R. texana*, the clearnose skate, *R. eglanteria*, the spreadfin skate, *Dipturus olseni*, and the Atlantic angel shark, *Squatina dumerili* will be developed ultimately for the estimation of vital rates. Vital rate information will be used to determine the productivity of the stocks and ensure that they are harvested at sustainable levels.

Coastal Shark Assessment Research Surveys: The SEFSC Mississippi Laboratories in Pascagoula have been operating annual research cruises aboard NOAA vessels since 1995. The objectives of this program are to conduct bottom longline surveys to assess the distribution and

relative abundance of coastal sharks along U.S. and Mexican waters of the Gulf of Mexico and the U.S. eastern seaboard. This is the only long-term, nearly stock-wide, fishery-independent survey of Atlantic sharks conducted in U.S. and neighboring waters. Ancillary objectives are to collect biological and environmental data, and to tag-and-release sharks. Starting in 2001 and under the auspices of the Mex-US Gulf Program, the Pascagoula Laboratories have provided logistical and technical support to Mexico's Instituto Nacional de la Pesca to conduct a cooperative research cruise aboard the Mexican research vessel Onjuku in Mexican waters of the Gulf of Mexico. The cruise also took place in 2002, but was suspended in 2003 and 2004 because of mechanical problems with the research vessel and other issues.

4.2 Incidental Catch Reduction

Pacific Islands Fisheries Science Center (PIFSC)

Reducing longline bycatch: The resumption of the previously banned Hawaii swordfish fishery in late 2004 and 2005 will likely increase blue shark catches, as in the past blue sharks comprised about 50 percent of the total catch in this fishery. With the ban on finning, these sharks will not be retained and will be categorized as regulatory bycatch. During a longline research cruise scheduled for January-February 2005, researchers at PIFSC will conduct a pilot study to determine the potential use of an olfactory deterrent to reduce shark bycatch. This study will utilize recent discoveries by Dr. Eric Stroud, from Shark Defense LLC (New Jersey, USA), who identified semiochemicals (chemical messengers important for shark orientation and survivorship) shown to trigger a "flight reaction" in sharks, even while feeding (presented at the 2004 Joint Meeting of Ichthyologists and Herpetologists 26 - 31 May, 2004, in Norman, Oklahoma). One series of semiochemical repellents have shown favorable behavioral shifts in six species of sharks, and can be administered by dosing a "cloud" of the repellent into a feeding school of sharks. Teleost fishes such as pilot fish and remora accompanying the sharks are not repelled, but continue to feed, suggesting the repellant might reduce shark bycatch without affecting target species catch rates. Dr. Stroud's team is also developing a semi-solid repellent. The upcoming PIFSC research cruise will be the first test of these shark repellant chemicals with longline fishing gear.

Southeast Fisheries Science Center

Cooperative Research-The capture depth, time, and hooked survival rate for bottom longline-caught large coastal sharks: A collaborative effort between SEFSC Panama City Shark Population Assessment Group and the University of Florida to examine alternative measures in the shark bottom longline fishery to reduce mortality on prohibited sharks such as reduced soak time, restrictions on the length of gear, and fishing depth restrictions will be tested using hook timers. Funding is being sought through the NMFS Cooperative Research Program.

4.3 Post-Release Survival

Pacific Islands Fisheries Science Center

Improved release technology: The recently resumed Hawaii-based swordfish longline fishery will be required to carry and utilize newly developed dehookers for removing hooks from sea turtles. These dehookers are reported to be effective in removing hooks from sharks as well. The deep-hooked de-hooking device removes deep swallowed hooks from the mouth, throat, and esophagus of fish, sea turtles, marine mammals, and sea birds. This should improve post-release survival and condition of released sharks.

Use of Pop-Up Satellite Archival Tags (PSATs) to determine the movements and post-release survival of sharks: The survivorship of sharks after incidental capture on commercial longline fishing gear is being examined using PSATs. Using the resulting transmitted data from these PSATs, morbidity of released fish is being examined based on departure from normal horizontal and vertical movement patterns. Results from this study are also being used in collaboration with a researcher at Queens University (Ontario), to try to quantify rates of morbidity and mortality in pelagic sharks and billfishes using a suite of biochemical assays to determine levels of stress from blood and (or) tissue samples (below). This endeavor seeks to develop a cost-effective biochemical technique to be used to sample large numbers of released pelagic fishes to quantify their chances for long-term survival.

To date, PIFSC researchers in collaboration with the University of Hawaii Joint Institute for Marine and Atmospheric Research (JIMAR) have deployed 143 PSATs on a variety of pelagic fishes including swordfish, marlin, tunas, and 63 sharks (8 bigeye thresher, 32 blue sharks, 13 oceanic white-tip, 4 shortfin mako, and 6 silky sharks) in the central north Pacific Ocean. PSATs were programmed to release either 8 or 12 months following the deployments. Of the 128 PSATs scheduled to report as of September 2004 we have received data from 72 devices, which is an overall reporting rate of 56 percent. The remaining 44 percent of the tags listed as "non-reporters" could be the result of a myriad of possible failure scenarios. In aggregate 496, 2216, 119, and 4270 days of observations from swordfish, marlins, tunas, and sharks, respectively, for a total of 7101 days (almost 20 years) have been collected.

Post-release survivorship of sharks from longline gear appears excellent. Data retrieved from 29 tagged sharks clearly illustrates only one confirmed mortality of a blue shark. There have, however, been sex and species-related differences in PSAT reporting rates. For example, of the 25 male sharks tagged, only 48 percent of PSATs have reported. However, of the 23 PSATs deployed on female sharks, 74 percent have reported. This difference appears to occur in blue, mako, oceanic white tip, and silky sharks. Deep diving species such as swordfish (32 percent) and bigeye thresher sharks (29 percent) similarly exhibited low PSAT reporting rates. It is hypothesized that tag failure/damage may be caused by nuptial bites and deep oscillatory diving which may ultimately weaken and compromise PSAT housings and seals over time. To further investigate the overall performance of PSATs, project personnel have organized a meta database

incorporating PSAT information from a number of different researchers on many different species to explore for patterns and commonalities (*e.g.* comparing serial numbers of non-reporting tags, species specific patterns, *etc.*).

PSATs have provided excellent data on vertical movement patterns. Bigeye thresher shark, and occasionally blue, and shortfin mako sharks exhibit an oscillatory diel vertical movement pattern, where they remain shallow at night (< ~80 m) but descend to ~80-1000 m during the day. In comparison, silky and oceanic white-tip sharks spend the majority of their time (day and night) in the uniform surface layer. With a team of PSAT collaborators, exploration of many different avenues of investigation may help explain vertical and horizontal movement patterns of pelagic sharks that may uncover vertical and thermal niche partitioning in the pelagic ecosystem.

Developing physiological and biochemical indices of survival in released blue sharks:
The primary goal of the collaboration with Queens University is to develop predictors of survival based on analysis of blood or tissue samples taken just prior to release. Although the focus was first on blue sharks, this approach can be applied to other commercial and recreational species. Blood samples were collected from sharks fitted with PSATs, so PSAT survivorship data could be related to the biochemical and physiological indicators at the time of release.

When a fish is caught, it experiences many different physiological challenges which may affect its long-term survival. Blood loss is assessed by measuring hematocrit, which reflects the level of blood cells in the circulation. Extreme exercise levels are assessed from lactic acid, released into the blood. Strenuous exercise also results in muscle damage. The presence of certain molecules in the blood can be used as an index of tissue damage. When fish experience hazardous conditions such as high temperature or oxidative stress, they can activate a line of defense to minimize damage to the blood cells. This stress response is recognized by stimulation of genes leading to production of a suite of protective proteins called heat shock proteins. The PSAT and biochemical studies should help NMFS to understand the factors causing delayed mortality of sharks and other large pelagics upon release, and to better quantify post-release mortality.

Southwest Fisheries Science Center

Survival of Caught and Released Sharks: Studies on the survival rate of caught and released sharks are continuing. A recently completed study examined hormone and sugar lactate levels in the plasma of sharks to be released and sharks who died from longline capture on SWFSC's Juvenile Shark Survey. Results indicate the fish chosen for tag-and-release are substantially more healthy in spite of their trauma from being caught. A study of 17 electronically tagged and released shortfin mako sharks indicated 94 percent survival beyond 2 months after release.

Northeast Fisheries Science Center

Post-Release Recovery and Survivorship Studies in Sharks - Physiological Effects of Capture Stress: This ongoing 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. As part of the effort to implement the U.S. 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. U.S. management entities are participating in this study.

4.6 Conclusion

Consistent with the provisions of Section 5 of the Shark Finning Prohibition Act, the Department of Commerce and the Department of State have been active in promoting development of

international agreements consistent with the Shark Finning Prohibition Act. The law calls for the United States to pursue an international ban on shark finning and to advocate improved data collection (including biological data, stock abundance, bycatch levels, and information on the nature and extent of shark finning and trade).

Since issuance of this Report to Congress last year, there has been several noteworthy and highly successful achievements towards advancing the provisions of Section 5 of the Act. The recent passage of an international shark finning ban in Atlantic waters adopted by ICCAT contributes to furthering the international provisions of the Act. The ICCAT recommendation was followed by adoption of a recommendation urging all IUCN member states to ban shark finning and require shark fins to be landed attached to the bodies. Trade in shark fins will also be restricted for some shark species and monitored for others as part of proposals adopted at the 2004 CITES meeting. Also in 2004, the NAFO Fisheries Commission became the first regional fisheries management organization in the world to establish a catch limit for a directed elasmobranch fishery.

Continuing efforts are being made nationally and internationally to increase data collection on shark stock assessments, develop gear modifications and capture/release techniques to minimize lethal shark bycatch, and increase our knowledge of shark ecology. These efforts are supported through agreements with international fishery management organizations including NAFO, IATTC, ICCAT, UNGA, APEC, FAO, CITES, and IUCN; and should lead to improved shark management. In addition, as reported in this Report, an abundance of research studies undertaken by NMFS Science Centers have produced much valuable information on shark status, mobility, habitat, ecology, and age and growth characteristics; all of which will be incorporated into effective shark fishery management decisions. Overall, relative to time prior to enactment of the Shark Finning Prohibition Act, great strides have been made in shark conservation, management, research, and education on a national and global scale which will contribute to sustainable management.

Appendix 1: Internet Information Sources

Atlantic Ocean Shark Management

Copies of Amendment 1 to the HMS FMP, the final rule, and Atlantic commercial and recreational fishing brochures can be found on the Highly Migratory Species Management Division website at: http://www.nmfs.noaa.gov/sfa/hms/. Information on Atlantic shark fisheries is updated annually in the Stock Assessment and Fishery Evaluation (SAFE) Report for Atlantic Highly Migratory Species (HMS), which are also available on the website. The website includes links to current fishery regulations (50 CFR 635), shark landings updates, the U.S. National Plan of Action (NPOA) for Sharks, and the Atlantic HMS SAFE Reports.

Pacific Ocean Shark Management

The final Fishery Management Plan for U.S. West Coast Highly Migratory Species Fisheries is currently available on the Pacific Fishery Management Council website: http://www.pcouncil.org/HMS/hms.html.

Data reported in Table 1.3.1, shark landings for California, Oregon, and Washington, 1992-2003, from the Pacific States Marine Fisheries Commission, PacFIN Database, may be found on their website at: www.psmfc.org/pacfin/data .

Western Pacific Shark Management

The Western Pacific Fishery Information Network (WPacFIN) is a federal and state partnership collecting, processing, analyzing, sharing, and managing fisheries data from American island territories and states in the Western Pacific. Their website may be found at: http://www.pifsc.noaa.gov/wpacfin/index.htm .

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

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

NMFS prepared and submitted a major status report on the implementation of its National Plan of Action for the Conservation and Management of Sharks (NPOA) to the February 2003 meeting of COFI, which can be found at http://www.nmfs.noaa.gov/sfa/international/Congress%20Reports/02SharkFinRptCongress.pdf.

U.S. Imports and Exports of Shark Fins

Summaries of U.S. imports and exports of shark fins based on information submitted by importers and exporters to the U.S. Customs and Border Protection Data, and U.S. Census Bureau are reported in the National Marine Fisheries Service Trade database at: http://www.st.nmfs.gov/st1/trade/index.html.