NOAA FISHERIES

Oceanic Whitetip Shark
(*Carcharhinus longimanus*)

Endangered Species Act (ESA) Draft Recovery Implementation Strategy

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Version 1

OCEANIC WHITETIP SHARK
(*Carcharhinus longimanus*)

DRAFT RECOVERY IMPLEMENTATION STRATEGY

DISCLAIMER

Recovery implementation strategies are flexible, operational documents focused on how, when and with whom recovery actions will be implemented. Recovery implementation strategies and the activities contained therein do not necessarily represent the views, official positions, or approval of any individuals or other agencies involved in the plan or strategy formulation. Recovery implementation strategies are guidance and planning documents only. Identification of an activity to be implemented by any public or private party does not create a legal obligation beyond existing legal requirements. Nothing in this Recovery Implementation Strategy should be construed as a commitment or requirement that any federal agency obligate or pay funds in any single fiscal year in excess of appropriations made by Congress for that fiscal year in contravention of the Anti-Deficiency Act, 31 U.S.C. § 1341, or any other law or regulation. Recovery implementation strategies are subject to modification as dictated by new findings, changes in species' status, and the completion of recovery actions and activities.

LITERATURE CITATION AND AVAILABILITY

National Marine Fisheries Service. 2023. Endangered Species Act Recovery Implementation Strategy for the Oceanic Whitetip Shark (*Carcharhinus longimanus*). January 2023, Version 1. NOAA Fisheries, Office of Protected Resources, Silver Spring, MD. 20901. 72 pages.

Download a digital copy of this Recovery Implementation Strategy from the Conservation and Management tab of our NMFS oceanic whitetip shark species profile web site, specifically at https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark#conservation-management.

Table of Contents

LIST OF ACRONYMS

AI – Artificial intelligence

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

CKMR – Close-kin mark-recapture

CMS – Convention on Migratory Species

COMMS – Communications (within NOAA)

EM – Electronic monitoring

FAD – Fish aggregating device

FAO – Food and Agriculture Organization (of the United Nations)

FWS – Fish and Wildlife Service

GOVT(s) – Government/Governments

HMS – Highly Migratory Species (within NMFS)

IATTC – Inter-American Tropical Tuna Commission

ICCAT – International Convention for the Conservation of Atlantic Tunas

IOTC – Indian Ocean Tuna Commission

ISSF – International Seafood Sustainability Foundation

IUCN – International Union for the Conservation of Nature

IUU – Illegal, unreported, and unregulated fishing

MU – Management Unit

NGO – Non-governmental Organization

NOAA – National Oceanic and Atmospheric Administration

NMFS – National Marine Fisheries Service

OLE – Office of Law Enforcement (within NMFS)

RFMO – Regional Fishery Management Organization

SPAW – Specially Protected Areas and Wildlife

SRFC – South Regional Fisheries Commission

SRPOA-Sharks - Sub-Regional Plan of Action for the Conservation and Sustainable Management of Shark Populations

SSG – Shark Specialist Group (within IUCN)

UNEP – United Nations Environment Programme

USFWS – United States Fish and Wildlife Service

WCPFC – Western and Central Pacific Fisheries Commission

WECAFC – Western and Central Atlantic Fisheries Commission

I. GUIDE TO THE RECOVERY IMPLEMENTATION STRATEGY

This Recovery Implementation Strategy is one of three separate recovery planning documents for the oceanic whitetip shark. The first document, the Recovery Status Review (NMFS 2023a), provides all the detailed information on the oceanic whitetip shark's biology, ecology, status and threats, and conservation efforts to date, which have typically been included in the background section of a species' recovery plan.

The second document, the Recovery Plan (NMFS 2023b), focuses on the statutory components of a recovery plan, as required under the Endangered Species Act (ESA), to the maximum extent practicable: (1) a description of site-specific management actions necessary for the conservation and survival of the species (hereafter referred to as recovery actions); (2) objective, measurable criteria that, when met, will allow the species to be removed from the endangered and threatened species list (hereafter referred to as recovery criteria); and (3) estimates of the time and cost required to achieve the plan's goals. Site-specific recovery actions in the Recovery Plan are described at a high level and are strategic in nature. Substantial modifications to the Recovery Plan, such as changes to any of the three statutory components of the Recovery Plan, require a revision of the recovery plan with public notice and the opportunity for public comment.

The third document, this Recovery Implementation Strategy, is a flexible, operational document separate from the Recovery Plan that identifies specific, prioritized activities necessary to fully implement recovery actions in the Recovery Plan, while affording us the ability to modify these activities efficiently to reflect changes in the information available as well as progress towards recovery. This Recovery Implementation Strategy is intended to assist NOAA Fisheries and other stakeholders in planning and implementing activities to carry out the recovery actions in the Recovery Plan. The stepped-down recovery activities identified here in this Recovery Implementation Strategy may be revised as needed during the recovery process, whenever experience and information gained call for a change in tactics, therefore maximizing flexibility of recovery implementation.

All documents used to inform the recovery of the oceanic whitetip shark, including the Recovery Status Review, the Recovery Plan, and the Recovery Implementation Strategy, are available on the Conservation and Management tab of the NOAA Fisheries oceanic whitetip shark species profile web site, specifically at https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark#conservation-management.

As presented in the Implementation Schedule (see Table 1), recovery "actions" (i.e., level 1 (e.g., 1., 2., 3.)) are the broad, overarching measures from the Recovery Plan that describe what needs to be done to accomplish the goal of achieving recovery such that the species can be delisted; recovery "activities" (i.e., Tiers 1, 2 and 3 (e.g., 2.1., 2.1.1, 2.1.1.2.)) are the detailed, on-the-ground tactical steps needed to implement the recovery actions. The Implementation Schedule includes action/activity numbers, descriptions and current status of those actions/activities, priority (see Box 1), recovery objective (see Box 2), the

oceanic whitetip shark management unit[1] (MU) to which the activity applies, estimated costs, estimated duration or frequency, and potential agencies/organizations involved in implementing the activity. It is a guide for planning and meeting the recovery objectives and criteria discussed in the Recovery Plan.

The Oceanic Whitetip Shark Recovery Plan initially projects at least a 62-year timeframe to achieve recovery (NMFS 2022b). The Implementation Schedule therefore estimates the total cost to implement activities over 70 years, i.e., through the year 2086 (if beginning in 2016, which is the terminal year of the stock assessment from which the projections were made (Rice et al. 2020)). This is the approximate date to reach the goal of recovery for this species. Actual expenditures by agencies and other partners are contingent upon appropriations and other budgetary constraints.

All recovery actions and activities are within the range of the oceanic whitetip shark, which includes tropical and subtropical waters globally (Figure 1). As discussed in the Recovery Plan (NMFS 2022b), all recovery actions apply broadly across all management units identified for the species (which covers the entire range of the species); here, many recovery activities apply to specific management units.

Figure 1. Global range of the oceanic whitetip shark with Management Unit boundaries based on tuna-Regional Fishery Management Organization (RFMO) convention areas. (Source: Modified from Young and Carlson 2020)).

[1] Management units are a tool that can be used in recovery plans to address differing threats, management authority, and/or population viability across geographic areas requiring tailored management programs. The oceanic whitetip shark recovery plan identifies four management units for the species: 1) Atlantic Ocean, 2) Eastern Pacific Ocean, 3) Western and Central Pacific Ocean, and 4) Indian Ocean.

While NOAA Fisheries has a strong leadership role to play in the recovery of listed marine and anadromous species, other federal agencies, states, and other stakeholders are critically important in the recovery process. The "Potential Agencies / Organizations Involved" column of the Implementation Schedule identifies partners who can make significant contributions to specific recovery tasks. The identification of agencies and other stakeholders within the Implementation Schedule does not constitute any additional legal responsibilities beyond what is already required under other provisions of the ESA or other applicable, existing authorities.

Prioritized recovery actions from the Recovery Plan, as well as post-delisting actions, and their associated activities are listed below in the Implementation Schedule (see Table 1). The assignment of priorities does not imply that some actions and activities are of low importance, but instead means that lower priority items may be deferred while higher priority items are being implemented (Box 1).

Box 1. Priority Assignments for Actions in the Recovery Plan[2]

Priority 1 Recovery Actions: These are the recovery actions and activities that must be taken to remove, reduce, or mitigate major threats and prevent extinction and often require urgent implementation.

Priority 2 Recovery Actions: These are recovery actions and activities to remove, reduce, or mitigate major threats and prevent continued population decline or research needed to fill knowledge gaps, but their implementation is less urgent than Priority 1 actions.

Priority 3 Recovery Actions: These are all recovery actions and activities that should be taken to remove, reduce, or mitigate any remaining, non-major threats and ensure the species can maintain an increasing or stable population to achieve delisting criteria, including research needed to fill knowledge gaps and monitoring to demonstrate achievement of demographic criteria.

Priority 4 Post-Delisting Actions: These are actions and activities that are not linked to downlisting or delisting criteria and are not needed for ESA recovery, but are needed to facilitate post-delisting monitoring under ESA section 4(g), such as the development of a post-delisting monitoring plan that provides monitoring design (e.g., sampling error estimates).

Priority 0 Other Actions: These are actions that are not needed for ESA recovery or post-delisting monitoring but that would advance broader goals beyond delisting. Other actions include, for example, other legislative mandates or social, economic, and ecological values. These actions are given a zero priority number because they do not fall within the priorities for delisting the species, yet the numeric value allows tracking these types of actions in the NOAA Fisheries Recovery Action Database.

[2] Endangered and Threatened Species Listing and Recovery Priority Guidelines (84 FR 18243, May 30, 2019)

Box 2. Recovery Objectives and Criteria (from the Draft Recovery Plan).

Objective	Delisting Criteria
1. Ensure the oceanic whitetip shark maintains resiliency and geographic representation, and is a functional component of the ecosystem, by increasing overall abundance to achieve viable populations in all ocean basins	1a) Formal stock assessment - The ratio of the current spawning biomass (SB) (i.e., the number of adult females in the current exploited population) in a given year to the unfished spawning biomass (SB_0, i.e., the number of adult females in the population subject only to natural mortality) is at least 0.30 ($SB_{current}/SB_0$=0.30) in three of four management units representing all ocean basins (Atlantic Ocean, Indian Ocean, and at least one Pacific Ocean MU; see discussion in section 3.2 of the Recovery Plan) and on average demonstrates an increasing trend for 20 years (i.e., 2 generation lengths). This ratio would be determined using a formal stock assessment that incorporates estimates, where applicable, of life history, relative abundance, catch, and discard mortality analogous to that produced by Tremblay-Boyer et al. (2019) for the Western and Central Pacific Ocean. In this case, the unfished spawning biomass (SB_0) was calculated from the estimated recruitments via the Beverton-Holt stock recruitment relationship. OR b) Data-limited assessment - The ratio of predicted total current stock biomass relative to unfished conditions (relative biomass), or predicted current spawning stock fecundity relative to unfished conditions (relative spawning stock fecundity) is at least 0.30 ($SB_{current}/SB_0$=0.3) in three of four management units representing all ocean basins (Atlantic Ocean, Indian Ocean, and at least one Pacific Ocean MU) and on average demonstrates an increasing trend for 20 years (i.e., 2 generation lengths). This ratio could be determined using an Age-Structured Catch-Free Model (e.g., Porch et al. 2006; Cortés et al. 2006), Incidental Catch Model (e.g., Caswell et al. 1998) or similar modeling approach that does not utilize catch as an input variable. OR c) Based on a spawning per recruit-based reference point as a proxy for status (e.g. Brooks et al. 2009), a ratio of spawner per recruit of 0.50 has been achieved in three of four management units representing all ocean basins (Atlantic Ocean, Indian

Objective	Delisting Criteria
	Ocean, and at least one Pacific Ocean MU) and over 20 years. OR d) The annual rate of population change is found to be increasing at a rate of a minimum of 12% in three of four management units representing all ocean basins (Atlantic Ocean, Indian Ocean, and at least one Pacific Ocean MU) and over 20 years. This can be determined by using population count or relative abundance index data within a Bayesian state-space model (e.g., Just Another Red List Assessment [JARA]; Sherley et al. 2019).
2. Increase oceanic whitetip shark resiliency by managing or eliminating significant anthropogenic threats.	***Factor A: Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range*** No threats have been identified under Factor A; therefore, this recovery plan does not include recovery criteria for this factor. ***Factor B: Overutilization for Commercial, Recreational, Scientific, or Educational Purposes*** 2. $F_{current}$ (i.e., the current level of total fishing mortality (at-vessel + post-release mortality)) [is less than] < F_{limit} (i.e., the fishing mortality rate that corresponds to the maximum level of mortality that can occur that may drive the population to low levels in the long-term) over a period of 2 generations (~20 years). 3. Trade management mechanisms are in place to monitor and limit, as necessary, the level of fins in international trade, and a systematic review shows that the volume of fins in trade is not placing the species in danger of extinction within the foreseeable future throughout all or a significant portion of its range. ***Factor C: Disease or Predation*** No threats have been identified under Factor C; therefore, this recovery plan does not include recovery criteria for this factor. ***Factor E: Other Natural or Manmade Factors*** No threats have been identified under Factor E; therefore, this recovery plan does not include recovery criteria for this factor.

Objective	Delisting Criteria
3. Ensure the continued viability of the oceanic whitetip shark through development and effective implementation of regulatory mechanisms for the long-term protection of the species.	***Factor D: Inadequacy of Existing Regulatory Mechanisms*** 4. U.S. Federal, state, and territorial laws are developed and/or maintained, implemented, and enforced to prevent finning of oceanic whitetip sharks and prevent retention of the species in commercial fisheries. Such laws include, but are not limited to, the Shark Conservation Act and Shark Finning Prohibition Act. 5. All nations identified as having significant catch, bycatch, and trade of oceanic whitetip shark (as identified by the respective RFMOs, their compliance committees, the Food and Agricultural Organization of the United Nations [FAO], and the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) have acceded to international and multilateral agreements and enacted national legislation or equivalent regulatory measures to implement management measures specified under the agreements. 6. Measures prohibiting retention and finning of oceanic whitetip sharks are maintained by all RFMOs and Parties are implementing these measures adequately as measured by landings data and country reports to RFMOs. This can be verified by each of the compliance committees in the respective RFMOs. 7. Within an individual country's EEZ not subject to RFMO retention prohibitions, laws are developed and/or maintained, implemented, and enforced to prevent finning of oceanic whitetip sharks and prevent retention of the species in commercial fisheries.

II. Outline of Recovery Program and Stepped-Down Activities

As previously mentioned, recovery "actions" (i.e., Tier 1 (e.g., 1., 2., 3.), in bold font) are the broad overarching measures from the Recovery Plan that describe what needs to be done to for us to understand and reduce threats, and restore the oceanic whitetip shark to the point at which the species can be delisted; recovery "activities" (i.e., Tiers 2, 3 and 4 (e.g., 2.1., 2.1.1., 2.1.1.2.), in normal font) are the detailed, on-the-ground steps needed to implement the recovery actions. The recovery actions listed below will occur throughout the range of the oceanic whitetip shark. Many activities will apply only to specific Management Unit(s); unless otherwise specified, however, the activities will apply throughout the species' range.

In addition, the Recovery Plan identifies two other actions (actions 10 and 11) that are not necessary for recovery, but would facilitate monitoring for other stressors and planning for post-delisting.

Population Dynamics

1. Improve knowledge and understanding of oceanic whitetip shark population status, abundance trends, and genetic structure.

- 1.1. Conduct stock assessments (or use other appropriate population assessment methods) regularly (ideally every 5 years) in all management units.
- 1.2. Develop and conduct scientific surveys using standard and alternate methods (e.g., pelagic baited remote underwater vehicles) to improve relative abundance estimates, ideally every 1–2 years depending on survey methodology.
- 1.3. Increase and improve genetic sampling in all management units, with particular focus on collection of samples from the Eastern Pacific, Western and Central Pacific, and Indian Ocean Management Units.
  - 1.3.1. Continue and enhance cooperative research programs between scientists and fishers to increase genetic sampling of oceanic whitetip sharks.
  - 1.3.2. Enhance, as needed, standardized genetic collection protocols for all ocean basins to improve genetic sampling to provide a better understanding of stock structure (tissue banks).
- 1.4. Determine census and effective population sizes for each management unit using genetics research (ideally every 5 years).
- 1.5. Identify potential regional populations to determine location of source/harvest, especially for international trade.
- 1.6. Utilize new emerging techniques, such as close-kin mark-recapture (CKMR), to estimate population size as a form of validation of the estimates derived through stock assessments.

2. Improve knowledge and understanding of oceanic whitetip shark distribution, movement, and habitat use.

- 2.1. Develop and enhance cooperative research programs between scientists and fishers to increase tagging data of oceanic whitetip sharks.

2.2. Continue and/or develop ecosystem-based/habitat-predictive modeling efforts to improve understanding of environmental, oceanographic, and other factors influencing areas of high use/occurrences of oceanic whitetip sharks and identify important habitat areas for different life stages.
2.3. Identify additional locations to tag oceanic whitetip sharks to further understand movement patterns and expand these studies to places that have not already been heavily studied to date.

3. Improve knowledge and understanding of the demographics and life history of oceanic whitetip sharks.

3.1. Increase and improve data collection and biological sampling of oceanic whitetip sharks in all management units, including but not limited to: fishery observer programs (domestic and international), scientific surveys, and landings data.
3.2. Determine and/or update life history information (e.g., age, growth, reproduction) using accepted or novel techniques.

Fisheries Interactions

4. Reduce fisheries bycatch and mortality of oceanic whitetip sharks by determining and addressing the frequency of capture and severity of fishing interactions in commercial, artisanal, and recreational fisheries.

4.1. Determine and reduce the frequency of oceanic whitetip shark interactions in commercial fisheries, specifically pelagic longlines, purse seines, and gillnets, taking into account potential impacts to other protected species.
4.1.1. Conduct research to determine factors (e.g., environmental conditions, fishing tactics) affecting frequency of oceanic whitetip shark interactions in commercial longline, purse seine, and gillnet fisheries.
4.1.2. Evaluate the potential utility and efficacy of time-area closures and/or protected areas in locations shown to have higher occurrences of oceanic whitetip sharks in order to reduce interactions with the species in commercial fisheries, and if deemed to be effective, develop regulations for implementation.
4.1.3. Determine the effectiveness of using rare earth metals, sound, light, olfaction, and other deterrent methods to repel oceanic whitetip sharks away from fishing gear, and if found to be effective, implement where appropriate.
4.1.4. Based on results of above research, develop and implement a strategy to reduce fishery interactions with oceanic whitetip sharks.
4.2. Reduce mortality associated with capture, handling, and release of oceanic whitetip sharks in commercial fishing gear, specifically pelagic longlines, purse seines, and gillnets, taking into account potential impacts to other protected species.
4.2.1. Continue to evaluate factors (e.g., soak time, handling) affecting at-vessel and post-release mortality of oceanic whitetip sharks in commercial longline, purse seine, and gillnet fisheries.

4.2.2. Based on results of above research, implement best practices for increasing oceanic whitetip shark survivorship in domestic and international longline fisheries, including eliminating trailing gear to less than 0.5 meters.

4.2.3. Based on results of above research, implement best practices for increasing oceanic whitetip shark survivorship in domestic and international purse seine fisheries, including minimizing brailing and time on deck.

4.2.4. Based on results of above research, implement best practices for increasing oceanic whitetip shark survivorship in international gillnet fisheries.

4.3. Continue to support and develop existing domestic education and training programs for fishermen to enhance safe handling, release, and data collection, and expand internationally.

4.4. Evaluate the impacts of non-commercial (e.g., artisanal, recreational) fishing activities on oceanic whitetip sharks for which limited information is available in all management units.

4.4.1. Evaluate the scope, scale, economic drivers, and potential impacts of artisanal fishing in the Atlantic MU, particularly captures and consumption of oceanic whitetip sharks in Caribbean nations, West Africa, and northern South America.

4.4.2. Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Atlantic MU and evaluate potential impacts.

4.4.3. Evaluate the scope, scale, economic drivers, and potential impacts of artisanal fishing in the Eastern Pacific MU, particularly captures and consumption of oceanic whitetip sharks in Central and South America.

4.4.4. Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Eastern Pacific MU and evaluate potential impacts.

4.4.5. Evaluate the scope, scale, economic drivers, and potential impacts of artisanal fishing in the Western and Central Pacific MU, particularly captures and consumption of oceanic whitetip sharks in Papua New Guinea, French Polynesia, Cook Islands.

4.4.6. Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Western and Central Pacific MU and evaluate potential impacts (e.g., Australia).

4.4.7. Evaluate the scope, scale, economic drivers, and potential impacts of artisanal fishing in the Indian Ocean MU, particularly captures and consumption of oceanic whitetip sharks in Indonesia, India, Sri Lanka, and Iran.

4.4.8. Determine the impact of artisanal gillnet fishing on oceanic whitetip sharks in the Indian Ocean MU.

4.4.9. Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Indian Ocean MU and evaluate potential impacts.

5. Reduce fisheries bycatch and mortality of oceanic whitetip sharks in international fisheries and trade through enhanced international coordination and collaboration with relevant international organizations, such as RFMOs.

5.1. Develop international capacity building programs and conduct regional training workshops with stakeholders in priority areas related to oceanic whitetip shark safe handling and release, species ID, and data collection protocols to address bycatch issues related to oceanic whitetip sharks.

5.2. Coordinate through RFMOs to enhance implementation, compliance, and effectiveness of existing conservation and management measures, and identify any new protective measures that may be needed for oceanic whitetip sharks to reduce fishing impacts to the species.

5.2.1. Increase knowledge and understanding of international fisheries impacts to oceanic whitetip sharks and compliance levels with existing regulations.

5.2.2. Encourage and assist Parties of RFMOs to develop, implement, and enforce domestic fishing regulations to minimize oceanic whitetip shark bycatch in commercial fisheries, and to comply with existing RFMO conservation measures related to oceanic whitetip sharks, particularly retention prohibitions.

5.2.3. Encourage and assist Parties to comply with minimum observer coverage requirements established by relevant RFMOs, and work towards increasing observer coverage through at-sea observers and/or electronic monitoring.

5.2.4. Encourage RFMOs to require reporting of oceanic whitetip shark catches and discards, and for Parties to increase reporting of oceanic whitetip shark catch and disposition to improve data quality and quantify the impact of fishing on the species.

5.2.5. Explore potential for establishing bilateral agreements/Memorandums of Understanding (MOU)s with countries that have known illegal trade of oceanic whitetip sharks to assist them in combating illegal trade.

Atlantic Management Unit

5.2.6. Conduct regional workshops with pertinent high-level government officials in priority areas (e.g., in Caribbean and Central and West Africa coasts) about potential ways to address bycatch of oceanic whitetip sharks.

5.2.7. Encourage the International Commission for the Conservation of Atlantic Tunas (ICCAT) Parties to prioritize oceanic whitetip sharks as a conservation issue and advocate for an assessment of the Atlantic stock status.

5.2.8. Continue and enhance coordination with the Western and Central Atlantic Fisheries Commission (WECAFC) to ensure coordination with ICCAT for non-ICCAT members and address artisanal fishing issues throughout the wider Caribbean.

5.2.9. Continue U.S. participation and coordination in the WECAFC working group on sharks and rays, and advocate for WECAFC member countries to support the retention prohibition adopted by ICCAT Parties.

5.2.10. Support small island nations to reduce capture and consumption of oceanic whitetip sharks, particularly juveniles, in artisanal fisheries (e.g., Haiti, Trinidad and Tobago, and Cuba).

5.2.11. Increase coordination and engagement with the Sub-Regional Plan of Action for the conservation and sustainable management of Shark populations (SRPOA-Sharks) and RFMOs that manage West Africa fisheries (SRFC), as this is an area where more data is needed on the species.

Eastern Pacific Management Unit

5.2.12. Continue U.S. participation and engagement in the Inter-American Tropical Tuna Commission (IATTC) on oceanic whitetip shark issues.

5.2.13. Identify and prioritize fisheries in coastal Latin America (i.e., those that are not subject to IATTC resolutions) for engagement, and conduct regional workshops with regard to bycatch reduction of oceanic whitetip shark.

5.2.14. Encourage the IATTC Secretariat and Members to prioritize the oceanic whitetip shark as a conservation issue and advocate for an assessment of the eastern Pacific stock status.

5.2.15. Encourage and assist foreign nations with existing shark sanctuaries (Galapagos Islands, Colombia, and Costa Rica) to enforce regulations for the conservation of oceanic whitetip sharks.

Western and Central Pacific Management Unit

5.2.16. Continue U.S. participation and engagement in Western and Central Pacific Fisheries Commission (WCPFC) on oceanic whitetip shark issues.

5.2.17. Analyze data to determine if oceanic whitetip sharks are being caught in foreign EEZs outside the purview of WCPFC as there is little or no observer data from those areas.

5.2.18. Encourage the WCPFC Secretariat and Members to prioritize oceanic whitetip shark as a conservation issue and continue conducting assessments of the Western and Central Pacific stock status.

5.2.19. Conduct regional workshops with pertinent stakeholders in priority areas (e.g., Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, New Caledonia, Papua New Guinea, Samoa, Solomon Islands) about potential ways to address bycatch of oceanic whitetip sharks.

5.2.20. Encourage and assist Pacific Island countries with existing shark sanctuaries (e.g., Cook Islands, French Polynesia, Marshall Islands, Micronesia, New Caledonia, Palau) in enforcing regulations for the conservation of sharks, including oceanic whitetip sharks.

Indian Ocean Management Unit

5.2.21. Increase U.S. engagement with Indian Ocean Tuna Commission (IOTC) by ensuring the United States is present as an observer at relevant meetings related to oceanic whitetip sharks, fisheries, and bycatch issues.

5.2.22. Encourage the IOTC Secretariat and Members to prioritize oceanic whitetip sharks as a conservation issue and advocate for an assessment of the Indian Ocean stock status.

5.2.23. Conduct regional workshops with pertinent stakeholders in priority areas (e.g., Indonesia, India, Seychelles, Maldives, Comoros Islands) about potential ways to address bycatch of oceanic whitetip sharks.

5.3. Coordinate through other relevant non-RFMO international organizations and mechanisms to enhance conservation and management of oceanic whitetip sharks to promote their recovery globally.

5.3.1. Continue and enhance U.S. engagement in Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) to ensure sustainable trade of oceanic whitetip sharks.

5.3.1.1. Advocate for an increase in compliance with CITES permitting and reporting.

5.3.1.2. Encourage CITES Parties to conduct thorough and scientifically robust non-detriment findings for trade in oceanic whitetip shark products and share results with the CITES Secretariat.

5.3.2. Facilitate recovery of oceanic whitetip sharks through enhanced engagement in the Convention on Migratory Species (CMS) and the CMS Sharks Memorandum of Understanding (MOU).

5.3.2.1. Support implementation of actions of the CMS Sharks MOU for oceanic whitetip sharks.

5.3.2.2. Encourage top shark fishing nations to become signatories to the CMS Sharks MOU.

5.3.3. Facilitate recovery of oceanic whitetip sharks in the Wider Caribbean Region through continued and enhanced engagement in and collaboration with the United Nations Environment Programme Protocol for Specially Protected Areas and Wildlife (SPAW Protocol).

5.3.3.1. Encourage the use of existing SPAW protected areas to protect the species, identify hotspots, and collaborate and develop partnerships and strategic planning among Parties.

5.3.3.2. Continue encouraging Parties to provide updates on status and progress of current Annex III listing implementation for the oceanic whitetip shark.

5.3.4. Facilitate recovery of oceanic whitetip sharks through continued and enhanced engagement in and collaboration with the International Union for the Conservation of Nature (IUCN) Shark Specialist Group (SSG).

5.3.4.1. Support the development of a global conservation strategy for pelagic sharks that will highlight the status and conservation needs for oceanic whitetip sharks.

5.3.4.2. Support and collaborate with the IUCN SSG to conduct safe handling/release, species ID, and other relevant training workshops.

5.3.5. Facilitate recovery of oceanic whitetip sharks through enhanced collaboration with the United Nations-Food and Agriculture Organization (FAO).

5.3.5.1. Support initiatives and recommendations developed as part of the Kobe Bycatch Workshop to reduce bycatch, in particular, as they pertain to sharks and specifically oceanic whitetip sharks.

5.3.5.2. Encourage increased participation in Port State Measures agreement and advocate for increased compliance of transshipment controls.

5.3.6. Facilitate recovery of oceanic whitetip sharks through continued and enhanced collaboration with the International Seafood Sustainability Foundation (ISSF).

5.3.6.1. Coordinate with the fishing industry, including the ISSF, to develop and implement proven mitigation measures across the international fishing community for improving survivorship of oceanic whitetip sharks in commercial fisheries.

5.3.6.2. Work with ISSF to encourage knowledge sharing/technology transfers among the international fishing community.

5.4. Enhance bilateral cooperation and engagement with pertinent government officials and stakeholders through regional workshops in key countries that have significant bycatch of oceanic whitetip sharks to promote conservation and recovery.

International Trade

6. Determine effects of the international shark fin trade on oceanic whitetip shark populations in all management units, and take research and management actions to reduce, and/or eliminate if necessary, the amount of oceanic whitetip shark fins in trade.

6.1. Determine the composition (percentage) of oceanic whitetip sharks in the fin and meat markets and track trends over time (ideally every 2–3 years).

6.2. Determine prevalence of oceanic whitetip shark products being transshipped through the United States.

6.3. Increase market surveys of landings to quantify domestic capture, local consumption, and local trade of oceanic whitetip sharks to monitor key areas (e.g., Indian Ocean and Western and Central Pacific management units).

6.4. Conduct mixed-stock analysis for Hong Kong fin trade to determine which management unit(s) most oceanic whitetip shark fins are coming from.

6.5. Based on results of above research, develop a strategy to reduce oceanic whitetip shark fins in the international shark fin trade.

7. Improve species-specific monitoring and reporting of oceanic whitetip sharks in commercial and artisanal fisheries by RFMOs and individual countries to provide a better understanding of the effects of illegal, unreported, and unregulated (IUU) fishing, improve estimates of catch and discards, and measure progress towards recovery.

7.1. Evaluate the efficacy of electronic monitoring (EM) coupled with artificial intelligence (AI) for identifying oceanic whitetip sharks and monitoring interactions in commercial and artisanal fisheries; if shown to be effective, promote the increased use of EM.
7.2. Promote improved reporting of oceanic whitetip shark bycatch and discards in commercial fishing logbooks.
7.3. Investigate the use of advanced technology (e.g., satellite imaging) to monitor IUU fishing and better understand IUU fishing impacts to oceanic whitetip sharks.
7.4. Continue to support training and deployment of observers on commercial longline and purse seine vessels domestically and internationally.
7.5. Increase domestic observer coverage in longline and purse seine fisheries as funding allows.
7.6. Increase observer coverage globally (see Activity 5.2.3).

Regulatory Mechanisms and Enforcement

8. Reduce fishing mortality of oceanic whitetip sharks through effective development, implementation, and enforcement of international and domestic measures, such as legislation and regulations.

8.1. Encourage development of and participation in multinational agreements that facilitate conservation of oceanic whitetip sharks.
8.2. Encourage non-signatory nations to accede to relevant international conventions and agreements (e.g., RFMOs, CMS, CITES) that facilitate management and conservation of oceanic whitetip sharks.
8.3. Encourage Parties of RFMOs to ensure sufficient enforcement exists to monitor compliance with regional and domestic retention prohibitions.
8.3.1. Conduct assessments to evaluate spatial and temporal scale of oceanic whitetip shark retention and evaluate compliance levels with RFMO no-retention measures; if compliance is deemed inadequate, determine causes and solutions for improvement.
8.3.2. Investigate economic tools to incentivize compliance at the individual and national scale levels.
8.4. Implement regulations to prohibit oceanic whitetip shark retention in all U.S. commercial fisheries.
8.5. Maintain and continue implementation of existing U.S. shark conservation laws (Shark Conservation Act, etc.).

8.6. Evaluate the level of illegal import, transit, and re-export of oceanic whitetip shark occurring domestically, and increase enforcement domestically and internationally.
  8.6.1. Work with USFWS enforcement to increase inspections where possible, in order to determine level of illegal import, transit, and re-export of oceanic whitetip shark fins in the United States.
  8.6.2. Support fin identification (ID) training and enforcement capacity building in foreign countries as needed.
8.7. Ensure sufficient enforcement exists to monitor compliance with domestic regulations for oceanic whitetip sharks.
  8.7.1. Encourage NOAA's Office of Law Enforcement to continue investigating and prosecuting persons engaging in violations of any domestic regulations applicable to oceanic whitetip sharks.
8.8. Consult with the U.S. Department of State to investigate the potential of developing economic incentives for countries to implement equivalent regulatory standards as U.S. commercial fishing operations (e.g., no-retention measures and safe handling/release guidelines).

Outreach and Education

9. Develop and implement outreach and education strategies and programs to increase public and stakeholder (including fishermen) awareness on the status and recovery needs of the oceanic whitetip shark.

9.1. Develop an outreach and education strategy to increase awareness among fishers of the status of oceanic whitetip sharks, and change negative perceptions to promote behavior changes needed for recovery.
  9.1.1. Conduct human dimensions research of fishers that incorporates behavioral, social and economic sciences to contextualize attitudes and behaviors and help address whether there is a need to target attitude or behavioral changes in fishers.
  9.1.2. Develop and implement an outreach campaign (including workshops, brochures in different languages, online learning, and video and photography tools) aimed at changing fisher perceptions and attitudes/behaviors regarding sharks based on results of human dimensions research/surveys.
9.2. Develop an outreach and education campaign, including regional communication strategies, for the public to increase awareness of the status and importance of oceanic whitetip sharks, while incorporating cultural insights and perspectives from various regions/locations of the species' range.
  9.2.1. Develop and expand community and citizen science programs to increase data collection on oceanic whitetip sharks; develop strong community relationships to explain goals of data collection, including development of a recreational fishing interaction reporting system.
  9.2.2. Increase social media campaigns on awareness, including highlighting specific expeditions and/or other on-going research projects.

9.2.3. Use video and film tools for effective storytelling and distribute to the public, with a particular focus on younger generations.
9.2.4. Develop regional outreach/education communication strategies for oceanic whitetip sharks similar to public awareness campaigns for other threatened and endangered species, including creating an International Oceanic Whitetip Shark Day.
9.2.5. Place educational signs regarding the legal and conservation status of oceanic whitetip sharks at public fishing/boat access points to the marine environment in priority areas.

Other Actions

Other Stressors

10. **Identify, evaluate, and minimize any other stressors that may be impeding recovery of oceanic whitetip sharks.**
    10.1. Determine how climate change, including ocean warming, may affect habitat quality, prey abundance and distribution, and the physiological ecology (e.g., thermal tolerance) of the species.
    10.2. Conduct modeling studies to determine the thermal tolerance range of oceanic whitetip sharks.
    10.3. Conduct modeling studies to determine potential changes in prey abundance and distribution.
    10.4. Conduct modeling studies to determine how potential changes in oceanic whitetip shark distribution may influence susceptibility and exposure to fishing impacts.
    10.5. Evaluate the stressors associated with environmental pollutants (e.g., mercury) on the physiological health and behavioral attributes of the species, and, if necessary, take appropriate actions to reduce impacts.
    10.6. Evaluate the impacts of non-fishing activities and other emerging stressors such as aquaculture development and tourism, and, if necessary, take appropriate action to reduce impacts.
        10.6.1. Determine impacts of and potential mitigation measures for aquaculture activities, including the degree of fish aggregating device (FAD) association for oceanic whitetip sharks.
        10.6.2. Conduct a social media study to help determine the level of public interactions with oceanic whitetip sharks during tourism activities.

Post-Delisting Monitoring Plan

11. **Develop a post-delisting monitoring plan to ensure management of oceanic whitetip sharks continues to be sustainable post-delisting.**

III. Implementation Schedule

Table 1: Implementation schedule for the oceanic whitetip shark. Recovery "actions" (i.e., Tier 1 (e.g., 1., 2., 3., represented in bold text)) are broad measures from the Recovery Plan that describe what needs to be done to accomplish the goal of long-term viability; recovery "activities" (i.e., Tiers 2, 3 and 4 (e.g., 2.1.1., 2.1.1.1., 2.1.1.2.)) are the detailed, on-the-ground tactical steps needed to implement the recovery actions. Projected time and cost estimates for each recovery action and activity are intended as a planning aid only. The "potential agencies/organizations involved" are not obligated to expend the amounts shown.

*No cost associated (NOAA Fisheries staff time)

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
POPULATION DYNAMICS													
1	**Improve knowledge and understanding of oceanic whitetip shark population status, abundance trends, and genetic structure.**	2	1	All	--	--	--	--	--	--	--	Ongoing	NOAA, RFMOs, academia, NGOs, foreign governments, observer programs
	Costs associated with this action are outlined in activities 1.1 – 1.6 below.												
1.1	Conduct stock assessments (or use other appropriate population assessment methods) regularly	2	1	All	$500					$6,000	$6,500	Continuous/ ideally every 5 years	RFMOs, academia, NGOs

[3] For activities with a duration exceeding five fiscal years, the FY6+ column includes total costs anticipated after FY1–5.
[4] The total is the sum of anticipated costs across the action's duration.

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	(ideally every 5 years) in all management units.												
	Cost includes travel for 2 members of the RFMO Secretariat ($6000), 20 meeting participants from various CPCs ($60,000), ~4 weeks of salary for each participant assuming that they make $200,000 a year (salary and benefits) = $338,500. So, at least $404,500. Plus data prep meeting = $500,000. Only the WCPO MU has an existing stock assessment (Tremblay-Boyer et al. 2019); all other MUs have yet to conduct any assessments.												
1.2	Develop and conduct scientific surveys using standard and alternate methods (e.g., pelagic baited remote underwater vehicles) to improve relative abundance estimates, ideally every 1-2 years depending on survey methodology.	2		All	$750		$750		$750	$22,500	$24,750	Continuous/ Biannually	NOAA, academia, NGOs, foreign governments
	Larger scale surveys will be more costly on NOAA ships ($25 K/sea day for everything) than smaller scale ($10 K/sea day), but both can be implemented. 30 sea days per year should be robust. Limited historical surveys have been conducted but none are currently ongoing.												
1.3	Increase and improve genetic sampling in all management units, with particular focus on collection of samples from the Eastern Pacific, Western Pacific, and Indian oceans.	2		All	$25	$25	$25	$25			$100	4 years/ Annual	NOAA, Academia, NGOs, foreign government scientific institutions
	Costs include initial meetings with stakeholders (travel, staff time, basic sampling supplies, and shipping). Follow-up meetings may be required. Genetic sampling is ongoing in some programs but overall sampling will need to be expanded to include additional partners.												
1.3.1	Continue and enhance cooperative research	2		All	*	*	*	*	*	*	*	Ongoing	Academia, RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	programs between scientists and fishers to increase genetic sampling of oceanic whitetip sharks.												
	Genetic sampling and analytical protocols have been previously developed among NMFS and cooperating partners. Any modification to the protocols would be advanced and circulated following the results of current and future research. There are no costs associated with this activity, as these protocols would be developed as part of activities 1.4, 1.5 and 1.6.												
1.3.2	Enhance, as needed, standardized genetic collection protocols for all ocean basins to improve genetic sampling to provide a better understanding of stock structure (tissue banks).	2		All	*	*	*	*	*	*	*	Ongoing	Observer programs (foreign and domestic) RFMOs, academia
	Genetic sampling and analytical protocols have been previously developed among NMFS and cooperating partners. Modifications may be necessary given limitations in some research platforms or following the results of current and future research. There are no costs associated with this activity, as these protocols would be developed as part of activities 1.4, 1.5 and 1.6.												
1.4	Determine census and effective population sizes for each management unit using genetics research (ideally every 5 years).	2		All	$35					$455	$490	Continuous/ every 5 years	Academia, RFMOs, NGOs
	Estimated costs include salary for a research scientist or graduate student to conduct genetic analyses of fin samples. The activity has been initiated but not yet completed.												
1.5	Identify potential regional stocks to	2		All	$35			$35		$700	$770	Continuous/	Academia, RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	determine location of source/harvest, especially for international trade											every 2-3 years	
	This activity could be conducted concurrently with activity 1.4. Continuous studies are needed to track potential changes in fin sources. The activity has been initiated but not yet completed.												
1.6	Utilize new emerging techniques, such as close-kin mark-recapture (CKMR), to estimate population size as a form of validation of the estimates derived through stock assessments	2		All	$250					$3,250	$3,500	Continuous/ every 5 years	Academia, RFMOs, NGOs
	Costs include salary for scientific staff, supplies and analysis. Genetics samples obtained from other genetic studies would also be used in this study. This activity has not yet been initiated.												
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2	**Improve knowledge and understanding of oceanic whitetip shark distribution, movement, and habitat use.**	2	1	All	--	--	--	--	--	--	--	Ongoing	NOAA, academia, NGOs, foreign government scientific institutions
	Costs associated with this action are outlined in activities 2.1 – 2.3 below.												
2.1	Develop and enhance cooperative research programs between scientists and fishers to	2	1	All	$20	$20	$20	$20	$20	$1,300	$1,400	Ongoing/ Annually	NOAA, Academia, RFMOs, NGOs, foreign government

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	increase tagging data of oceanic whitetip sharks												scientific institutions
	Funding will be needed annually for the purchase and distribution of conventional tags and tag applicators ($5K per management unit). Tagging efforts are ongoing in some programs, but overall efforts will need to be expanded to include additional locations and partners.												
2.2	Continue and/or develop ecosystem-based/habitat-predictive modelling efforts to improve understanding of environmental, oceanographic, and other factors influencing areas of high use/occurrences of oceanic whitetip sharks and identify important habitat areas for different life stages.	2		All	$130					$260	$390	1 year/ Once every 20 years	NOAA, academia, RFMOs, NGOs
	A research scientist would be hired to develop or refine existing modeling efforts for each management unit. Costs include salary and overhead. Project should be repeated every 20 years to account for changes in climate. Initial research is ongoing in the WCPO but additional modeling efforts are required for all MUs.												
2.3	Identify additional locations to tag oceanic whitetip sharks to further understand movement patterns and expand these studies to places that have not already been heavily studied to date.	2		All	$300					$3,000	$3,300	As needed	NOAA, academia, NGOs, foreign government scientific institutions

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	Frequency of survey and tagging efforts will coincide with the determination of new areas. Costs related to survey and satellite/acoustic tag supplies. It is anticipated that 2 areas per management unit could be potentially identified over the next 50 years. This activity has not yet been initiated.												
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3	**Improve knowledge and understanding of the demographics and life history of oceanic whitetip sharks.**	2	1	All	--	--	--	--	--	--	--	Ongoing	NOAA, RFMOs, academia, NGOs, foreign government scientific institutions
	Costs associated with this action are outlined in activities 3.1 – 3.2 below.												
3.1	Increase and improve data collection and biological sampling of oceanic whitetip sharks in all management units, including but not limited to: fishery observer programs (domestic and international), scientific surveys, and landings data.	2		All	$20	$20	$20	$20	$20	$1,300	$1,400	Ongoing	NOAA, academia, NGOs, foreign government scientific institutions
	Funds would be needed for shipping and sampling supplies ($5K per management unit). Some sampling is ongoing in the Atlantic but increased efforts are required for all MUs.												
3.2	Determine and/or update life history information (e.g. age, growth, reproduction) using accepted or novel techniques.	2		All	$75					$150	$225	Ongoing/ Every 10 years	NOAA, academia, NGOs, foreign government scientific institutions

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	Funds are needed for a research scientist to process samples, analyze data and produce reports/publications. Life history information would need to be updated every generation (~10 years). Cost per year does not include cost of living adjustment. Studies have already been completed in the southwest Atlantic and the north Pacific, but these would need to be updated along with new studies conducted in MUs where life history information is lacking.												
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TOTAL FOR POPULATION DYNAMICS					**$2,105**	**$65**	**$7,790**	**$65**	**$7,540**	**$31,210**	**$48,775**		
FISHERIES INTERACTIONS													
4	**Reduce fisheries bycatch and mortality of oceanic whitetip sharks by determining and addressing the frequency of capture and severity of fishing interactions in commercial, artisanal, and recreational fisheries.**	2	2	All	--	--	--	--	--	--	--	Ongoing	NOAA, academia, RFMOs, NGOs, fishing industry and communities
	Costs associated with this action are outlined in activities 4.1 – 4.4.9 below.												
4.1	Determine and reduce the frequency of oceanic whitetip shark interactions in commercial fisheries, specifically pelagic longlines, purse seines, and gillnets, taking into account potential impacts to other protected species.	2	2	All	--	--	--	--	--	--	--	Ongoing	NOAA, academia, RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	All costs are outlined in sub-activities 4.1.1- 4.1.4 below. Frequency of sub-activities corresponds with 1 generation length (~10 years) to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.1.1	Conduct research to determine factors (e.g., environmental conditions, fishing tactics) affecting frequency of oceanic whitetip shark interactions in commercial longline, purse seine, and gillnet fisheries	2	2	All	$135	$135	$135			$2,430	$2,835	3 years/ Every 10 years	NOAA, academia, RFMOs, NGOs
	Research scientist would be hired to develop or refine existing modeling efforts for each management unit. The same scientist can also evaluate purse seine and other fisheries. Costs include salary and overhead. Frequency of sub-activity corresponds with 1 generation length (~10 years) to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.1.2	Evaluate the potential utility and efficacy of time-area closures and/or protected areas in locations shown to have higher occurrences of oceanic whitetip sharks in order to reduce interactions with the species in commercial fisheries, and if deemed to be effective, develop regulations for implementation.	2	2	All	$135	$135	$135			$2,430	$2,835	3 years/ Every 10 years	NOAA, academia, RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	Research scientist would be hired to develop or refine existing modeling efforts for each management unit. Costs include salary and overhead. Frequency of sub-activity corresponds with 1 generation length (~10 years) to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.1.3	Determine the effectiveness of using rare earth metals, sound, light, olfaction, and other deterrent methods to repel oceanic whitetip sharks away from fishing gear, and if found to be effective, implement where appropriate.	2	2	All	$250	$250	$250	$250	$250	$250	$1,500	As needed/ 1 study per year	NOAA, academia, RFMOs, NGOs
	The study would design experimental protocols, potentially, on contract longline commercial fishing vessels to test these various deterrents. As this study cannot test all deterrents simultaneously, multiple year studies needed. This activity has not been initiated.												
4.1.4	Based on results of above research, develop and implement a strategy to reduce fishery interactions with oceanic whitetip sharks.	2	2	All	*	*	*	*	*	*	*	Continuous	NOAA, fishing industry, RFMOs, NGOs
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
4.2	Reduce mortality associated with capture, handling, and release of oceanic whitetip sharks in commercial fishing gear, specifically pelagic longlines, purse seines,	2	2	All	--	--	--	--	--	--	--	Continuous	NOAA, fishing industry, RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	and gillnets, taking into account potential impacts to other protected species.												
	Costs associated with this activity are outlined in sub-activities 4.2.1 - 4.2.5 below.												
4.2.1	Continue to evaluate factors (e.g., soak time, handling) affecting at-vessel and post-release mortality of oceanic whitetip sharks in commercial longline, purse seine, and gillnet fisheries.	2	2	All	$100	$140	$75	$75		$1,170	$1,560	4 years/ Every 10 years	NOAA, fishing industry, RFMOs, NGOs
	Year 1 would involve a research scientist to develop a predictive model to determine environmental and operation factors affecting bycatch; Year 2 would involve stakeholder workshop and initial testing of fishing modifications with Years 3 and 4 continuing testing. Frequency of sub-activities corresponds with 1 generation length to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.2.2	Based on results of above research, implement best practices for increasing oceanic whitetip shark survivorship in domestic and international longline fisheries, including eliminating trailing gear to less than 0.5 meters.	2	2	All	*	*	*	*	*	*	*	Continuous	NOAA, fishing industry, RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
4.2.3	Based on results of above research, implement best practices for increasing oceanic whitetip shark survivorship in domestic and international purse seine fisheries, including minimizing brailing and time on deck.	2	2	All	*	*	*	*	*	*	*	Continuous	NOAA, fishing industry, RFMOs, NGOs
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
4.2.4	Based on results of above research, implement best practices for increasing oceanic whitetip shark survivorship in domestic and international gillnet fisheries.	2	2	All	*	*	*	*	*	*	*	Continuous	NOAA, fishing industry, RFMOs, NGOs
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
4.3	Continue to support and develop existing domestic education and training programs for fishermen to enhance safe handling, release,	2	2	ATL, EPO, WCPO	*	*	*	*	*	*	*	Ongoing	RFMOs, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	and data collection, and expand internationally.												
	*This is a domestic activity and requires NMFS staff time only, the costs of which are reflected in cost estimates for NMFS staff time at the bottom of this table. Costs to expand to international fisheries is in activity 5.2.3. Identification guides have been developed and training is ongoing domestically and within some countries, but this activity needs to be expanded throughout the species' range.												
4.4	Evaluate the impacts of non-commercial (e.g., artisanal, recreational) fishing activities on oceanic whitetip sharks for which limited information is available in all Management Units	2	2	All	*	*	*	*	*	*	*	Continuous	NGOs, RFMOs, fishing community
	Costs associated with this activity are outlined in sub-activities 4.4.1 – 4.4.9 below.												
4.4.1	Evaluate scope, scale, economic drivers, and potential impacts of artisanal fishing in the Atlantic MU, particularly captures and consumption of oceanic whitetip sharks in Caribbean nations, West Africa, and northern South America.	2	2	ATL	$70	$70	$70	$70	$70	$2,100	$2,450	Annual until FY5; every 10 years thereafter	NGOs, RFMOs, fishing community
	Step 1 would be to identify countries/ports of focus. Step 2 includes conducting market surveys and interviews. Step 3 includes analysis of results. Costs per survey ~$25-$35 K with 2 surveys per year. Frequency of sub-activities corresponds with 1 generation length to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
4.4.2	Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Atlantic MU and evaluate potential impacts.	2	2	ATL	$50					$250	$300	Ongoing/ every 10 years	NMFS, NGOs, RFMOs, fishing community
	This would be a desk study using government recreational intercept data as well as potential citizen scientist information. The study should be repeated once every 10 years (1 generation) to monitor changes. This activity has not been initiated.												
4.4.3	Evaluate scope, scale, economic drivers, and potential impacts of artisanal fishing in the Eastern Pacific MU, particularly captures and consumption of oceanic whitetip sharks in Central and South America.	2	2	EPO	$70	$70	$70	$70	$70	$2,100	$2,450	Annual until FY5; every 10 years thereafter	NGOs, RFMOs, fishing community
	Step 1 would be to identify countries/ports of focus. Step 2 includes conducting market surveys and interviews. Step 3 includes analysis of results. Costs per survey ~$25-$35 K with 2 surveys per year. Frequency of sub-activities corresponds with 1 generation length to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.4.4	Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Eastern Pacific MU and evaluate potential impacts.	2	2	EPO	$50					$300	$350	Ongoing; every 10 years	NMFS, NGOs, RFMOs, fishing community

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	This would be a desk study using government recreational intercept data as well as potential citizen scientist information. The study should be repeated once every 10 years (1 generation) to monitor changes. This activity has not been initiated.												
4.4.5	Evaluate the scope, scale, economic drivers, and potential impacts of artisanal fishing in the Western and Central Pacific MU, particularly captures and consumption of oceanic whitetip sharks in Papua New Guinea, French Polynesia, Cook Islands.	2	2	WC PO	$70	$70	$70	$70	$70	$2,100	$2,450	Annual until FY5; every 10 years thereafter	NGOs, RFMOs, fishing community
	Step 1 would be to identify countries/ports of focus. Step 2 includes conducting market surveys and interviews. Step 3 includes analysis of results. Costs per survey ~$25-$35 K with 2 surveys per year. Frequency of sub-activities corresponds with 1 generation length to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.4.6	Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Western and Central Pacific MU and evaluate potential impacts (e.g., Australia).	2	2	WC PO	$50					$300	$350	Ongoing; every 10 years	NMFS, NGOs, RFMOs
	This would be a desk study using government recreational intercept data as well as potential citizen scientist information. The study should be repeated once every 10 years (1 generation) to monitor changes. This activity has not been initiated.												
4.4.7	Evaluate the scope, scale, economic drivers, and potential impacts of artisanal fishing in the Indian Ocean MU,	2	2	IO	$70	$70	$70	$70	$70	$2,100	$2,450	Annual until FY5; every 10 years thereafter	NGOs, RFMOs, fishing community

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	particularly captures and consumption of oceanic whitetip sharks in Indonesia, India, Sri Lanka, and Iran.												
	Step 1 would be to identify countries/ports of focus. Step 2 includes conducting market surveys and interviews. Step 3 includes analysis of results. Costs per survey ~$25-$35 K with 2 surveys per year. Frequency of sub-activities corresponds with 1 generation length to monitor potential changes in fishery operations and biological status of the species over the course of the recovery timeline. This activity has not been initiated.												
4.4.8	Determine the impact of artisanal gillnet fishing on oceanic whitetip sharks in the Indian Ocean MU.	2	2	IO	$35					$210	$245	Every 10 years after initial study	NGOs, RFMOs, fishing community
	This would require coordinating with IOTC and conducting a data study. The study should be repeated once every 10 years (1 generation) to monitor changes. This activity has not been initiated.												
4.4.9	Determine whether any recreational fisheries interact with oceanic whitetip sharks in the Indian Ocean MU and evaluate potential impacts.	2	2	IO	$50					$300	$350	Ongoing; every 10 years	NMFS, NGOs, RFMOs
	This would be a desk study using government recreational intercept data as well as potential citizen scientist information. The study should be repeated once every 10 years (1 generation) to monitor changes. This activity has not been initiated.												
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5	**Reduce fisheries bycatch and mortality of oceanic whitetip sharks in international fisheries and trade**	2	2	All	--	--	--	--	--	--	--	Continuous	NOAA, U.S. State Department, RFMOs, NGOs, CITES, CMS, IUCN SSG, ISSF,

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	through enhanced international coordination and collaboration with relevant international organizations, such as RFMOs.												foreign governments, fishing industry and communities
	Costs associated with this action are outlined in activities and sub-activities 5.1 – 5.4 below.												
5.1	Develop international capacity building programs and conduct regional training workshops with stakeholders in priority areas related to oceanic whitetip shark safe handling and release, species ID, and data collection protocols to address bycatch issues related to oceanic whitetip sharks.	2	2	All	$250	$250	$250	$250	$250	$1,500	$2,750	Ongoing/ once every 5-10 years in priority areas	NGOs, CMS, FAO, fishing Industry
	Estimated costs assumes $50k per workshop, 5 workshops per year, cycle of 5-10 years between workshops in each port; includes costs for education and outreach materials, such as brochures, videos, and photography. Safe release guidelines have been developed in general for sharks but require updating and further dissemination.												
5.2	Coordinate through RFMOs to enhance implementation, compliance, and effectiveness of existing conservation and management measures,	2	2	All	$40	$40	$40	$40	$40	$2,600	$2,800	Ongoing/ Annually	NGOs, RFMOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	and identify any new protective measures that may be needed for oceanic whitetip sharks to reduce fishing impacts to the species.												
	Estimated costs includes travel to ensure NMFS staff attend the 4 major tuna RFMO meetings for each respective management unit each year ($10K per meeting), but many activities could be completed at a single meeting. Coordination with RFMOs is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery, and have not yet been initiated.												
5.2.1	Increase knowledge and understanding of international fisheries impacts to oceanic whitetip sharks and compliance levels with existing regulations.	2	2	All	$135					$1,755	$1,890	Ongoing/ Every 5 years	RFMOs, NGOs, fishing industry
	This activity is related to understanding impacts of foreign fleets on the mortality of oceanic whitetip sharks, as well as how this relates to compliance levels with retention prohibition measures. A research scientist would be contracted to conduct a baseline analysis of current impacts of foreign fisheries with additional analyses conducted periodically to track trends over time. RFMO committees already monitor level of compliance with the prohibitions. This activity requires a more focused analysis across RFMOS relative to the impact on oceanic whitetip sharks specifically, and has not yet been initiated.												
5.2.2	Encourage and assist Parties of RFMOs to develop, implement, and enforce domestic regulations to minimize oceanic whitetip shark bycatch in commercial fisheries, and to comply with existing RFMO conservation measures related to oceanic whitetip sharks,	2	2	All	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Ongoing	RFMOs, NGOs, fishing industry

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	particularly retention prohibitions.												
	Costs would be associated with assisting foreign nations to implement measures to reduce mortality of oceanic whitetip sharks in their fisheries, including (but not limited to): gear changes (wire to mono), circle hooks, line cutters, etc. Because we do not yet know what measures will be implemented, it is not realistic to estimate costs for this activity at this time. Coordination with RFMOs is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery, and have not yet been initiated.												
5.2.3	Encourage and assist Parties to comply with minimum observer coverage requirements established by relevant RFMOs, and work towards increasing observer coverage through at-sea observers and/or electronic monitoring.	2	2	All	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Ongoing	RFMOs, NGOs, fishing industry
	Costs would be associated with assisting foreign nations to implement procedures to comply with minimum observer coverage requirements and eventually increase levels of observer coverage. These procedures could include training workshops to improve at-sea safety and the use of electronic monitoring and/or artificial intelligence. As the mechanism for increasing observer coverage may be different depending on the fleet, safety or other issue, the costs associated cannot be determined at this time. Coordination with RFMOs to increase observer coverage is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, implementation of new technologies and strategies to increase observer coverage may be necessary to assist RFMOs in meeting minimum goals, and has not yet been initiated.												
5.2.4	Encourage RFMOs to require reporting of oceanic whitetip shark catches and discards, and for Parties to increase reporting of oceanic whitetip shark catch and disposition to improve data quality and	2	2	All	*	*	*	*	*	*	*	Continuous	RFMOs, fishing industry

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	quantify the impact of fishing on the species.												
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Coordination with RFMOs is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery, and have not yet been initiated.												
5.2.5	Explore potential for establishing bilateral agreements/MOUs with countries that have known illegal trade of oceanic whitetip sharks to assist them in combating illegal trade.	2	2,3	All	*	*	*	*	*	*	*	Continuous	NOAA, U.S. State Department, foreign governments
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Countries for initial focus include Colombia, Seychelles, United Arab Emirates, Ecuador, Taiwan, Costa Rica, Mexico, and Cuba, based on illegal trade records from AFCD Hong Kong. This activity has not been initiated.												
5.2.6	Conduct regional workshops with pertinent high-level government officials in priority areas (e.g., in Caribbean and Central and West Africa coasts) about potential ways to address bycatch of oceanic whitetip sharks.	2	2	ATL	$50	$50	$50	$50	$50	$1,500	$1,750	Ongoing/ 1 per year for FY1-5; then 1 per year every 10 years thereafter	SPAW, WECAFC, NGOs
	Costs include logistics and support for holding stakeholder workshops, including travel for 2 NMFS staff to participate. This activity has not been initiated.												
5.2.7	Encourage ICCAT Parties to prioritize oceanic whitetip shark	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing/ every 5 years	NMFS, ICCAT Secretariat, ICCAT Parties

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	as a conservation issue and advocate for an assessment of the Atlantic stock status.												
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Discussions related to this activity have occurred within the ICCAT shark working group but have not been elevated to the Secretariat or Parties.												
5.2.8	Continue and enhance coordination with the Western and Central Atlantic Fisheries Commission (WECAFC) to ensure coordination with ICCAT for non-ICCAT members and address artisanal fishing issues throughout the wider Caribbean.	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing	NMFS, WECAFC Secretariat, WECAFC Parties
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Coordination with WECAFC is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery, and have not yet been initiated.												
5.2.9	Continue U.S. participation and coordination in the WECAFC working group on sharks and rays and advocate for WECAFC member countries to support the retention prohibition adopted by ICCAT Parties.	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing	NMFS, WECAFC Secretariat, WECAFC Parties

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Initial discussions among the WECAFC Working Group on Sharks and Rays has begun, but further development of the plan of action for sharks is required.												
5.2.10	Support small island nations to reduce capture and consumption of oceanic whitetip sharks particularly juveniles, in artisanal fisheries (e.g., Haiti, Trinidad and Tobago, and Cuba).	2	2	ATL	$120					$720	$840	Ongoing/ Every 10 years	NMFS, NGOs, small island nation governments and fishing communities
	A onetime workshop would be conducted among participating Caribbean nations to outline approaches for managing fishing activities related to oceanic whitetip sharks. Follow-up workshops may be needed. This activity has not been initiated, but funding has been acquired to begin this activity.												
5.2.11	Increase coordination and engagement with the Sub-Regional Plan of Action for the conservation and sustainable management of Shark populations (SRPOA-Sharks) and RFMOs that manage West Africa fisheries (SRFC), as this is an area where more data is needed on the species.	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing	NMFS, NGOs, SRFC, West African fishing communities
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. A workshop was held previously in 2011. Further coordination and engagement among the parties is needed.												

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
5.2.12	Continue U.S. participation and engagement in IATTC on oceanic whitetip shark issues.	2	2,3	EPO	*	*	*	*	*	*	*	Ongoing	NMFS, IATTC Secretariat, IATTC Parties, NGOs
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Coordination with IATTC is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery.												
5.2.13	Identify and prioritize fisheries in coastal Latin America (i.e., those that are not subject to IATTC resolutions) for engagement, and conduct regional workshops with regard to bycatch reduction of oceanic whitetip shark.	2	2	EPO	$50	$50	$50	$50	$50	$1,500	$1,750	Annually/1 per year for first 5 years; then 1 per year every 10 years thereafter	NMFS, NGOs, CMS, foreign governments, fishing industry
	Costs include logistics and support for holding stakeholder workshops, including travel for 2 NMFS staff to participate. This activity has not been initiated.												
5.2.14	Encourage IATTC Secretariat and Members to prioritize the oceanic whitetip shark as a conservation issue and advocate for an assessment of the eastern Pacific stock status.	2	1,2	EPO	*	*	*	*	*	*	*	Ongoing	NMFS, IATTC Secretariat, IATTC Parties

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Coordination with IATTC is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery.												
5.2.15	Encourage and assist foreign nations with existing shark sanctuaries (Galapagos Islands, Colombia, and Costa Rica) to enforce regulations for the conservation of oceanic whitetip sharks.	2	2,3	EPO	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Ongoing	Fishing industry, NGOs, CMS, foreign governments, enforcement agencies
	It is unrealistic to estimate a cost for this activity at this time as we do yet not know what type and level of assistance will be required.												
5.2.16	Continue U.S. participation and engagement in Western and Central Pacific Fisheries Commission (WCPFC) on oceanic whitetip shark issues.	2	2,3	WC PO	*	*	*	*	*	*	*	Ongoing	NMFS, WCPFC Secretariat, WCPFC Parties
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Coordination with WCPFC is ongoing through NMFS Office of International Affairs, Trade, and Commerce. However, more focused conservation strategies specific to oceanic whitetip sharks are required for recovery.												
5.2.17	Analyze data to determine if oceanic whitetip sharks are being caught in waters outside the purview of WCPFC as there is little	2	2	WC PO	$135					$810	$945	Continuous/ every 10 years	NMFS, RFMOs, fishing industry, foreign governments

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	or no observer data from those areas.												
	A research scientist would be hired to data mine all existing data sources and conduct the analysis. As fisheries tactics often change this analysis should be repeated every 10 years to monitor changes. This activity has not been initiated.												
5.2.18	Encourage WCPFC Secretariat and Members to prioritize oceanic whitetip shark as a conservation issue and continue conducting assessments of the Western and Central Pacific stock status.	2	1,2	WC PO	*	*	*	*	*	*	*	Ongoing	NMFS, WCPFC Secretariat, WCPFC Parties
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. Coordination with WCPFC is ongoing through NMFS Office of International Affairs, Trade, and Commerce and this activity has been initiated. WCPFC has conducted stock assessments for the oceanic whitetip shark. Continued and focused conservation strategies specific to oceanic whitetip sharks are required for recovery.												
5.2.19	Conduct regional workshops with pertinent stakeholders in priority areas (e.g., Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, New Caledonia, Papua New Guinea, Samoa, Solomon Islands) about potential ways to address bycatch of oceanic whitetip sharks.	2	2	WC PO	$50	$50	$50	$50	$50	$1,500	$1,750	Annually/1 per year for first 5 years; then 1 per year every 10 years thereafter	NMFS, NGOs, CMS, foreign governments, fishing industry

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	Costs include logistics and support for holding stakeholder workshops, including travel for 2 NMFS staff to participate. This activity has not been initiated.												
5.2. 20	Encourage and assist Pacific Island countries with existing shark sanctuaries (e.g., Cook Islands, French Polynesia, Marshall Islands, Micronesia, New Caledonia, Palau) in enforcing regulations for the conservation of sharks, including oceanic whitetip sharks.	2	2,3	WC PO	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Ongoing	Fishing industry, NGOs, CMS, foreign governments, enforcement agencies
	It is unrealistic to estimate a cost for this activity at this time as we do not yet know what type and level of assistance will be required. This activity has not been initiated.												
5.2. 21	Increase U.S. engagement with Indian Ocean Tuna Commission (IOTC) by ensuring the United States is present as an observer at relevant meetings related to oceanic whitetip sharks, fisheries, and bycatch issues.	2	2,3	IO	*	*	*	*	*	*	*	Ongoing	NMFS, IOTC Secretariat, IOTC Parties
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Additional funds are necessary for travel to IOTC meetings; however, these costs are already incorporated in activity 5.2. The United States is not a party to IOTC, therefore coordination with IOTC (through NMFS Office of International Affairs, Trade, and Commerce) is limited. However, more engagement and focused conservation strategies specific to oceanic whitetip sharks are required for recovery.												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
5.2. 22	Encourage the IOTC Secretariat and Members to prioritize oceanic whitetip sharks as a conservation issue and advocate for an assessment of the Indian Ocean stock status.	2	1,2	IO	*	*	*	*	*	*	*	Ongoing	NMFS, IOTC Secretariat, IOTC Parties
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Additional funds are necessary for travel to IOTC meetings; however, these costs are already incorporated in activity 5.2. The United States is not a party to IOTC, therefore coordination with IOTC (through NMFS Office of International Affairs, Trade, and Commerce) is limited. However, more engagement and focused conservation strategies specific to oceanic whitetip sharks are required for recovery.												
5.2. 23	Conduct regional workshops with pertinent stakeholders in priority areas (e.g. Indonesia, India, Seychelles, Maldives, Comoros Islands) about potential ways to address bycatch of oceanic whitetip sharks.	2	2	IO	$50	$50	$50	$50	$50	$1,500	$1,750	Annually/1 per year for first 5 years; then 1 per year every 10 years thereafter	NMFS, NGOs, CMS, foreign governments, fishing industry
	Costs include logistics and support for holding stakeholder workshops, including travel for 2 NMFS staff to participate. This activity has not been initiated.												
5.3	Coordinate through other relevant non-RFMO international organizations and mechanisms to enhance conservation and management of oceanic whitetip sharks to	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NMFS, U.S. State Department, CITES, CMS, IUCN Sharks Specialist Group, UNEP-SPAW, FAO, ISSF

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	promote their recovery globally.												
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Status of associated sub-activities is variable and detailed below.												
5.3.1	Continue and enhance U.S. engagement in CITES to ensure sustainable trade of oceanic whitetip sharks	2	2,3	All	*	*	*	*	*	*	*	Ongoing	U.S. State Department, CITES Secretariat, CITES Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with CITES is ongoing through NMFS Office of International Affairs, Trade, and Commerce and NMFS Office of Protected Resources.												
5.3.1.1	Advocate for an increase in compliance with CITES permitting and reporting	2	2,3	All	*	*	*	*	*	*	*	Ongoing	U.S. State Department, CITES Secretariat, CITES Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with CITES is ongoing through NMFS Office of International Affairs, Trade, and Commerce and NMFS Office of Protected Resources. Continued engagement is required.												
5.3.1.2	Encourage CITES Parties to conduct thorough and scientifically robust non-detriment findings for trade in oceanic whitetip shark products and share results with the CITES Secretariat.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	U.S. State Department, CITES Secretariat, CITES Parties, NGOs

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with CITES is ongoing through NMFS Office of International Affairs and NMFS Office of Protected Resources. Continued engagement is required.												
5.3.2	Facilitate recovery of oceanic whitetip sharks through enhanced engagement in the Convention on Migratory Species (CMS) and the CMS Sharks Memorandum of Understanding (MOU).	2	2,3	All	*	*	*	*	*	*	*	Ongoing	U.S. State Department, CMS Secretariat, CMS Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with CMS is ongoing through NMFS Office of International Affairs, Trade, and Commerce. Continued engagement is required.												
5.3.2.1	Support implementation of actions of the CMS Sharks MOU for oceanic whitetip sharks.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	U.S. State Department, CMS Secretariat, CMS Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with CMS is ongoing through NMFS Office of International Affairs, Trade, and Commerce. Continued engagement is required.												
5.3.2.2	Encourage top shark fishing nations to become signatories to the CMS Sharks MOU.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	U.S. State Department, CMS Secretariat, CMS Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with CMS is ongoing through NMFS Office of International Affairs, Trade, and Commerce. Continued engagement is required.												
5.3.3	Facilitate recovery of oceanic whitetip sharks in the Wider Caribbean Region through continued and enhanced	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing	U.S. State Department, SPAW Secretariat,

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Action/Activity Additional Information & Current Status													
	engagement in and collaboration with the United Nations Environment Programme Protocol for Specially Protected Areas and Wildlife (SPAW Protocol).												SPAW Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with SPAW is ongoing through NOAA Office of International Affairs, Trade, and Commerce and NMFS Office of Protected Resources. Continued engagement is required.												
5.3.3.1	Encourage the use of existing SPAW protected areas to protect the species, identify hotspots, and collaborate and develop partnerships and strategic planning among Parties.	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing	U.S. State Department, SPAW Secretariat, SPAW Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with SPAW is ongoing through NOAA Office of International Affairs, Trade, and Commerce and NMFS Office of Protected Resources, but this particular activity has not yet been initiated.												
5.3.3.2	Continue encouraging Parties to provide updates on status and progress of current Annex III listing implementation for the oceanic whitetip shark	2	2,3	ATL	*	*	*	*	*	*	*	Ongoing	U.S. State Department, SPAW Secretariat, SPAW Parties, NGOs

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with SPAW is ongoing through NOAA Office of International Affairs, Trade, and Commerce and NMFS Office of Protected Resources. Continued engagement is required.												
5.3.4	Facilitate recovery of oceanic whitetip sharks through continued and enhanced engagement in and collaboration with the International Union for the Conservation of Nature (IUCN) Shark Specialist Group (SSG).	2	2	All	*	*	*	*	*	*	*	Ongoing	IUCN SSG, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Some NMFS staff are already members of the IUCN-SSG. Continued collaboration is required.												
5.3.4.1	Support the development of a global conservation strategy for pelagic sharks that will highlight the status and conservation needs for oceanic whitetip shark.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	IUCN SSG, NGOs, foreign governments
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Some NMFS staff are already members of the IUCN-SSG and this activity is in the initial planning stages. Continued collaboration is required.												
5.3.4.2	Support and collaborate with the IUCN SSG to conduct safe handling/release, species ID, and other relevant training workshops.	2	2	All	*	*	*	*	*	*	*	Ongoing	IUCN SSG, NGOs, foreign governments

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					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Some NMFS staff are already members of the IUCN-SSG. Continued collaboration is required.												
5.3.5	Facilitate recovery of oceanic whitetip sharks through enhanced collaboration with the United Nations-Food and Agriculture Organization (FAO).	2	2	All	*	*	*	*	*	*	*	Ongoing	FAO, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. Engagement with FAO is ongoing through NMFS Office of International Affairs, Trade, and Commerce. Continued engagement is required.												
5.3.5.1	Support initiatives and recommendations developed as part of the Kobe Bycatch Workshop to reduce bycatch, in particular, as they pertain to sharks and specifically oceanic whitetip sharks.	2	2	All	*	*	*	*	*	*	*	Ongoing	RFMOs, Fishing Industry, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS has been an active member in the Kobe process and should continue to play an active role.												
5.3.5.2	Encourage increased participation in Port State Measures agreement and advocate for increased compliance with transshipment controls.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table.												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
5.3.6	Facilitate recovery of oceanic whitetip sharks through continued and enhanced collaboration with the International Seafood Sustainability Foundation (ISSF).	2	2	All	TBD	TBD	TBD	TBD	TBD	TBD	TBD	As needed	NMFS, ISSF, fishing community
	Through a contract with ISSF, NMFS may provide funding to support a number of recovery activities including but not limited to outreach to industry, observer training, and fishing modifications to reduce bycatch of oceanic whitetip shark. Because the methods of support are not yet known, it is unrealistic to estimate a cost for this activity at this time. NMFS has provided an initial grant to ISSF to conduct bycatch research for mobulids, but this activity has not been initiated for oceanic whitetip shark.												
5.3.6.1	Coordinate with the fishing industry, including the ISSF, to develop and implement proven mitigation measures across the international fishing community for improving survivorship of oceanic whitetip sharks in commercial fisheries.	2	2	All	$150					$1,950	$2,100	Ongoing/ every 5 years	NMFS, ISSF, fishing community
	Some of this activity could be done with existing NMFS staff resources (outreach/coordination with ISSF). May require additional funds for training workshops in coordination with ISSF and the potential for testing alternative fishing methods with industry. As industry often changes tactics, any methods would need to be re-evaluated every 5 years. NMFS has provided an initial grant to ISSF to conduct bycatch research for mobulids, but this activity has not been initiated for oceanic whitetip shark.												
5.3.6.2	Work with ISSF to encourage knowledge sharing/technology transfers among the	2	2	All	*	*	*	*	*	*	*	Ongoing	NMFS, ISSF, fishing community

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	international fishing community.												
	Costs of this activity are included in 5.4 below. NMFS has provided an initial grant to ISSF to conduct bycatch research for mobulids, but this activity has not been initiated for oceanic whitetip shark.												
5.4	Enhance bilateral cooperation and engagement with pertinent government officials and stakeholders through regional workshops in key countries that have significant bycatch of oceanic whitetip sharks to promote conservation and recovery.	2	2	All	$60	$60	$60	$60	$60	$720	$1,020	Continuous /1 per year for first 5 years; then 1 per year every 10 years thereafter	U.S. State Department, IUCN, CMS, CITES, RFMOs
	This activity could be conducted on margins of international annual RFMO, IUCN, CITES Animals Committee and CMS Shark MOU meetings. Approximate cost $60K for a side event including travel for individuals not participating in the general agenda. This activity has not been initiated.												
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TOTAL FOR FISHERIES INTERACTIONS					**$2,195**	**$1,460**	**$1,395**	**$1,125**	**$1,050**	**$17,075**	**$24,300**		
INTERNATIONAL TRADE													
6	**Determine the effects of the international shark fin trade on oceanic whitetip shark populations in all management units, and take management actions to reduce**	2	2	All	$130		$130		$130	$3,250	$3,640	Ongoing	NMFS OLE, academia, NGOs, RFMOs, CITES Secretariat & Parties

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	and/or eliminate if necessary, the amount of oceanic whitetip shark fins in trade.												
	*Costs associated with this action are outlined in activities 6.1 – 6. 5 below.												
6.1	Determine the composition (percentage) of oceanic whitetip shark in the fin and meat markets and track trends over time (ideally every 2-3 years).	2	2	All	$30		$30		$30	$1,020	$1,110	Ongoing/ every 2-3 years	Academia, NGOs, RFMOs
	Costs include analysis of genetic samples via graduate student or laboratory technician. The activity has been initiated but not yet completed												
6.2	Determine prevalence of oceanic whitetip shark products being transshipped through the United States.	2	2	All	*	*	*	*	*	*	*	Continuous	NMFS OLE, Customs, FWS
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity will require an increase in the level of shipments examined. This activity has not been initiated												
6.3	Increase market surveys of landings to quantify domestic capture, local consumption, and local trade of oceanic whitetip sharks to monitor key areas (e.g., Indian Ocean and Western and Central Pacific management units).	2	2	All	$70		$70		$70	$2,380	$2,590	Ongoing/ every 2-3 years	Academia, NGOs, RFMOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	Step 1 would be to identify countries/ports. Step 2 conduct market surveys and interviews. Step 3 analyze results. Costs per survey ~$25-$35 K. Previous studies have been conducted by academia and NGOs, but expansion of this activity is required.												
6.4	Conduct mixed-stock analysis for Hong Kong fin trade to determine which management unit(s) most oceanic whitetip shark fins are coming from.	2	2	All	$30		$30		$30	$1,020	$1,110	Ongoing/ every 2-3 years	Academia, NGOs, RFMOs
	Costs include analysis of genetic samples via graduate student or laboratory technician. The activity has been initiated but not yet completed.												
6.5	Based on results of above research, develop a strategy to reduce oceanic whitetip shark fins in the international shark fin trade.	2	2	All	*	*	*	*	*	*	*	Continuous	Academia, CITES Secretariat, CITES Parties, NGOs
	This activity requires NMFS staff time only, the costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
	Row left intentionally blank.												
TOTAL FOR INTERNATIONAL TRADE					**$130**		**$130**		**$130**	**$3250**	**$3,640**		
FISHERIES MONITORING AND REPORTING													
7	**Improve species-specific monitoring and reporting of oceanic whitetip sharks in commercial and artisanal fisheries by RFMOs and**	3	2,3	All	$450	$125	TBD	TBD	TBD	TBD	TBD	Ongoing	NOAA, RFMOs, NGOs, technology & fishing industries

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	individual countries to provide a better understanding of the effects of Illegal, Unreported, and Unregulated (IUU) fishing, improve estimates of catch and discards, and measure progress towards recovery.												
	*Costs associated with this action are outlined in activities 7.1 – 7.6 below.												
7.1	Evaluate the efficacy of electronic monitoring (EM) coupled with artificial intelligence (AI) for identifying oceanic whitetip sharks and monitoring interactions in commercial and artisanal fisheries; if shown to be effective, promote the increased use of EM.	3	3	All	$325						$325	2 years/Once	NGOs, technology industry, RFMOs
	Costs include cloud-based portal and storage, technical support consultant, machine learning engineers to develop shark detection model with EM systems, travel, and management of data image library. A grant proposal to initiate this activity has been submitted but was not funded. Funds are currently being sought from other organizations.												
7.2	Promote improved reporting of oceanic whitetip shark bycatch and discards in	3		All	*	*	*	*	*	*	*	Ongoing	Fishing captains and crew, NGOs, RFMOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	commercial fishing logbooks.												
	This activity can most likely be conducted through RFMO engagement and requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS continues to engage with all RFMOs to improve data collection and reporting.												
7.3	Investigate the use of advanced technology (e.g., satellite imaging) to monitor IUU fishing and better understand IUU fishing impacts to oceanic whitetip sharks.	3	2,3	All	$125	$125					$250	2 years	Academia, NGOs, RFMOs, technology industry
	Costs over 2 years include development of a tool to identify hotspots of overlap and possible non-reporting of catch of high seas fleets for oceanic whitetip shark by using movement data and data from Global FishWatch (https://globalfishingwatch.org/). This activity has not been initiated for oceanic whitetip shark.												
7.4	Continue to support training and deployment of observers on commercial longline and purse seine vessels domestically and internationally.	3	2,3	All	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Ongoing	NOAA, RFMOs, NGOs, fishing industry
	Support of domestic observer program costs covered by NMFS; Costs for supporting international observer programs would be commensurate with meeting the goal of 5% observer coverage required by all tuna RFMOs. NMFS continues to support observer programs domestically and internationally.												
7.5	Increase domestic observer coverage in longline and purse seine fisheries as funding allows.	3	2,3	ATL, EPO, WCPO	TBD	TBD	TBD	TBD	TBD	TBD	TBD	Ongoing	NOAA, fishing industry, OLE, Coast Guard
	Current observer coverage in the US Atlantic longline fishery is 8%; coverage in the US Pacific deep-set longline fishery is 20%, 100% in the shallow-set longline fishery and 100% in the Pacific purse seine fishery. Increasing coverage to a target of 10% in the Atlantic and 25% in the Pacific would cost ~$1,500 per sea day												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	(includes observer salary, travel, debriefing, etc.). NMFS continues to support observer programs domestically. Increased funding is required to raise observer coverage levels.												
7.6	Increase observer coverage globally (see Activity 5.2.3).	3	2,3	All	--	--	--	--	--	--	--	Ongoing	RFMOs, NGOs, fishing industry
	Costs for this activity are captured under activity 5.2.3												
TOTAL FOR FISHERIES MONITORING & REPORTING													
REGULATORY MECHANISMS & ENFORCEMENT													
8	**Reduce fishing mortality of oceanic whitetip sharks through effective development, implementation, and enforcement of international and domestic measures, such as legislation and regulations.**	2	2,3	All	--	--	--	--	--	--	--	Ongoing	NMFS OLE, U.S. State Department, foreign governments, RFMOs, NGOs, CITES, CMS
	Estimated costs for this action are outlined in activities and sub-activities 8.1– 8.8 below. Many of the activities associated with this action require NMFS staff time only, which are reflected in the estimated costs of NMFS staff time at the bottom of this table.												
8.1	Encourage development of and participate in multinational agreements that facilitate conservation of oceanic whitetip sharks.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NOAA, U.S. State Department, foreign governments

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS already engages internationally within multiple agreements. Continued engagement is required.												
8.2	Encourage non-signatory nations to accede to relevant international conventions and agreements (e.g. RFMOs, CMS, CITES) that facilitate management and conservation of oceanic whitetip sharks.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NOAA, U.S. State Department, foreign governments
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS promotes through RFMO compliance committees the enforcement of existing management and prohibitions. Continued engagement is required.												
8.3	Encourage Parties of RFMOs to ensure sufficient enforcement exists to monitor compliance with regional and domestic retention prohibitions.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NOAA, U.S. State Department, RFMOs, foreign governments, NGOs, fishing industry
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS already engages internationally within multiple conventions and agreements. Continued engagement is required.												
8.3.1	Conduct assessment to evaluate spatial and temporal scale of oceanic whitetip shark retention and evaluate compliance levels with RFMO no-retention	2	2,3	All	$125					$1,625	$1,750	Continuous/ every 5 years	RFMOs and Compliance Committees

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	measures; if compliance is deemed inadequate, determine causes and solutions for improvement.												
	A research scientist would be hired to data mine all existing data sources and conduct the analysis. This activity has not been initiated.												
8.3.2	Investigate economic tools to incentivize compliance at the individual and larger national scale levels.	2	2,3	All	*	*	*	*	*	*	*	Continuous	NOAA, U.S. State Department, RFMOs, foreign governments
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
8.4	Implement regulations to prohibit oceanic whitetip shark retention in all U.S. fisheries.	2	2,3	ATL, EPO, WCPO	*	*	*	*	*	*	*	Continuous	NMFS, HMS
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS Highly Migratory Species Office is currently in the rule making process for the Atlantic MU.												
8.5	Maintain and continue implementation of existing U.S. shark conservation laws (Shark Conservation Act, Shark Finning Prohibition Act, etc.)	2	2,3	ATL, EPO, WCPO	*	*	*	*	*	*	*	Ongoing	NOAA, NMFS OLE
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS continues to uphold and enforce all existing regulations.												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
8.6	Evaluate the level of illegal import, transit, and re-export of oceanic whitetip shark occurring domestically, and increase enforcement domestically and internationally.	2	2,3	ATL, EPO, WCPO	*	*	*	*	*	*	*	Ongoing	NMFS OLE, USFWS enforcement
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
8.6.1	Work with USFWS enforcement to increase inspections, where possible, in order to determine level of illegal import, transit, and re-export of oceanic whitetip shark fins in the United States.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NMFS OLE, USFWS enforcement
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												
8.6.2	Support fin identification (ID) training and enforcement capacity building in foreign countries as needed.	2	2,3	All	$25	$25	$25	$25	$25	$1,625	$1,750	Continuous	NGOs, CMS, CITES
	Fin ID workshops require the assistance and collaboration with multiple parties. Costs are commensurate with level of participation with entities outside NMFS. Fin ID workshops have been previously held but will need to continue to instruct and educate new staff.												
8.7	Ensure sufficient enforcement exists to	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NMFS OLE, U.S. Coast Guard

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	monitor compliance with domestic regulations for oceanic whitetip sharks.												
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS continues to uphold and enforce all existing regulations.												
8.7.1	Encourage NOAA's Office of Law Enforcement to continue investigating and prosecuting persons engaging in violations of any domestic regulations for oceanic whitetip sharks.	2	2,3	All	*	*	*	*	*	*	*	Ongoing	NMFS OLE
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. NMFS continues to uphold and enforce all existing regulations.												
8.8	Consult with U.S. State Department to investigate the potential of developing economic incentives for countries to implement equivalent regulatory standards at U.S. commercial fishing operations (e.g., no-retention measures and safe handling/release guidelines).	2	2,3	All	*	*	*	*	*	*	*		NOAA, U.S. State Department
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This activity has not been initiated.												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	(this row intentionally left blank)												
TOTAL FOR REGULATORY MECHANISMS & ENFORCEMENT					**$150**	**$25**	**$25**	**$25**	**$25**	**$2,250**	**$2,500**		
OUTREACH & EDUCATION													
9	**Develop and implement outreach and education strategies and programs to increase public and stakeholder (including fishermen) awareness on the status and recovery needs of the oceanic whitetip shark.**	3	-	All	--	--	--	--	--	--	--	Ongoing	NMFS Office of Communications, academia, NGOs, fishing & diving communities, general public, State and Territorial governments
	Estimated costs for this action are outlined in activities and sub-activities 10.1 – 10.2.5 below.												
9.1	Develop an outreach and education strategy to increase awareness among fishers of the status of oceanic whitetip sharks, and change negative perceptions to promote behavior changes needed for recovery.	3		All	--	--	--	--	--	--	--	Ongoing	NMFS Office of Communications, academia, NGOs, fishing community
	Estimated costs for this activity are outlined in activities and sub-activities 10.1.1 – 10.2.5 below.												

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
9.1.1	Conduct human dimensions research of fishers that incorporates behavioral, social and economic sciences to contextualize attitudes and behaviors and help address whether there is a need to target attitude or behavioral changes in fishers.	3	2	All	$70	$70				$840	$980	2 years/ Every 10 years	Academia, NGOs, fishing community
	Costs include salary of a social research scientist to conduct a 2-year study. This activity should be completed early on because it will be the basis for the outreach program. This activity should be repeated every 10 years (1 generation) to monitor changes in fishermen attitudes and perceptions. A master's level thesis project was conducted on this topic in Hawaii, but additional research will be needed in other areas.												
9.1.2	Develop and implement an outreach campaign (including workshops, brochures in different languages, online learning, video and photography tools) aimed at changing fisher perceptions and attitudes/behaviors regarding sharks based on results of human dimensions research/surveys.	3	2	All	$50	$50	$50	$50		$1,200	$1,400		NMFS Office of Communications, academia, NGOs, fishing community
	Estimated costs include $10k/mgmt unit each year = $50,000 /year and includes staff time and associated materials. This activity has not been initiated												
9.2	Develop an outreach and education campaign, including	3	2	All	--	--	--	--	--	--	--		NMFS Office of Communications, academia, NGOs,

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	regional communication strategies, for the public to increase awareness of the status and importance of oceanic whitetip sharks, while incorporating cultural insights and perspectives from various regions/locations of the species' range.												fishing & diving communities, general public, State and Territorial governments
	Associated costs of this activity are included in sub-activities 10.2.1- 10.2.5 below.												
9.2.1	Develop and expand community and citizen science programs to increase data collection on oceanic whitetip sharks; develop strong community relationships to explain goals of data collection, including development of a recreational fishing interaction reporting system	3	2	All	$70	$50	$50	$50	$50	$3,250	$3,520	Ongoing	NGOs, fishing communities
	Initial cost of central database and recurring cost for technician to track what information is being inputted. Rough estimate $50k/yr to maintain for part time tech. $20k initial to build. This activity has not been initiated.												
9.2.2	Increase social media campaigns on awareness, including highlighting specific	3		All	*	*	*	*	*	*	*		NMFS Office of Communications, NGOs

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	expeditions and/or other on-going research projects.												
	*This activity requires NMFS staff time only, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table.												
9.2.3	Use video and film tools for effective storytelling and distribute to the public, with a particular focus on younger generations.	3		All	$25						$25		NMFS Office of Communications, academia, NGOs
	Costs would include production of 2 educational short films regarding the status and recovery needs of oceanic whitetip sharks. This activity has not been initiated.												
9.2.4	Develop regional outreach/education communication strategies for oceanic whitetip sharks similar to public awareness campaigns for other threatened and endangered species, including creating an International Oceanic Whitetip Shark Day.	3	2	All	$35	$35	$35	$35		$840	$980	Continuous/ Every 10 years	NMFS Office of Communications, academia, NGOs
	Costs of this activity would include research and design of a conservation campaign and regional communication strategies for each management unit to build awareness and a constituency for oceanic whitetip shark conservation and management among stakeholders –specifically fishers, consumers, decision makers and young people. $35k would be the cost for one strategy per management unit. Repeated once every 10 years. This activity has not been initiated.												
9.2.5	Place educational signs regarding the legal and conservation status of	3		All	$5	$5	$5	$5	$5	$325	$350	Continuous	State, Territorial and local

Action/ Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+[3]	Total[4]		
Action/Activity Additional Information & Current Status													
	oceanic whitetip sharks at public fishing/boat access points to the marine environment in priority areas.												governments, NGOs
	Cost per sign~ $50 each. It is likely 100 signs per year would need to be purchased for initial placement and/or replacement. This activity has not been initiated.												
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TOTAL FOR OUTREACH & EDUCATION					**$255**	**$140**	**$140**	**$140**	**$55**	**$3,780**	**$4,510**		
TOTAL FOR NMFS STAFF TIME (2 ZP3/4 FTEs)					**$250**	**$250**	**$250**	**$250**	**$250**	**11,250+**	**$12,500 +**		
GRAND TOTALS					**$5,600**	**$2,165**	**$2,785**	**$1,670**	**$2,330**	**$95,485**	**$110,035+**	**$110,035,000+**	

Table 2: Other "actions" are not needed for recovery, but would facilitate monitoring for potential emerging threats and planning for post-delisting. Items in bold text represent broad measures from the Recovery Plan that describe the goals of the action, while the activities below each action (i.e., Tiers 2 and 3 (e.g., 10.1, 10.1.1.) are the detailed, on-the-ground tactical steps needed to implement the actions. Projected time and cost estimates for each action and activity are intended as a planning aid only. The "potential agencies/organizations involved" are not obligated to expend the amounts shown.

Action / Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+	Total		
Action/Activity Additional Information & Current Status													
OTHER STRESSORS													
10	**Identify, evaluate, and minimize any other potential threats to oceanic whitetip sharks that may be impeding recovery, including potential effects of climate change and pollutants.**	0	--	All	--	--	--	--	--	--	--	Ongoing/ Every 10 years	NOAA, academia, NGOs
	Estimated costs for this action are outlined in activities and sub-activities 9.1 – 9.3.2 below.												
10.1	Determine how climate change, including ocean warming, may affect habitat quality, prey abundance and distribution, and the physiological ecology (e.g., thermal tolerance) of the species.	0	--	All	$50	$50				$600	$700	Ongoing/ Every 10 years	Academia, NGOs
	Costs associated with this activity include sub-activities 9.1.1 – 9.1.3 below, and include funds for research scientist to conduct modeling activities. This activity has been initiated but needs to be expanded further.												

Action / Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+	Total		
Action/Activity Additional Information & Current Status													
10.1.1	Conduct modeling studies to determine the thermal tolerance range of oceanic whitetip sharks.	0	--	All								Ongoing/ Every 10 years	Academia, NGOs
	This activity has not been initiated.												
10.1.2	Conduct modeling studies to determine potential changes in prey abundance and distribution.	0	--	All								Ongoing/ Every 10 years	Academia, NGOs
	This activity has not been initiated.												
10.1.3	Conduct modeling studies to determine how potential changes in oceanic whitetip shark distribution may influence susceptibilty and exposure to fishing impacts.	0	--	All								Ongoing/ Every 10 years	Academia, NGOs
	This activity has not been initiated.												
10.2	Evaluate the threat from environmental pollutants (e.g., mercury) on the physiological health and behavioral attributes of the species, and if necessary, take	0	--	All	$50	$50	$50	$50		$1,200	$1,400	Ongoing/ Every 10 years	Academia, NGOs

Action / Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+	Total		
Action/Activity Additional Information & Current Status													
	appropriate actions to reduce impacts.												
10.3	Evaluate the impacts of non-fishing activities and other emerging threats such as aquaculture development and tourism, and if necessary, take appropriate action to reduce impacts.	0	--	All	--	--	--	--	--	--	--		Academia, NGOs, aquaculture and tourism industries
	Estimated costs for this activity are outlined in sub-activities 9.3.1 – 9.3.2 below.												
10.3.1	Determine impacts of and potential mitigation measures for aquaculture activities, including the degree of fish aggregating device (FAD) association for oceanic whitetip sharks.	0	--	All	$110	$110					$220	2 years/ Once	Academia, NGOs, aquaculture industry
	Costs include studies related to FAD association of oceanic whitetip sharks as well as an acoustic telemetry study of both oceanic whitetip sharks and tuna to help understand the impacts of offshore aquaculture on protected bycatch species and targeted commercial teleosts (e.g., tuna) movement behavior and habitat use. This activity has not been initiated.												
10.3.2	Conduct social media study to help determine the level of public interactions with oceanic	0	--	All	$75						$75	1 year/ Once	Academia, NGOs

Action / Activity #	Action/Activity Title	Priority #	Recov. Obj. #	Mgmt. Unit	Cost Estimates by FY (thousands of dollars)							Duration/ Frequency	Potential Partners ±
					FY1	FY2	FY3	FY4	FY5	FY6+	Total		
Action/Activity Additional Information & Current Status													
	whitetip sharks during tourism activities.												
	A research scientist (MS level) would be hired to conduct social media surveys, analyze data, and publish report(s). A small-scale study for the Atlantic MU has been initiated, but needs to be expanded to other MUs.												
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	TOTAL FOR OTHER STRESSORS				**$335**	**$260**	**$100**	**$100**	**$50**	**$1,750**	**$2,595**		
	POST-DELISTING MONITORING PLAN												
11	**Develop a post-delisting monitoring plan to ensure management of oceanic whitetip sharks continues to be sustainable post-delisting.**	4	--	All	--	--	--	--	--	--	--	Once; update as needed	
	*This activity requires NMFS staff time only to develop and implement a post-delisting monitoring plan, the estimated costs of which are reflected in the NMFS staff time costs at the bottom of this table. This action will be implemented prior to de-listing of the oceanic whitetip shark.												
	TOTAL FOR POST-DELISTING MONITORING PLAN				--	--	--	--	--	--	--		
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IV. Literature Cited

NMFS 2023a. Endangered Species Act Recovery Status Review for the Oceanic Whitetip Shark (*Carcharhinus longimanus*). January 2023, Version 1.0. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. 138 pages.

NMFS 2023b. Draft Endangered Species Act Recovery Plan for the Oceanic Whitetip Shark (*Carcharhinus longimanus*). January 2023. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Office of Protected Resources. 62 pages.