Implementation of the United States National Plan of Action for the Conservation and Management of Sharks

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Executive Summary

Implementation of the United States National Plan of Action for the Conservation and Management of Sharks highlights advancements made by the United States toward the objectives of the 2001 *U.S. National Plan of Action for the Conservation and Management of Sharks* (NPOA-Sharks). The United States has improved research, outreach and education, and international and domestic management of sharks. There are two U.S. laws specifically focused on shark management. The Shark Finning Prohibition Act of 2000 requires the Secretary of Commerce (Secretary), through the National Marine Fisheries Service (NMFS) — within in the National Oceanic and Atmospheric Administration (NOAA), U.S. Department of Commerce (DOC) — to promulgate regulations to prohibit the practice of shark finning by any person under U.S. jurisdiction. In addition, the Act provides NMFS with a mandate to, along with the U.S. State Department, initiate discussion with other nations in order to develop international agreements to address shark finning and to establish programs for data collection and research. The Shark Conservation Act of 2010 requires, with limited exceptions, that all sharks be landed with their fins naturally attached. The Act also requires the Secretary to identify a nation if two or more of its fishing vessels were detected catching sharks, either directly or incidentally, in waters beyond national jurisdiction and that nation has not adopted a regulatory program to provide for shark conservation that is comparable in effectiveness to that of the United States. The Act further requires the United States to urge international fishery management organizations to adopt shark conservation measures, including prohibiting removal of shark fins at sea.

The U.S. regional fishery management councils, which were developed under the Magnuson-Stevens Fishery Conservation and Management Act, are responsible for developing fishery management plans (FMP), including those for management of sharks caught in directed fisheries and as bycatch. In the case of Atlantic highly migratory species, this responsibility is imparted to the Secretary. Since the release of NPOA-Sharks in 2001, the United States has taken many actions to advance sustainable management of sharks. The 2006 Consolidated Atlantic Highly Migratory Species FMP and its amendments address overfishing and rebuilding of stocks of certain shark species, authorize which species the commercial and recreational shark fisheries can harvest, require sharks to be landed with fins naturally attached to the carcass, establish a shark research fishery, and require dealers to attend shark identification workshops, among other measures. The West Coast Highly Migratory Species FMP covers eight shark species and manages sharks with the goal to balance achieving optimum yield with preventing localized depletion. The North Pacific Fishery Management Council prohibited directed fishing for sharks in its management areas in 2011 and 2012 and limited incidental catch of sharks at 20% of aggregated incidental catch in groundfish fisheries. In Hawaii-based pelagic longline fisheries managed by the Western Pacific Fishery Management Council, shark landings from 2001 to 2010 decreased by 93% from their peak in 1999, following enactment of the Shark Finning Prohibition Act. The New England and Mid-Atlantic Fishery Management Councils jointly manage the Atlantic spiny dogfish fishery, the nation's largest volume shark fishery, which is fully rebuilt and managed with precautionary catch limits.

U.S. shark management measures are informed by research activities of the NMFS Fisheries Science Centers. The Science Centers collect and analyze critical information on shark abundances and stock structure, which contributes to stock assessments. In most cases, the life histories of shark species are not fully understood and ongoing studies will help to better comprehend longevity, growth, movement, trophic ecology, and nursery grounds of sharks. Studies also investigate incidental catch reduction methods and post-release survival of sharks. Working in concert with research and management, NMFS promotes outreach and education efforts to inform the general public and to engage stakeholders, including commercial and recreational fishermen, in shark conservation. NMFS developed a number of shark identification guides and safe catch and release techniques for commercial and recreational fishermen. NMFS also created interactive websites for the public to add to shark data collection.

The United States continues to address shark conservation and management in its bilateral relationships as well as in a number of regional fisheries management organizations and international programs. As such, the United States proposed or supported measures to conserve sharks in the Northwest Atlantic Fisheries Organization, Commission for the Conservation of Antarctic Marine Living Resources, Inter-American Tropical Tuna Commission, International Commission for the Conservation of Atlantic Tunas, Western and Central Pacific Fisheries Commission, the Convention on International Trade in Endangered Species, the Convention on the Conservation of Migratory Species of Wild Animals -Memorandum of Understanding on the Conservation of Migratory Sharks, and the United Nations General Assembly Sustainable Fisheries Resolution. In addition, the United States engages in international capacity building for shark management and observer programs. The United States will continue to promote the adoption of measures and other actions that promote shark conservation and management in

relevant international organizations. These actions will include research, outreach, and educational activities as the need and opportunity arises.

Introduction

The United States developed the *U.S. National Plan of Action for the Conservation and Management of Sharks* (NPOA-Sharks)[1] in 2001 to fulfill the requirements of the *International Plan of Action for the Conservation and Management of Sharks* (IPOA-Sharks) adopted by the Food and Agriculture Organization of the United Nations (FAO) in 1999. The National Marine Fisheries Service (NMFS) developed the NPOA-Sharks in consultation with stakeholders. By supporting the adoption of the IPOA and developing the NPOA-Sharks, the United States committed to ensuring that shark populations are maintained at sustainable levels.

The purpose of the NPOA-Sharks is to delineate how the United States plans to meet the objectives of the IPOA-Sharks, including how the United States manages sharks, a group of species known to be vulnerable to overfishing. The IPOA-Sharks and the subsequent NPOA-Sharks are necessary because of the management challenges presented by sharks and other elasmobranchs. The life-history characteristics of many elasmobranchs, such as late age of maturity, relatively slow growth rates, and low fecundity, result in low productivity in most species and make them more susceptible to overfishing than most bony fishes. Recovery of populations from severe depletions may take many years for most elasmobranch species. In addition, due to these biological traits, the assumptions used in some fisheries models are not always appropriate and can make stock assessments and management of elasmobranchs difficult. Elasmobranch fisheries assessments are further complicated because of the mobility of many species across political boundaries, even across oceans; a general lack of baseline information about the practices employed in shark fisheries worldwide; incomplete data on catch, effort, landings, and trade; and a lack of information on biological parameters, importance of specific habitats to productivity, and population dynamics of many species. As a result, fishing elasmobranchs down to unsustainable levels may occur rapidly, and successful management of elasmobranch fisheries requires a stronger commitment to fishery monitoring, biological research, and proactive management than many other fisheries. Thus, the NPOA-Sharks addresses ways the United States can resolve these challenges to promote conservation and effective management of sharks.

Since 2001, the United States has made a great deal of progress to conserve sharks and improve their management. This report presents the achievements of the United States in the implementation of the NPOA-Sharks, highlighting U.S. management measures, research activities, outreach and education efforts, and international fishery management measures. The report also summarizes the current status of U.S. shark stocks and explores areas for development of future initiatives. The work of the regional fishery management councils and of various agencies, including NMFS, NOAA's Office of General Counsel, the Department of State, the U.S. Coast Guard, and the U.S. Fish and Wildlife Service comes together in a promising course for shark conservation and management in the United States.

[1] Available at http://www.nmfs.noaa.gov/sfa/hms/FinalNPOA_Feb_01.pdf

Actions Taken to Conserve and Manage Sharks

Since the development of the NPOA-Sharks, the United States has garnered many successes in furthering the conservation and management of sharks, through the development and implementation of management measures in both domestic and international fisheries, research activities, and outreach and education efforts. This section describes some of the accomplishments of the United States in these areas.

U.S. Management Measures

Shark Finning Prohibition Act

The 2000 Shark Finning Prohibition Act[2] amended the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to prohibit the practice of shark finning by any person under U.S. jurisdiction. The MSA required the Secretary of Commerce, through NMFS, within NOAA, DOC, to promulgate regulations to implement the prohibitions of the MSA, initiate discussion with other nations to develop international agreements on shark finning and data collection, and establish research programs. NMFS published a rule (67 FR 6194) in 2002 to implement the provisions of the MSA. In 2008, NMFS published a final rule (73 FR 35778, corrected in73 FR 40658) that amended the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP) that, among other things, requires that all sharks in the Atlantic HMS fishery be offloaded with the fins naturally attached.

The Act also requires the Secretary, in consultation with the Secretary of State, to provide Congress an annual report[3] describing efforts to carry out the Act, the international trade in shark fins and vessels conducting shark finning, a plan of action to adopt international measures for the conservation of sharks, and recommendations to ensure that U.S. actions are consistent with national, international, and regional obligations relating to shark populations.

> In addition to meeting the statutory requirement of the Shark Finning Prohibition Act, the annual Report to Congress serves as a periodic update of information called for in the IPOA- and NPOA-Sharks.

The NMFS Office of Law Enforcement (OLE) has responsibility for enforcing the Shark Finning Prohibition Act and its implementing regulations. In addition, OLE works in cooperation with the U.S. Coast Guard and various state law enforcement partners to detect violations. Each year, regulatory violations of the Act are investigated and referred for administrative prosecution in the regional enforcement divisions. Moreover, and under certain circumstances, federal criminal charges can be brought after an investigation by the OLE and are subsequently prosecuted by the Office of the United States Attorney.

[2] Available at http://www.gpo.gov/fdsys/pkg/BILLS-106hr5461enr/pdf/BILLS-106hr5461enr.pdf
[3] Available at http://www.nmfs.noaa.gov/sfa/domes_fish/fisheries_news.htm#sharkfinning

Shark Conservation Act

The Shark Conservation Act of 2010[4] (2010 Act) was signed into law in January 2011. The 2010 Act amended two previous acts—the High Seas Driftnet Fishing Moratorium Protection Act and the MSA—to improve the existing domestic and international shark conservation measures. The 2010 Act amended the 2000 Shark Finning Prohibition Act provisions in the MSA to state that it is illegal "to remove any of the fins of a shark (including the tail) at sea; to have custody, control, or possession of any such fin aboard a fishing vessel unless it is naturally attached to the corresponding carcass; to transfer any such fin from one vessel to another vessel at sea, or to receive any such fin in such transfer, without the fin naturally attached to the corresponding carcass; or to land any such fin that is not naturally attached to the corresponding carcass, or to land any shark carcass without such fins naturally attached." The 2010 Act also includes a savings clause for commercial fishing of smooth dogfish in waters from Maine through Florida out to 50 nautical miles.

In addition, the 2010 Act amended the High Seas Driftnet Fishing Moratorium Protection Act to require the Secretary to identify a nation if fishing vessels of that nation have been engaged during the preceding calendar year in fishing activities or practices that target or incidentally catch sharks in waters beyond national jurisdiction, and the nation has not adopted a regulatory program for shark conservation that is comparable to that of the United States. If a nation is identified, and sufficient corrective action is not taken, the identified nation will not receive a positive certification, which may lead to prohibitions on the import of certain fisheries products into the United States or the denial of port privileges for vessels of that nation.

U.S. engagement in international shark conservation

The Shark Conservation Act of 2010 amends the High Seas Driftnet Fishing Moratorium Protection Act to direct the United States to urge international fishery management organizations to adopt shark conservation measures, including measures prohibiting the removal of shark fins at sea, and to seek to enter into international agreements that require measures for the conservation of sharks.

NMFS is addressing the requirements of the 2010 Shark Conservation Act by publishing three regulations: (1) the Office of International Affairs set forth identification and certification procedures to address shark conservation in areas beyond any national jurisdiction and also amended the definition of illegal, unreported, or unregulated (IUU) fishing (final rule published January 16, 2013[5]); (2) the Office of Sustainable Fisheries' Domestic Fisheries Division is redefining shark finning regulations to prohibit the removal of the fins of a shark at sea (proposed rule published May 2, 2013[6]); and (3) the Office of Sustainable Fisheries' Highly Migratory Species Management Division is modifying the smooth dogfish regulations.

[4] Available at http://www.gpo.gov/fdsys/pkg/BILLS-111hr81enr/pdf/BILLS-111hr81enr.pdf
[5] Available at http://www.nmfs.noaa.gov/ia/iuu/msra_page/shark_iuu_rule.pdf
[6] Available at http://www.gpo.gov/fdsys/pkg/FR-2013-05-02/pdf/2013-10439.pdf

Endangered Species Act

Following a comprehensive review of the status of hammerhead sharks, in April 2013 NMFS proposed to list four distinct population segments of hammerhead sharks as threatened or endangered under the Endangered Species Act.[7] NMFS proposed the Eastern Atlantic and Eastern Pacific populations to be listed as endangered, while the Central and Southwest Atlantic and the Indo-West Pacific populations were proposed as threatened. A final decision is due in April 2014.

Atlantic Highly Migratory Species

In U.S. Federal waters[8] of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea, oceanic sharks (excluding spiny dogfish) and other highly migratory species are under the jurisdiction of the Secretary of Commerce, who delegates management authority to NMFS. In 1993, NMFS implemented the FMP for Sharks of the Atlantic Ocean. In 1999, this FMP was replaced by the FMP for Atlantic Tunas, Swordfish, and Sharks. In 2003, the final rule implementing Amendment 1 to the 1999 FMP was published (68 FR 74746), with several regulatory changes including implementing a time/area closure off the coast of North Carolina effective January 1, 2005. To aid in enforcement of this area, directed shark fishing vessels with bottom longline fishing gear on board, located between 33° and 36° 30′ N latitude, are required to have a vessel monitoring system installed and operating during the mid-Atlantic shark closure period (January 1–July 31).

On October 2, 2006, the 1999 FMP was replaced with the final 2006 Consolidated Atlantic HMS FMP (71 FR 58058), which (1) consolidated management of all Atlantic HMS under one plan, (2) reviewed current information on shark essential fish habitat, (3) required the second dorsal and anal fin to remain on shark carcasses through landing, (4) required shark dealers to attend shark identification workshops, and (5) included measures to address overfishing of finetooth sharks.

In 2008, NMFS published a final rule (73 FR 35778, corrected in 73 FR 40658) that amended the 2006 Consolidated Atlantic HMS FMP based on recent stock assessments for large coastal sharks, dusky sharks, and porbeagle sharks. The rule included measures to (1) adjust quotas and retention limits, (2) modify authorized species for the commercial shark fishery, (3) establish a shark research fishery, (4) require that all sharks be offloaded with all fins naturally attached, and (5) modify the species that can be landed by recreational fishermen.

In 2010, NMFS published a final rule for Amendment 3 to the 2006 Consolidated HMS FMP (75 FR 30484) for small coastal sharks, pelagic sharks, and smooth dogfish. The final rule and amendment included measures to rebuild blacknose sharks, prevent overfishing of other small coastal sharks, and encourage the release of live shortfin mako sharks.

[7] Available at http://www.gpo.gov/fdsys/pkg/FR-2013-04-05/pdf/2013-07781.pdf

[8] U.S. Federal waters (referred to as the exclusive economic zone, or EEZ) are generally from 3 to 200 nautical miles from shore, or from 9 to 200 nautical miles in some cases.

Rebuilding and management of shark stocks in the U.S. Atlantic Ocean

In 2013, NMFS published a final rule for Amendment 5a to the 2006 Consolidated Atlantic HMS FMP. This amendment maintains rebuilding the sandbar shark stock, ends overfishing for and rebuilds scalloped hammerhead and Atlantic blacknose shark stocks, establishes total allowable catch and commercial quotas for Gulf of Mexico blacknose and blacktip sharks, and establishes new recreational shark fishing management measures.

Based on recent stock assessment results, a number of Atlantic HMS shark stocks are not overfished, with no overfishing occurring, including the Gulf of Mexico blacktip shark, finetooth shark, blue sharks, and shortfin mako. In 2013, NMFS updated the assessments for Atlantic sharpnose and bonnethead sharks; however, the final stock status results were not available when writing this document. For sharks that have been found to be overfished, NMFS has adopted rebuilding plans (e.g. porbeagle, sandbar, dusky, and scalloped hammerhead sharks). In 2014, NMFS intends to conduct new stock assessments for smooth dogfish, Florida smoothhound, and Gulf smoothhound.

New England and Mid-Atlantic Fishery Management Councils

The New England Fishery Management Council (NEFMC) and Mid-Atlantic Fishery Management Council (MAFMC) jointly manage the Atlantic spiny dogfish fishery in Federal waters between Maine and North Carolina. The MAFMC has the administrative lead on the Spiny Dogfish FMP, which was implemented in 2000. Spiny dogfish is the only Atlantic shark species managed by the Regional Fishery Management Councils.

The Northeast Fisheries Science Center (NEFSC) monitors spiny dogfish biomass annually in its bottom trawl survey on the northeast continental shelf. Spiny dogfish were determined to be overfished in 1998, so the NEFMC and MAFMC jointly developed a fishery management plan to rebuild the stock. Restrictive commercial fishery quotas and possession limits helped the stock recover, and NMFS declared spiny dogfish to be rebuilt in 2010. Since that time, the stock has remained above its target biomass levels, and annual catch limits for spiny dogfish have been significantly increased by NMFS.

Pacific Fishery Management Council

The Pacific Fishery Management Council's area of jurisdiction is Federal waters off the coasts of California, Oregon, and Washington. The U.S. West Coast Highly Migratory Species FMP, implemented in 2004, covers management of blue, common thresher, and shortfin mako sharks; monitors bigeye thresher and pelagic thresher sharks; and prohibits capture of great white, megamouth, and basking sharks. Sharks within the West Coast HMS FMP are managed to achieve optimum yield set at a precautionary level of 75% of maximum sustainable yield. The precautionary approach is meant to prevent localized depletion of these vulnerable species.

In addition, the Pacific Coast Groundfish FMP includes management of three shark species: leopard, soupfin, and spiny dogfish. Beginning in 2006, NMFS implemented two-month cumulative trip limits for spiny dogfish for both open access and limited entry fisheries to control

the harvest of dogfish and associated overfished groundfish species. A benchmark assessment for spiny dogfish was conducted for the first time in 2011. That assessment indicated that the portion of the Pacific coast dogfish stock found off the United States was likely well above its target spawning output level.

North Pacific Fishery Management Council

The North Pacific Fishery Management Council (NPFMC) manages the groundfish fisheries in Federal waters off Alaska, including the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BSAI). Eleven shark species are found in the Alaskan waters. Pacific sleeper and salmon sharks and spiny dogfish are taken incidentally in groundfish fisheries and are monitored in season by NMFS. The other eight species are rarely taken in any recreational or commercial fishery and are not targeted for harvest. Sharks are consistently identified to species levels in catches by fishery observers. There has been no effort targeting sharks in the BSAI or GOA since 2006. Estimates of the incidental catch of sharks in the BSAI and GOA are largely based on NMFS survey results, observer data, and the NMFS catch accounting system data, which was implemented in 2003.

Due to conservation concerns, the final rules to implement groundfish harvest specifications in the BSAI and GOA in 2011 and 2012 prohibited directed fishing for sharks in both management areas. In other groundfish fisheries open to directed fishing, the retention of sharks taken as incidental catch is limited to no more than 20% of the aggregated amount of sharks, skates, octopi, and sculpins in the BSAI, and sharks, octopi, squid, and sculpins in the GOA. In the BSAI, NMFS conducts surveys annually in the Eastern Bering Sea and triennially along the deeper slope area in the BSAI for all groundfish, as well as sharks. In the GOA, NMFS conducts surveys biennially for groundfish, including sharks.

Western Pacific Fishery Management Council

The Western Pacific Fishery Management Council's area of jurisdiction is Federal waters around Hawaii, American Samoa, Guam, the Northern Mariana Islands, and the Pacific Remote Island Areas, which include Howland Island, Baker Island, Jarvis Island, Palmyra Atoll, Kingman Reef, Johnston Atoll, and Wake Atoll. Shark landings by the Hawaii-based pelagic longline fisheries in these areas peaked in 1999 due largely to the finning of blue sharks. With the subsequent enactment of the Shark Finning Prohibition Act, shark landings from 2001 to 2010 decreased by 93%. Shark landings in the American Samoa longline fishery have also declined since 1999.

Additional information on U.S. management measures for shark conservation and management can be found in NMFS' annual Shark Finning Report to Congress.[9]

[9] Available at http://www.nmfs.noaa.gov/sfa/domes_fish/fisheries_news.htm#sharkfinning

Research Activities

Research conducted by the NMFS Regional Fisheries Science Centers has produced valuable information on shark status, survivorship, mobility, migration, habitat, ecology, genetics, and age and growth characteristics. Additional research aims to identify fishing methods that minimize the incidental catch of sharks and/or maximize the survival of captured sharks after release. This information will be incorporated into effective shark fishery management decisions.

Shark abundance and stock assessments

- Fishery data collection: The Pacific Islands Fisheries Science Center (PIFSC) has a shore side sampling program dating from 1987 that collects market data including detailed biological and economic information on sharks in the longline fisheries. The Western Pacific Fishery Information Network is a federal-state partnership collecting, processing, analyzing, sharing, and managing fisheries data on sharks and other species from U.S. territories and States in the central and western Pacific.[10]
- Shark catch per unit effort (CPUE) data analysis from longline observer program: PIFSC produced standardized CPUE time series for use as input for stock assessments for blue, oceanic whitetip, and silky sharks in the Hawaii longline fisheries using the Pacific Islands Regional Observer Program data (1995–2010).[11]
- Insular shark surveys: The PIFSC Coral Reef Ecosystem Division estimates densities of insular sharks through surveys of 10 major shallow reefs in the Northwestern Hawaiian Islands (2000–2010), the main Hawaiian Islands (2005–2010), the Pacific Remote Island Areas (2000–2012), American Samoa (2002–2012), Guam and the Commonwealth of the Northern Marianas Islands (2003–2011), Johnston Atoll (2004–2012), and Wake Atoll (2005–2011). Four species are encountered most frequently: grey reef shark, Galapagos shark, whitetip reef shark, and blacktip reef shark.[12]
- Insular shark population model: PIFSC scientists analyzed shark count data from coral reef assessment and monitoring surveys conducted between 2004 and 2010. The shark count data were used to build a computer model capable of explaining observed reef shark abundances at various reefs by examining the effects of variables related to human impacts, oceanic productivity, sea surface temperature, and reef habitat physical complexity. The model was used to predict reef shark densities in the absence of humans.[13]
- Shortfin mako and blue shark abundance surveys: In 2011, the Southwest Fisheries Science Center (SWFSC) conducted its 18th juvenile shark survey for shortfin mako and blue sharks to track trends in abundance on nursery grounds in the Southern California Bight. Results showed a declining trend in nominal CPUE for both species over the time series of the survey.
- Neonate common thresher shark abundance survey: Annually since 2003 the SWFSC has conducted a common thresher shark survey to develop a fisheries-independent index of pre-recruit abundance. Overall, 391 common thresher sharks were tagged and 409 DNA and other biological samples were collected to enhance ongoing research including age and growth, feeding, and habitat utilization studies.

[10] Available at http://www.pifsc.noaa.gov/wpacfin/ and http://www.pifsc.noaa.gov/wpacfin/pdf_file/v27intro.pdf
[11] Available at http://www.pifsc.noaa.gov/library/pubs/admin/PIFSC_Admin_Rep_11-10.pdf
[12] Available at http://www.pifsc.noaa.gov/cred/eco_assess.php
[13] Available at http://onlinelibrary.wiley.com/doi/10.1111/j.1523-1739.2012.01835.x/pdf

Population genetics studies of pelagic sharks reveal stock structure

An ongoing study using mitochondrial DNA control loop sequences to determine Pacific shortfin mako shark stock structure has recently been updated with additional samples collected in the western Pacific. Results show a single stock in the North Pacific, and distinct eastern and western stocks in the South Pacific. The results have been reviewed by the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific Ocean (ISC) Shark Working Group and form the basis for the stock boundaries for the shortfin mako assessment. The SWFSC is also collaborating on population genetics studies for other pelagic sharks including common thresher, pelagic thresher, silky, and blue sharks. Results from both silky and pelagic thresher sharks reveal stock structures in the Pacific Ocean.

- Basking shark research program: The SWFSC developed a basking shark sightings website coupled with an education and outreach program to mine existing data for additional biological information, conduct an electronic tagging study, improve international data collection, and improve national sightings.[14]
- Monitoring and assessment on the West Coast: The Northwest Fisheries Science Center (NWFSC) supports monitoring and assessment of sharks along the West Coast and in Puget Sound. The Pacific Fishery Information Network serves as a clearinghouse for commercial landings data, including sharks.[15] In addition the At-Sea Hake Observer Program[16] and West Coast Groundfish Observer Program[17] collect data on shark species caught on vessels selected for observer coverage. The NWFSC conducts annual trawl surveys of the West Coast to acquire abundance data for groundfish stocks. NWFSC conducted the first assessment for longnose skates in 2007 and an assessment of spiny dogfish along the Pacific coast of the U.S. in 2011.
- Stock assessments of shark species subject to incidental harvest in Alaskan waters: The Alaska Fisheries Science Center (AFSC) has completed stock assessments for the shark species most commonly encountered as incidental catch: Pacific sleeper sharks, spiny dogfish, and salmon sharks.[18]
- Modeling spiny dogfish distribution: A better understanding of areas of high incidental catch would provide critical information to fishery managers, whether they seek to convert discards into fishery landings or to manage fishing mortality. The spatial distribution of spiny dogfish from fishery-dependent and -independent data collected by the AFSC between 1996 and 2008 showed that longline catches were concentrated east of Kodiak Island.

[14] Available at http://psrc.mlml.calstate.edu/current-research/basking-shark/about-the-project/
[15] Available at http://pacfin.psmfc.org/
[16] Available at http://www.st.nmfs.noaa.gov/observer-home/regions/westcoast/at-sea-hake
[17] Available at http://www.nwfsc.noaa.gov/research/divisions/fram/observation/index.cfm
[18] Available at http://www.afsc.noaa.gov/REFM/Docs/2012/BSAIshark.pdf and http://www.afsc.noaa.gov/REFM/Docs/2012/GOAshark.pdf

- Collection of recreational shark fishing data and samples: The NEFSC has been attending recreational shark fishing tournaments since 1961, compiling data on species, sex, and size of captured sharks as well as collecting biological samples for pelagic and coastal sharks.[19]
- Delaware Bay sand tiger shark survey: This survey by the NEFSC, initiated in 2006, is used to identify essential fish habitat and monitor abundance and size composition to allow for comparison between historic and current abundances.
- Dusky shark stock structure: A collaborative study with NEFSC on the genetic stock structure of the dusky shark was initiated to delineate management units and monitor trade.[20]
- Spiny dogfish tagging study: To assess stock structure, movement patterns, and life history of the spiny dogfish, the NEFSC is tagging sharks in two consecutive years during winter and summer in southern New England, Gulf of Maine, and Georges Bank.
- Stock assessments of large coastal, small coastal, pelagic, and prohibited sharks: In 2011 and 2012, the Southeast Fisheries Science Center (SEFSC) and NEFSC staff completed stock assessments of sandbar, Atlantic and Gulf of Mexico blacknose, dusky sharks, and Gulf of Mexico blacktip sharks under Southeast Data, Assessment, and Review (SEDAR) 21 and 29.[21]
- Shark observer program: Observer programs administered by the SEFSC collect data on catch, bycatch, and discards of sharks from various fisheries. These data are used for future stock assessments. Fisheries in the southeast that directly or indirectly harvest sharks, and are monitored through observer programs, include the pelagic longline fishery, shark and reef fish bottom longline fishery, shrimp trawl fishery, and coastal gillnet fishery. Most of these programs were implemented in the early 1990s.
- Relative abundance and size of coastal sharks derived from commercial data: Relative abundance indices were derived from 1994 to 2009 using observer data collected in a commercial bottom longline fishery. Trends in abundance and average size were estimated for four shark species: spinner, bull, lemon, and tiger.[22]
- Monitoring the recovery of smalltooth sawfish: The smalltooth sawfish was the first marine fish listed as endangered under the Endangered Species Act. The completion of the Smalltooth Sawfish Recovery Plan in early 2009 identified new research and monitoring priorities that are currently being implemented. Surveys identify the presence or absence of neonates, young-of-the-year, and juveniles in southwest Florida, and research in the Florida Keys and Florida examines the distribution and abundance of adult animals.[23]
- Uruguay-U.S. cooperative pelagic shark research project: A collaborative project between SEFSC and Uruguay's fisheries agency (DINARA) has existed since 2010 to advance our knowledge of the biological productivity and susceptibility to longline fisheries of pelagic sharks in the Atlantic Ocean, to ensure their sustainable exploitation, and reduce unnecessary

[19] Available at http://na.nefsc.noaa.gov/sharks/tourney.html
[20] Available at http://www.int-res.com/articles/esr2011/14/n014p013.pdf
[21] Available at http://www.sefsc.noaa.gov/sedar/Sedar_Workshops.jsp?WorkshopNum=21 and http://www.sefsc.noaa.gov/sedar/download/S29_GOM%20blacktip%20report_SAR_final.pdf?id=DOCUMENT
[22] Available at http://onlinelibrary.wiley.com/doi/10.1111/j.1095-8649.2011.03193.x/pdf
[23] Available at http://sero.nmfs.noaa.gov/pr/esa/Smallooth%20sawfish/Smalltooth%20Sawfish%205%20Year%20Review%20final%20HQ%20cleared-1.pdf

bycatch. This collaboration has resulted in several projects conducted under the auspices of the International Commission for the Conservation of Atlantic Tunas.[24]

- Shark assessment research surveys: The NEFSC Coastal Shark Bottom Longline Survey of Atlantic large and small coastal sharks, started in 1986 and conducted every 2-3 years, is the longest fishery-independent shark survey in the U.S. Atlantic Ocean. Its primary objective is to conduct a standardized, systematic survey of the shark populations off the U.S. Atlantic coast to provide unbiased indices of relative abundance for species inhabiting the waters from Florida to the Mid-Atlantic. The SEFSC has conducted similar bottom longline surveys in the Gulf of Mexico, Caribbean, and southern North Atlantic since 1995 in order to assess the distribution and abundance of large and small coastal sharks across their known ranges and develop a time series for trend analysis.

Shark biology

- Age validation using bomb radiocarbon dating for sandbar shark: PIFSC scientists, in collaboration with NEFSC, led a recent study to validate age estimates for the sandbar shark. Results from both tag-recapture and bomb radiocarbon dating show longevity to exceed 30 years for this species.[25] PIFSC and SEFSC are also working to validate the age, growth, and longevity of the sand tiger shark.
- Electronic tagging studies of shortfin mako, blue, and common thresher sharks: Since 1999, the SWFSC has been using satellite technology to study the movements and behaviors of these three species of sharks in the northeast Pacific. The multiyear records reveal that shortfin mako sharks return to specific neighborhoods in successive years.
- Age validation studies of shortfin mako, blue, and common thresher sharks: Age and growth of the three shark species are being estimated from bank formation in vertebrae. In addition to being important for studying basic biology, accurate age and growth curves are needed in stock assessments. SWFSC scientists are validating ageing methods for these three species based on band deposition periodicity. An analysis of juvenile mako shark band deposition patterns was recently completed.[26]
- Foraging ecology of shortfin mako, blue, and common thresher sharks: To better understand niche separation and the ecological role of these three shark species, stomach contents collected by fishery observers have been examined at the SWFSC since 2002. Diets of these three species are strongly differentiated, indicating niche separation.[27]
- Biological data from bottom trawl surveys: Since 2002, a NWFSC survey has collected biological data and tissue samples from spiny dogfish, including dorsal spines, which can be used to age the fish. Biological data and tissue samples were also collected from leopard sharks and cat sharks.
- Movement research: Over the past decade, NWFSC has conducted extensive research on localized movements and seasonal migrations of bluntnose sixgill sharks,[28] broadnose sevengill sharks,[29] and northern spiny dogfish.

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[24] Available at http://www.iccat.es/Documents/SCRS/Guide_ID_Sharks_ENG-2.pdf
[25] Available at http://fishbull.noaa.gov/1094/1094andrews.pdf
[26] Available at http://swfsc.noaa.gov/publications/CR/2013/2013Wells.pdf
[27] Available at http://link.springer.com/article/10.1007%2Fs10641-012-9980-x#page-1
[28] Available at http://www.currentzoology.org/temp/%7BF24B2395-3A21-41BA-B842-2A780168D318%7D.pdf
[29] Available at http://onlinelibrary.wiley.com/doi/10.1111/j.1095-8649.2011.03179.x/pdf

Studying potential effects of climate change on spiny dogfish bioenergetics and habitat

The NWFSC developed an energy budget model for spiny dogfish based on published physiology data. This model can characterize predatory demands and estimate how climate change might affect dogfish metabolic rates.

Since 2009, AFSC scientists have deployed tags on spiny dogfish in the GOA. Results indicate depth and temperature preferences, which may inform the effects of climate changes in the North Pacific. Further, the results will elucidate the degree to which GOA spiny dogfish populations mix with other populations.

- Trophic ecology of Pacific sleeper sharks: Stable isotope ratios were used by AFSC to examine variability in the trophic ecology of Pacific sleeper sharks. The results are similar to previously published results based on stomach content data.[30]
- Migration and habitat use of Pacific sleeper sharks: During 2003-2006, AFSC scientists deployed 270 tags on Pacific sleeper sharks. Information on temperature, depth, and movement will be used to identify habitat and potential interactions with other species.[31]
- Age and growth methods for spiny dogfish and Pacific sleeper sharks: AFSC scientists will expand a pilot study investigating a potential new method for ageing spiny dogfish using vertebrae and histological staining. Scientists are working to establish a captive population of spiny dogfish to validate the histological ageing methods and generate improved age-at-length data that will be used to re-estimate growth models for stock assessments. The study will also establish a method for ageing Pacific sleeper sharks.
- Life history and demographic studies of spiny dogfish: AFSC scientists examined the basic life history of a lightly exploited stock of spiny dogfish in the GOA to establish a baseline for future comparison and to provide critical information for stock assessments. The delayed age of maturity, low natural mortality, and low rates of reproduction imply that only very low rates of fishing mortality are sustainable. Demographic models may be an appropriate alternative to cohort analysis for sharks due to their life history. A study on spiny dogfish suggested that the stage-based model is an appropriate substitute for the age-based model.[32]
- Pelagic shark nursery grounds: Pelagic shark biology, movements, and abundance studies in the NEFSC continued in 2011 with further investigations of pelagic nursery grounds in collaboration with the high seas commercial longline fleet.
- Cooperative Atlantic States Shark Pupping and Nursery (COASTSPAN) program: Comprehensive and standardized investigations of coastal shark nursery habitat have been completed in Atlantic coastal waters from Florida to Massachusetts and in the U.S. Virgin Islands by the NEFSC and Atlantic coastal state agencies and universities. COASTSPAN surveys are used to describe habitat preferences and to determine the relative abundance, distribution, and migration of shark species through longline and gillnet sampling and mark-recapture data. Standardized indices of abundance from COASTSPAN surveys are used in the

[30] Available at http://onlinelibrary.wiley.com/doi/10.1111/j.1095-8649.2012.03261.x/pdf
[31] Available at http://spo.nmfs.noaa.gov/tm/tm82.pdf
[32] Available at http://www.publish.csiro.au/?act=view_file&file_id=MF11062.pdf

stock assessments for large and small coastal sharks. The juvenile sandbar shark population in Delaware Bay is also surveyed as part of the COASTSPAN program.[33]

- Galapagos shark life history: A collaborative study between NEFSC, University of Massachusetts, and the Massachusetts Division of Marine Fisheries (MDMF) on the life history and ecological role of the Galapagos shark in Bermuda will investigate size-at-age and age-at-maturity estimates as well as trophic position and diet shifts.
- White shark age study: White shark vertebrae, collected by the NEFSC since 1963, were used for an age study in 2011 in collaboration with MDMF. Vertebrae were analyzed and in most cases the age estimates were validated.
- Dusky shark age and growth: A revision of the age and growth of the dusky shark with the NEFSC and SEFSC using 150 new vertebrae indicated that preliminary growth curves were similar to previous estimates.
- Bull shark age study: In 2011, the NEFSC, in collaboration with the Florida Fish and Wildlife Conservation Commission, collected vertebrae from 124 bull sharks and processed them for age studies.
- Sand tiger shark age study: The NEFSC is using bomb radiocarbon analysis of sand tiger vertebrae from the North Atlantic and South Indian Oceans to validate growth band periodicity and longevity. These results will provide new estimates of age at maturity and longevity to update the productivity for this species.
- Sandbar shark ageing study: Results from a NEFSC bomb radiocarbon and tag-recapture dating study to determine valid age-estimation criteria and longevity estimates for the sandbar shark indicate that current age interpretations based on counts of growth bands in vertebrae are accurate to 10 or 12 years. Beyond these years, bomb radiocarbon and tag-recapture data show that large adult sharks were considerably older than the estimates derived from counts of growth bands.
- Sandbar shark trophic study: Results from NEFSC from the non-lethal stomach eversion technique for sandbar sharks show great promise for trophic studies. This technique was considered effective at limiting sampling mortality based on tag and recapture of everted sharks.
- Cooperative Shark Tagging Program: The NEFSC Cooperative Shark Tagging Program (CTSP) provides information on distribution, movements, and essential fish habitats for shark species in U.S. Atlantic and Gulf of Mexico waters. The total number of tags through 2011 was 230,000 sharks tagged of more than 50 species and 13,600 sharks recaptured of 33 species.[34]
- Blacktip shark movement patterns: Mark/recapture data from the NEFSC CSTP were summarized for blacktip shark in the Gulf of Mexico for SEDAR 29. No blacktip sharks in this study moved between the Gulf of Mexico and the Atlantic or Caribbean. Similarly, there was no evidence of exchange between the eastern and western Gulf of Mexico.
- Scalloped hammerhead shark movement patterns: NEFSC analyzed scallop hammerhead mark/recapture data from the CTSP to investigate movement patterns and habitat selection as well as the possible role that gender and age may play in determining these characteristics.
- Temporal changes in diet between shark species: Using the food habits data collected by the NEFSC Apex Predators Program over the past 38 years, temporal changes are being

[33] Available at http://na.nefsc.noaa.gov/sharks/coastspan.html
[34] Available at http://na.nefsc.noaa.gov/sharks/tagging.html

examined in prey species, taxonomic and ecological prey groups, and overall trophic levels for blue and shortfin mako sharks. Indices of standardized diet composition are being analyzed to identify changes in the prey species consumed, and then related to temporal changes in the distribution and abundance of those prey items.

- Habitat use and movement patterns of smalltooth sawfish: Using a synthesis of data from tags across multiple institutional programs, including SEFSC, movements and habitat use of endangered smalltooth sawfish were determined for animals from southern Florida to the Bahamas.[35]
- Elasmobranch feeding ecology: Studies are currently underway at the SEFSC describing the diet and foraging ecology, habitat use, and predator-prey interactions of multiple shark species caught by commercial longline gear, including dusky, sandbar, silky, and tiger sharks. This study will test the hypothesis that diet studies based on longline-caught animals could be biased due to longline depredation.
- Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey: The SEFSC manages and coordinates a survey of coastal bays and estuaries from Florida to Louisiana that identify the presence or absence of neonate and juvenile sharks and attempt to quantify the relative importance of each area as it pertains to essential fish habitat. The tagging database includes over 10,000 tagged animals and 205 recaptured animals.[36]
- Life history studies of elasmobranchs: In the SEFSC, age, growth, and reproduction of blacktip sharks in the Gulf of Mexico were reanalyzed for SEDAR 29.[37] Data were collected from over 750 sharks during 2006-2011. Age, growth, and reproduction for the finetooth shark are being examined in anticipation of a stock assessment. Research with PIFSC to validate ageing on sand tiger sharks began in 2011. Endangered smalltooth sawfish were aged by counting opaque bands in sectioned vertebrae.
- Molecular shark species identification: The NOAA Center for Coastal Environmental Health and Biomolecular Research conducts research on suitable molecular markers for identification of shark species. DNA identifications can be used to determine whether prohibited species are found among fish that are not landed intact as well as the identity of dried, processed fins. Research into a smaller DNA fragment to increase success in identifying highly processed fins is ongoing. Sample collection and research to expand the number and range of shark species sequenced for the diagnostic DNA fragment is continuing.[38]

Incidental catch reduction

- Shark bycatch in Hawaii-based longline fisheries: Large pelagic sharks, particularly blue sharks, are the majority of bycatch in pelagic gillnets and longline fisheries targeting swordfish. PIFSC deploys tags on pelagic sharks caught in commercial longline fisheries to determine species-specific movement patterns and survival after release from fishing gear. Analysis of tags showed species-specific depth and temperature ranges. This knowledge

[35] Available at http://onlinelibrary.wiley.com/doi/10.1002/aqc.2382/pdf
[36] Available at http://www.sefsc.noaa.gov/labs/panama/species/shark/research/essential1.htm
[37] Available at http://www.sefsc.noaa.gov/sedar/download/S29_GOM%20blacktip%20report_SAR_final.pdf?id=DOCUMENT
[38] Available at http://www.chbr.noaa.gov/par/eg_molecular_identification.aspx

could allow targeting of longline gear to create mismatches between hook depth and the sharks' habitat.[39]

- Reducing longline shark bycatch: Researchers at PIFSC have undertaken several projects to address shark bycatch on longlines. The use of large circle hooks instead of conventional tuna hooks in the world's pelagic tuna longline fleets has displayed conservation potential for some highly migratory species.[40]
- Electromagnetic deterrents to bycatch: One potential strategy to reduce incidental capture of sharks is to exploit the unique electrosensory system of sharks, which are capable of detecting weak electric fields. PIFSC studied scalloped hammerhead, sandbar, and tiger sharks and, with the SWFSC, mako and blue sharks. In the Eastern Tropical Pacific off Ecuador studies targeted thresher, silky, and scalloped hammerhead sharks. The results suggest that there are inter-specific differences regarding the effects of lanthanide metal on catch rates.[41]
- Visual cues to reduce shark bycatch: A new PIFSC project has been initiated that investigates the effects of visual cues on the catch composition of coastal gillnets in Baja California. Preliminary results show that UV illumination of gillnets significantly reduces the catch rates of sharks and other elasmobranchs.
- Testing deep longline gear: The SWFSC has been conducting tests to target swordfish using deep-set longline gear off California at depths below 200 m. These deeper depths coincide with the daytime distribution of swordfish, putting hooks below the epipelagic waters inhabited by sea turtles and shortfin mako sharks. During the first test of the deep-set longline no shortfin mako sharks were caught and 96% of blue sharks caught were released alive.

Post-release survival

- Satellite tagging of oceanic whitetip, bigeye thresher, shortfin mako, and blue sharks: Satellite tagging studies have been used to investigate post-release mortality of animals. PIFSC tag reporting rates were highest in oceanic whitetip, followed by shortfin mako and bigeye thresher. Meta-analysis on blue shark mortality indicated the summary effect of post-release mortality from longline gear was 15%, and suggested that catch-and-release longline fisheries can be a viable management tool to protect parental biomass in shark populations. Studies also demonstrated a high rate of post-release survival of pelagic sharks captured and released from longline gear fished with circle hooks.[42]
- Recreational fishery for common thresher shark: To examine post-release mortality associated with the recreational fishery, SWFSC is deploying satellite tags on common thresher sharks captured using fishery standard techniques and released with trailing gear. The final phase of the research will quantify hooking mortality rates associated with sharks being hooked in the mouth rather than by the tail.
- Blue sharks released from the California drift gillnet fishery: In 2007, the SWFSC and Southwest Regional Office (now the West Coast Regional Office) began deploying satellite tags on sharks released from the drift gillnet fishery to assess survivorship. Records suggest

[39] Available at http://www.soest.hawaii.edu/PFRP/reprints/FISH2730.pdf
[40] Available at http://www.pifsc.noaa.gov/tech/NOAA_Tech_Memo_PIFSC_16.pdf
[41] Available at http://ac.els-cdn.com/S0165783612002123/1-s2.0-S0165783612002123-main.pdf?_tid=17b23344-27bc-11e3-b752-00000aab0f02&acdnat=1380317635_61f0d3df6e5ece57894b9e31a221c7db
[42] Available at http://www.soest.hawaii.edu/PFRP/reprints/1094musyl.pdf

that all animals survived the acute effects of capture in the fishery. Temperature, depth, and movement data demonstrated behavior of blue sharks that was similar to that reported in other studies.

- Physiological effects of capture stress: Ongoing cooperative studies with the NEFSC examine shark migratory routes, potential nursery areas, swimming behavior, and environmental associations. Secondarily, these studies can assess the physiological effects of capture stress and post-release recovery in commercially and recreationally captured sharks. The studies use blood and muscle sampling methods coupled with acoustic tracking and satellite tags to quantify the magnitude and impacts of capture stress. Electronic tagging studies include porbeagle, shortfin mako, blue, sand tiger, dusky, and tiger sharks.
- Capture depth, time, and hooked survival rate for bottom longline caught scalloped hammerhead shark: Scalloped hammerheads suffer from high hooking mortality. Experiments by the SEFSC began in 2011 to determine the relationship between soak time and capture depth on fishing mortality and CPUE of scalloped hammerhead sharks using hook timers and time-depth recorders. Results from the study will provide critical information for fishery managers to rebuild this species.
- The effect of circle hooks on shark catchability, at-vessel mortality, and post-release survival rates in bottom longline fisheries: Over the last few years, a growing number of studies have investigated the use of circle hooks and their effects on a range of species, including sharks. To assess the potential effect of a change from J hooks to circle hooks in the shark bottom longline fishery, SEFSC is conducting controlled experiments testing the catchability and mortality rates of sharks caught on J vs. circle hooks. Post-release survivorship is assessed by tagging sharks with a satellite pop-up archival transmitting tag.

Alternate fishing practices to reduce mortality of dusky shark in longline fisheries

SEFSC has been conducting a series of experiments using commercial fishing vessels participating in the Shark Research Fishery to investigate methods to reduce at-vessel mortality of dusky shark, a prohibited species. Preliminary results suggest that soak time is longer than the tolerance of dusky sharks to longline fishing. These preliminary results reflect the potential of bycatch mortality rates to influence already depleted populations, and these results could be used to propose regulations on longline soak time that could aid in population recovery of this species.

Additional information on U.S. research activities on shark conservation and management can be found in NMFS' annual Shark Finning Report to Congress.[43]

[43] Available at http://www.nmfs.noaa.gov/sfa/domes_fish/fisheries_news.htm#sharkfinning

Outreach and Education Efforts

The United States, through NMFS, has a number of education and outreach activities that are completed or ongoing, including shark identification guides, regulation compliance guides, a live-release program, and international capacity building.

- NMFS, together with Rhode Island Sea Grant, published a "Guide to Sharks, Tunas, and Billfishes of the U.S. Atlantic and Gulf of Mexico." They also produced identification placards for pelagic sharks and ridgebacks[44] and non-ridgebacks and hammerheads.[45]
- Since 2008, the NMFS Offices of International Affairs and Science and Technology have provided observer training in Ghana, Senegal, Gabon, and Liberia. As part of these workshops a one-day elasmobranch identification training session is given to all attendees. Shark identification guides specific to West Africa are distributed and attendees are trained with specimens to use the identification guide.[46] Finally, observers are instructed on measurement and biological sampling techniques; workshop attendees are also shown how to remove spines or vertebrae for ageing, gonads for reproductive analysis, and stomachs for diet studies.
- From 2008 to 2010, the United States worked cooperatively with governments in the eastern Pacific Ocean to hold three regional workshops to improve shark conservation and management efforts. Workshop attendees included representatives from 15 countries in Central and South America. Topics covered in the workshops included review of each country's NPOA-Sharks, import/export trends in the shark fin trade, national laws prohibiting finning, identification of data and data needs in order to develop stock assessment estimates for several key shark species, and agreement on a set of minimum data collection protocols for countries' respective sampling programs.
- In 2010, NMFS identified basking sharks in the eastern North Pacific as a species of concern. In response, the SWFSC initiated a basking shark research program. One of the goals of the program is to improve national sightings information by developing a sightings website[47] and an education and outreach program centered around Monterey Bay, California.

Live release of shortfin mako sharks: interactive map and smartphone app for fishermen

In 2011, staff from the HMS Management Division began an outreach effort to encourage the live release of shortfin mako sharks, which are experiencing overfishing. To support this outreach effort, NMFS produced postcard-size mailers to send out to shark permit holders and shark tournament operators. In addition, NMFS staff developed an online live-release map where fishermen can post coordinates and pictures of where they have released a live shortfin mako shark.[a] Fishermen can also download a free smartphone app, Release Mako, to report live releases while still on the water.

[a] Available at http://www.nmfs.noaa.gov/sfa/hms/shortfinmako/Map/index.htm

[44] Available at http://seagrant.gso.uri.edu/z_downloads/bookstore_sharkplacard1.pdf
[45] Available at http://seagrant.gso.uri.edu/z_downloads/bookstore_sharkplacard2.pdf
[46] Available at http://www.st.nmfs.noaa.gov/st4/nop/trainingmanuals/Westobserver/SharkID_form_v1.2_A4.pdf
[47] Available at http://psrc.mlml.calstate.edu/current-research/basking-shark/report-a-sighting/

- In 2011, the NMFS HMS Management Division developed an outreach brochure detailing safe catch and release techniques to maximize post-release survival of HMS, including sharks.[48]
- In 2011, the NEFSC published a booklet for recreational shark fishermen detailing tagging and recapture instructions, catch and release guidelines, research results, length and weight information, management regulations, and contact websites and telephone numbers.[49] The booklet, tags, identification guides, and placards are made available to the fishing public and are also mailed to NMFS Cooperative Shark Tagging Program participants.
- The West Coast Regional Office and the SWFSC collaborated on public outreach toward the development of alternative fishing methods that reduce post-release mortality of thresher sharks. This collaboration continued in 2011 with two seminars offered that provided over 200 recreational fishermen with a thorough review of thresher shark life history, reproductive biology, history of the fishery, fishing tactics, current fisheries management, and possible ways to improve current practices. Seminars also focused specifically on the development of techniques that reduce trailing gear in sharks that are hooked in the tail but not landed. In addition, the NOAA Ocean Media Center released an outreach video on "Sustainable sport fishing for thresher sharks."[50]
- In 2013, the NOAA Ocean Media Center produced videos on "Shark conservation and the NESFC Apex Predators Program" and "Sharks: best fishing practices for catch and release," among others topics.[51]
- The SEFSC provides outreach and information to the media on shark biology and guidelines to avoid encounters with sharks through interviews and online chats. In 2012, SEFSC scientists were featured in an "Ask a Shark Scientist" question and answer forum during the Discovery Channel's Shark Week. SEFSC scientists also provided live updates of ongoing research to determine movements of sawfish in the Bahamas. Daily posts were posted on Facebook and Twitter with video footage of the day's research activities. Scientists from SWFSC and NEFSC participated in "Ask the Experts" during Shark Week 2013.
- In 2013, the SEFSC released a guide titled "Visual identification of fins from common elasmobranchs in the northwest Atlantic Ocean."[52]
- In 2013, NMFS updated Atlantic HMS Fishery Compliance Guides for recreational and commercial fishermen and dealers.[53]
- In 2013, NMFS completely revised the shark identification placard for the recreational fishery of the U.S. Atlantic and Gulf of Mexico so that it includes more information on how to identify which sharks can or cannot be landed.[54]

Additional information on U.S. outreach and education efforts for shark conservation and management can be found in NMFS' annual Shark Finning Report to Congress.[55]

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[48] Available at http://www.nmfs.noaa.gov/sfa/hms/Compliance_Guide/Careful_release_brochure.pdf
[49] Available at http://na.nefsc.noaa.gov/sharks/cstpbooklet.pdf
[50] Available at http://vimeo.com/35645550
[51] Available at http://vimeo.com/noaaomc
[52] Available at http://www.nmfs.noaa.gov/sfa/hms/sharks/2013/abercrombie_et_al_fin_guide_noaa_tech_memo_643.pdf
[53] Available at http://www.nmfs.noaa.gov/sfa/hms/Compliance_Guide/index.htm
[54] Available at http://www.nmfs.noaa.gov/sfa/hms/sharks/2008/Rec_shark_ID_placard.pdf
[55] Available at http://www.nmfs.noaa.gov/sfa/domes_fish/fisheries_news.htm#sharkfinning

International Fishery Management Measures

The United States continues to promote global shark conservation and management by supporting the development and implementation of international agreements consistent with domestic laws. The United States also works within regional and international bodies, and bilaterally with international partners, to develop and promote conservation and management measures for sharks.

The United States participates in bilateral discussions with foreign governments and entities on issues relating to international shark conservation and management. In these bilateral consultations, the United States emphasizes the need to enhance collection and exchange of information and makes requests for data such as shark and shark fin landings, transshipping activities, and trade. In addition, the United States encourages other countries to implement the IPOA-Sharks by finalizing and implementing their own NPOAs.

Additionally, the NMFS SWFSC and West Coast Regional Office work with the Mexican Centro de Investigación Científica y de Educación Superior de Ensenada to conduct data collection for blue, shortfin mako, and thresher sharks throughout Baja California, as well as help advance cooperative stock assessment efforts. The first U.S.-Mexico collaborative shark stock assessment, for the common thresher shark, was completed in 2012.

The United States works to address shark conservation and management in the following regional fisheries management organizations (RFMOs) and international programs:

- Northwest Atlantic Fisheries Organization (NAFO)
- Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)
- Inter-American Tropical Tuna Commission (IATTC)
- International Commission for the Conservation of Atlantic Tunas (ICCAT)
- Western and Central Pacific Fisheries Commission (WCPFC)
- Indian Ocean Tuna Commission (IOTC)
- South East Atlantic Fisheries Organization (SEAFO)
- General Fisheries Commission for the Mediterranean (GFCM)
- North East Atlantic Fisheries Commission (NEAFC)
- Commission for the Conservation of Southern Bluefin Tuna (CCSBT)
- Treaty on Fisheries Between the Governments of Certain Pacific Island States and the Government of the United States of America (South Pacific Tuna Treaty)
- International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC)
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
- FAO Committee on Fisheries (COFI)
- United Nations General Assembly (UNGA)
- Convention on the Conservation of Migratory Species of Wild Animals (CMS)
- International Union for Conservation of Nature (IUCN)
- World Summit on Sustainable Development
- International Council for the Exploration of the Sea (ICES)

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

Northwest Atlantic Fisheries Organization

In 2004, NAFO became the first RFMO in the world to establish a catch limit for a directed elasmobranch fishery. In 2005, NAFO adopted a ban on shark finning in all NAFO-managed fisheries and mandated the collection of information on shark catches. In 2006, a U.S.-Japan proposal for improving elasmobranch data collection was adopted. In 2011, the NAFO Fisheries Commission adopted revisions to its bycatch reporting provisions to require that all sharks be reported at the species level, to the extent possible. In 2013, the United States co-sponsored a proposal calling for all sharks that are retained to be landed with their fins naturally attached, which was not adopted.

Commission for the Conservation of Antarctic Marine Living Resources

In 2006, CCAMLR adopted a conservation measure prohibiting directed fishing on shark species in the Convention Area, other than for scientific research purposes. It also agreed that any bycatch of sharks, especially juveniles and gravid females, taken accidentally in fisheries, shall, as far as possible, be released alive. In 2011 and again in 2013, the United States proposed a prohibition on shark finning in the CCAMLR Convention Area, calling for all sharks that are retained to be landed with their fins naturally attached. Consensus has not yet been reached on this proposal.

Inter-American Tropical Tuna Commission

In 2010 and 2011, the IATTC convened three technical meetings to discuss conservation, management, research, and stock assessments of sharks under the Antigua Convention. NOAA scientists are contributing to ongoing work on silky shark stock structure in the eastern Pacific Ocean and participating in the assessment efforts. In 2011, Resolution C-11-10 on the Conservation of Oceanic Whitetip Sharks Caught in Association with Fisheries in the Antigua Convention Area was approved. The resolution prohibits retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in the fisheries covered by the Antigua Convention. In addition, vessels will promptly release unharmed, to the extent practicable, oceanic whitetip sharks.

International Commission for the Conservation of Atlantic Tunas

In 2004, ICCAT adopted a recommendation that prohibits finning by requiring full utilization of sharks caught in association with ICCAT fisheries and specifying that the total weight of shark fins onboard a vessel must not exceed 5% of the total carcass weight. This measure also requires all parties to annually report catch and effort data for sharks, in accordance with ICCAT data reporting procedures. In 2008, ICCAT adopted two shark-related proposals: the first called for ICCAT and ICES to coordinate the assessment of porbeagle sharks, which occurred in June 2009; the second measure requires the release of bigeye thresher sharks caught in association with fisheries managed by ICCAT and that are still alive when brought to the vessel. In 2009, ICCAT adopted a recommendation prohibiting retention of bigeye thresher sharks with the

exception of a small-scale Mexican coastal fishery. In 2010, the United States proposed a cap on North Atlantic shortfin mako landings. Instead, the Commission adopted a measure that reinforces existing requirements to reduce mortality on the North Atlantic stock and requires reporting on actions taken in this regard for review by the Compliance Committee. Also in 2010, ICCAT adopted a measure that prohibits retention of oceanic whitetip sharks caught in association with ICCAT fisheries and a measure to prohibit retention of all species of hammerhead sharks (with the exception of bonnethead sharks) that are caught in association with ICCAT fisheries, with limited exceptions for developing countries that rely on sharks for local consumption. In 2011, ICCAT adopted a recommendation, co-sponsored by the United States, which requires the release of silky sharks caught in association with ICCAT fisheries as well as the prohibition of retention on board, transshipment, and landing of the species. At each annual meeting since 2009, the United States has co-sponsored a proposal to require that all sharks caught in association with ICCAT fisheries be landed with their fins naturally attached. Consensus has not yet been reached on this proposal, although support has been increasing.

Since 2008, the ICCAT Standing Committee on Research and Statistics (SCRS) has conducted stock assessments of Atlantic shortfin mako, blue, and porbeagle sharks. In 2012, the SCRS Shark Working Group conducted a stock assessment of shortfin mako. The North Atlantic and South Atlantic stocks of shortfin mako are not overfished and overfishing is not occurring; however, there was a high degree of uncertainty in the results of the stock assessment. The Shark Working Group also completed an updated and extended Ecological Risk Assessment (ERA) of 15 Atlantic pelagic sharks and one ray species (20 stocks in total). The ERA indicated that the five stocks with lowest productivity are the bigeye thresher, sandbar, longfin mako, night, and South Atlantic silky shark; whereas the highest susceptibility (to pelagic longline fisheries) corresponded to shortfin mako, North and South Atlantic blue sharks, porbeagle, and bigeye thresher.

Western and Central Pacific Fisheries Commission

In 2006, WCPFC adopted a measure for the conservation and management of sharks. In 2008, WCPFC adopted a U.S. proposal to modify and strengthen the 2006 measure. Commission Members, Cooperating non-Members, and participating Territories (CCMs) must report annually regarding their retention and discards of total shark catches as well as their annual catch and effort by gear type for the following key shark species: blue, oceanic whitetip, mako, thresher, and silky sharks (added in 2009), and porbeagle and hammerhead sharks (added in 2010). In 2011, the Commission adopted a U.S. proposal to ban the retention of oceanic white tip sharks and in 2012 the Commission adopted an Australian proposal to prohibit knowingly setting a purse seine net in the vicinity of a whale shark. Stock assessments have been recently completed by the Commission's science provider on oceanic white tip and silky sharks. In December 2013, the WCPFC adopted a European Union proposal to ban the retention of silky sharks.

Joint Meeting of the Tuna RFMOs

At the third joint meeting (Kobe III) in 2011, during discussions of the Bycatch Joint Technical Working Group, sharks emerged as a key issue for immediate consideration within RFMOs, including ecological risk assessment, stock assessment, and bycatch. Participants noted that the issue was broader than by-catch and needed to acknowledge that full stock assessments should

be conducted for those shark species where data are available. For those species lacking data, precautionary, science-based conservation and management measures should be taken for sharks in fisheries within each tuna RFMO, including as appropriate: (1) measures to improve the enforcement of existing finning bans; (2) prohibitions on retention of particularly vulnerable or depleted shark species, based on advice from scientists and experts; (3) concrete management measures in line with best available scientific advice with priority given to overfished populations; (4) precautionary fishing controls on a provisional basis for shark species for which there is no scientific advice; and (5) measures to improve the provision of data on sharks in all fisheries and by all gears. The Working Group, with WCPFC and ICCAT taking the lead, also agreed to harmonize guidance for shark identification, in collaboration with the IUCN shark specialist group and others. The Working Group noted that sharks (as well as other elasmobranchs such as skates and rays) are often targeted as well as taken as incidental catch, and that further discussion on sharks should be in the context of the seven Kobe recommendations on sharks.

International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean

In 2010, the ISC Plenary established a new Shark Working Group responsible for conducting stock assessments and other scientific studies as required on sharks. The working group will focus on North Pacific fisheries for shark catch and bycatch, particularly for blue, shortfin mako, bigeye thresher, pelagic thresher, silky, oceanic whitetip, hammerhead, and any other shark species for which stock assessments may be needed. Scientists from NMFS SWFSC and PIFSC were nominated to work with other international scientists and the ISC Chairman in organizing the first meeting of the working group.

Food and Agriculture Organization of the United Nations Committee on Fisheries

In 2010, FAO convened a joint workshop between FAO and CITES to review the application and effectiveness of international regulatory measures for the conservation and sustainable use of elasmobranchs. The workshop was attended by experts from different geographic areas and sectors, including two NMFS representatives. The workshop outlined the strengths and weaknesses of the various types of regulatory measures and regulations and discussed their effectiveness with regard to implementation and stock recovery, as well as their impact on fisheries, livelihood, food security, markets and trade, and government administrations. Further, at the 2012 Session of COFI, FAO presented a report on the extent of the implementation of the IPOA-Sharks and the challenges being faced by Members in implementing the instrument, and the Committee called for further analysis on the implementation.

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

Whale sharks, great white sharks, and basking sharks are listed in Appendix II of CITES as species that may become threatened with extinction unless trade is subject to regulation. In 2007, the United States successfully proposed that sawfishes be listed in Appendix I, thus banning commercial trade in sawfish and sawfish products, with the exception of largetooth sawfish. Largetooth sawfish is listed in Appendix II for the exclusive purpose of allowing international trade in live animals to appropriate and acceptable aquaria for primarily conservation purposes. In 2010, The United States developed and submitted proposals to add the oceanic whitetip,

dusky, sandbar and scalloped hammerhead sharks (with great hammerhead and smooth hammerhead shark as look-alike species) to Appendix II of CITES. However, the proposals were not adopted.

Historic protection for sharks and rays under CITES

In 2013, CITES Parties agreed to list several commercially-harvested shark species in Appendix II of CITES for the first time. The United States joined Brazil in co-sponsoring a proposal by Colombia to list oceanic whitetip shark in Appendix II of CITES. The United States also supported proposals introduced to list porbeagle shark and scalloped hammerhead shark (with great hammerhead and smooth hammerhead shark as look-alike species) in Appendix II. All three shark proposals were adopted. Proposals were also adopted to list manta rays in Appendix II and transfer freshwater sawfish from Appendix II to Appendix I. A decision was also adopted directing the CITES Secretariat to establish a working group with the range States to gather information on the management status and trade of freshwater stingrays, and encourage States to participate in research and monitoring programs.

United Nations

Based on language proposed by the United States, the United Nations General Assembly adopted, by consensus, language in its annual Sustainable Fisheries Resolutions calling upon States and RFMOs to consider adopting measures requiring that sharks be landed with fins naturally attached and language calling upon States and RFMOs to adopt measures for the collection of species specific biological and trade data for sharks. The United States also worked with other countries to propose and successfully adopt language and recommendations regarding reducing bycatch and discards of sharks and continues to work within the UNGA process to develop specific calls to States and RFMOs to strengthen conservation and management measures for sharks.

The United States was successful in negotiating language for the conservation and management of sharks at the United Nations resumed Review Conference for the Implementation of the UN Fish Stocks Agreement in 2010. Specifically, the resumed Review Conference recommended that States and regional economic integration organizations, individually and collectively through regional fisheries management organizations or arrangements, strengthen the conservation and management of sharks. Discussions are underway to plan a second resumed Review Conference.

Convention on the Conservation of Migratory Species of Wild Animals

In 2010, the United States, along with 10 other States, signed a global Memorandum of Understanding (MOU) for Migratory Sharks under the auspices of the Convention on Migratory Species. There are currently 27 Signatories- 26 national governments and the European Union. The MOU aims to coordinate international action on the threats faced by sharks and works to improve their species conservation status. The MOU came into effect March 1, 2010, and it initially covers great white, basking, whale, porbeagle, shortfin mako, longfin mako, and the Northern Hemisphere population of spiny dogfish; more species can be added later. The first

meeting of the Signatories to the MOU was held in Bonn, Germany, in September 2012. At that meeting the Signatories adopted, among other items, a Conservation Plan for the MOU. Two working groups were established during the meeting, an Intersessional Working Group and an Advisory Committee, and representatives from the United States were elected as Chairs for each working group.

Additional information on U.S. engagement in international shark conservation and management can be found in NMFS' annual Shark Finning Report to Congress.[56]

[56] Available at http://www.nmfs.noaa.gov/sfa/domes_fish/fisheries_news.htm#sharkfinning

Status of Shark Stocks

For 2013, in United States fisheries, only three out of thirty-four shark stocks or stock complexes (9%) were subject to overfishing and only five shark stocks (15%) were overfished (Table 1). However, continued research is needed to assess shark stocks, as twenty shark stocks or stock complexes (59%) had an unknown or undefined status in terms of their overfishing status and nineteen shark stocks or stock complexes (56%) had an unknown or undefined status in terms of their overfished status (Table 1). Two species, Atlantic sharpnose and bonnethead sharks, are listed as unknown because they are currently being assessed.

Future Initiatives for Further Conservation and Management of Sharks

Consistent with the provisions of the Shark Finning Prohibition Act and Shark Conservation Act, the United States continues to be active in promoting development of international agreements consistent with the Acts. Recommendations are brought forward through bilateral and international efforts. As agreements are developed, the United States implements those agreements through developing domestic regulations for shark management. Among other efforts, the United States perseveres in this work by proposing and supporting measures in a number of RFMOs requiring sharks to be landed with their fins naturally attached.

The United States will support future domestic initiatives in shark conservation and management through, inter alia, stock assessments and science-based recommendations on management carried out by NMFS Fisheries Science Centers and Fishery Management Councils. These groups look to the most current information available to make prudent decisions for the sustainability of shark populations. Recommendations will be informed by research activities and observer programs in the United States and international organizations. Fishery Management Plans are continually evolving to capture the present status of shark stocks.

Research activities are ongoing in the United States to better understand the biology of sharks and how they are affected by fishing, as highlighted in this report. Although significant advancements have been made in several important areas of research, more information is needed to ensure the sustainability of U.S. shark stocks. Monitoring and stock assessments should be conducted continuously for effective management. Fishing methods and gear should be evaluated for specificity and impacts on sharks. Gaps should be filled in our knowledge of the life histories of many shark species. There should be an improved understanding of the influence on sharks of changes in the environment and food web. Scientists in the NMFS Fisheries Science Centers will continue their collaborations with domestic and international partners, to analyze data collected, compile time series and databases, and conceive of new research projects.

In addition, outreach and education initiatives will inform commercial and recreational fishers, as well as the general public. The United States will also continue to support capacity building in a number of developing countries. Outreach efforts will advance along with technology, as evidenced by the use of interactive websites, smartphone apps, and internet videos. As new research results are released, new data collection needs are identified, and new management measures are implemented, NMFS will continue its practice of educating the public so they can better support shark conservation and management.

Table 1.Status of shark stocks and stock complexes in U.S. fisheries in 2013.
Source: NMFS 2013.

Status of Shark Stocks and Stock Complexes in U.S. Fisheries in 2013				
Fishery Management Council (FMC)	**Fishery Management Plan (FMP) or Fishery Ecosystem Plan (FEP)**	**Stock or Stock Complex**	**Overfishing**	**Overfished**
New England FMC & Mid Atlantic FMC	Spiny Dogfish FMP	Spiny dogfish – Atlantic coast	No	No
NMFS Highly Migratory Species Division	Consolidated Atlantic Highly Migratory Species FMP	Atlantic large coastal shark complex[A]	Unknown	Unknown
		Atlantic pelagic shark complex[B]	Unknown	Unknown
		Atlantic sharpnose shark[C]	Unknown	Unknown
		Atlantic small coastal shark complex[D]	No	No
		Blacknose shark – Atlantic[C]	Yes	Yes
		Blacknose shark – Gulf of Mexico[C]	Unknown	Unknown
		Blacktip shark – Gulf of Mexico[E]	No	No
		Blacktip shark –Atlantic[E]	Unknown	Unknown
		Blue shark – Atlantic[F]	No	No
		Bonnethead – Atlantic[C]	Unknown	Unknown
		Dusky shark – Atlantic[G]	Yes	Yes
		Finetooth shark – Atlantic[C]	No	No
		Porbeagle – Atlantic[F]	No	Yes
		Sandbar shark – Atlantic[E]	No	Yes
		Scalloped hammerhead shark – Atlantic[E]	Yes	Yes
		Shortfin mako – Atlantic[F]	No	No
Pacific FMC	Pacific Coast Groundfish FMP	Leopard shark – Pacific Coast	Unknown	Unknown
		Spiny dogfish – Pacific Coast	Unknown	No
		Soupfin (Tope)- Pacific Coast	Unknown	Unknown
Pacific FMC & Western Pacific FMC	U.S. West Coast Fisheries for Highly Migratory Species &Pacific Pelagic FEP	Thresher shark – North Pacific	Unknown	Unknown
		Shortfin mako shark – North Pacific	Unknown	Unknown
		Blue shark – North Pacific	No	No
Western Pacific FMC	FEP for Pelagic Fisheries of the Western Pacific Region (Pacific Pelagic FEP)	Longfin mako shark – North Pacific	Unknown	Unknown
		Oceanic whitetip shark – Tropical Pacific	Unknown	Unknown
		Salmon shark – North Pacific	Unknown	Unknown
		Silky shark – Tropical Pacific	Unknown	Unknown

Fishery Management Council (FMC)	Fishery Management Plan (FMP) or Fishery Ecosystem Plan (FEP)	Stock or Stock Complex	Overfishing	Overfished
Western Pacific FMC	Hawaiian Archipelago FEP	Hawaiian Archipelago Coral Reef Ecosystem Multi-Species Complex[H]	Unknown	Unknown
Western Pacific FMC	American Samoa FEP	American Samoa Coral Reef Ecosystem Multi-Species Complex[H]	Undefined	Undefined
Western Pacific FMC	Mariana Archipelago FEP	Guam Coral Reef Ecosystem Multi-Species Complex[H]	Undefined	Undefined
		Northern Mariana Islands Coral Reef Ecosystem Multi-Species Complex[H]	Undefined	Undefined
Western Pacific FMC	Pacific Remote Islands Areas FEP	Pacific Island Remote Areas Coral Reef Ecosystem Multi-Species Complex[I]	Undefined	Undefined
North Pacific FMC	Gulf of Alaska Groundfish FMP	Gulf of Alaska Shark Complex[J]	Unknown	Undefined
North Pacific FMC	Bering Sea/Aleutian Island Groundfish FMP	Bering Sea / Aleutian Islands Shark Complex[K]	Unknown	Undefined
Totals:			3 "yes" 9 "no" 18 "Unknown" 4 "Undefined"	5 "yes" 8 "no" 15 "Unknown" 6 "Undefined"

[A]In addition to sandbar shark, Gulf of Mexico blacktip shark, Atlantic blacktip shark, and scalloped hammerhead shark (which are assessed individually), the Large Coastal Shark Complex also consists of additional stocks including spinner shark, silky shark (authorized in the commercial fishery but not the recreational fishery), bull shark, tiger shark, lemon shark, nurse shark, great hammerhead shark, and smooth hammerhead shark.

[B]In addition to shortfin mako shark, blue shark, and porbeagle shark (which are assessed individually), the Pelagic Shark Complex also consists of oceanic whitetip shark and thresher shark.

[C]This stock is part of the Small Coastal Shark Complex, but is assessed separately. Atlantic sharpnose and bonnethead sharks are currently undergoing an assessment.

[D]The Small Coastal Shark Complex consists of finetooth shark, Atlantic sharpnose shark, blacknose shark, and bonnethead shark.

[E]This stock is part of the Large Coastal Shark Complex, but it is assessed separately

[F]This stock is part of the Pelagic Shark Complex, but is assessed separately.

[G] In addition to dusky shark, the prohibited species under the 2006 Consolidated Atlantic HMS FMP include whale, basking, sand tiger, bigeye sand tiger, white, night, bignose, Galapagos, Caribbean reef, narrowtooth, longfin mako, bigeye thresher, sevengill, sixgill, bigeye sixgill, Caribbean sharpnose, smalltail, and Atlantic angel sharks. These species cannot be retained in Atlantic or Gulf of Mexico commercial or recreational fisheries.

[H]In 2009, the Western Pacific Crustaceans, Bottomfish & Seamount Groundfish, Precious Corals, and Coral Reef Ecosystem FMPs were replaced by FEP for American Samoa, Hawaii, the Mariana Archipelago (Guam and the Northern Mariana Islands) and the Pacific Remote Island Areas. The Western Pacific Pelagics FMP was converted to the Pelagics FEP. This complex contains up to 146 "currently harvested coral reef taxa" and innumerable "potentially harvested coral reef taxa." All commercial fishing is prohibited in the Islands Unit of the Marianas Trench (Mariana Islands) and within the Rose Atoll (American Samoa) Marine National Monuments.

[I]The Pacific Remote Island Areas (PRIA) are U.S. island possessions in the Pacific Ocean that include Palmyra Atoll, Kingman Reef, Jarvis Island, Baker Island, Howland Island, Johnston Atoll, and Wake Island. All reefs of the PRIA except Wake Island, which is under the jurisdiction of the Department of Defense, are National Wildlife Refuges. Fishing for coral reef-associated species is prohibited in all these areas except Palmyra Atoll, Johnston Atoll, and Wake Island. All commercial fishing is prohibited within the boundaries of the Pacific Remote Islands Marine National Monument. Recreational or sustenance fishing is permitted at Palmyra Atoll, Johnston Atoll, and Wake Atoll with an approved permit.

[J]The Gulf of Alaska Shark Complex consists of: Pacific sleeper shark, salmon shark, spiny dogfish, and other/unidentified sharks.
[K]The Bering Sea/Aleutian Islands Shark Complex consists of: Pacific sleeper shark, salmon shark, spiny dogfish, and other/unidentified sharks.