

DEPARTMENT OF COMMERCE**National Oceanic and Atmospheric Administration****50 CFR Part 223**

[Docket No. 151110999–6999–02]

RIN 0648–XE314

Endangered and Threatened Wildlife and Plants; Proposed Threatened Listing Determination for the Oceanic Whitetip Shark Under the Endangered Species Act (ESA)

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Proposed rule; request for comments.

SUMMARY: NMFS has completed a comprehensive status review under the Endangered Species Act (ESA) for the oceanic whitetip shark (*Carcharhinus longimanus*) in response to a petition from Defenders of Wildlife to list the species. Based on the best scientific and commercial information available, including the status review report (Young *et al.*, 2016), and after taking into account efforts being made to protect the species, we have determined that the oceanic whitetip shark warrants listing as a threatened species. We conclude that the oceanic whitetip shark is likely to become endangered throughout all or a significant portion of its range within the foreseeable future. Any protective regulations determined to be necessary and advisable for the conservation of the species under ESA section 4(d) would be proposed in a subsequent **Federal Register** announcement. Should the proposed listing be finalized, we would also designate critical habitat for the species, to the maximum extent prudent and determinable. We solicit information to assist in this listing determination, the development of proposed protective regulations, and the designation of critical habitat in the event this proposed listing determination is finalized.

DATES: Comments on this proposed rule must be received by March 29, 2017. Public hearing requests must be requested by February 13, 2017.

ADDRESSES: You may submit comments on this document, identified by NOAA–NMFS–2015–0152, by either of the following methods:

- **Electronic Submissions:** Submit all electronic comments via the Federal eRulemaking Portal. Go to www.regulations.gov/

#/docketDetail;D=NOAA-NMFS-2015-0152, click the “Comment Now!” icon, complete the required fields, and enter or attach your comments.

- **Mail:** Submit written comments to Chelsey Young, NMFS Office of Protected Resources (F/PR3), 1315 East West Highway, Silver Spring, MD 20910, USA. Attention: Oceanic whitetip proposed rule.

Instructions: Comments sent by any other method, to any other address or individual, or received after the end of the comment period, may not be considered by NMFS. All comments received are a part of the public record and will generally be posted for public viewing on www.regulations.gov without change. All personal identifying information (*e.g.*, name, address, etc.), confidential business information, or otherwise sensitive information submitted voluntarily by the sender will be publicly accessible. NMFS will accept anonymous comments (enter “N/A” in the required fields if you wish to remain anonymous).

You can find the petition, status review report, **Federal Register** notices, and the list of references electronically on our Web site at <http://www.nmfs.noaa.gov/pr/species/fish/oceanic-whitewtip-shark.html>. You may also receive a copy by submitting a request to the Office of Protected Resources, NMFS, 1315 East-West Highway, Silver Spring, MD 20910, Attention: Oceanic whitetip proposed rule.

FOR FURTHER INFORMATION CONTACT: Chelsey Young, NMFS, Office of Protected Resources, (301) 427–8403.

SUPPLEMENTARY INFORMATION:**Background**

On September 21, 2015, we received a petition from Defenders of Wildlife to list the oceanic whitetip shark (*Carcharhinus longimanus*) as threatened or endangered under the ESA throughout its entire range, or, as an alternative, to list two distinct population segments (DPSS) of the oceanic whitetip shark, as described in the petition, as threatened or endangered, and to designate critical habitat. We found that the petitioned action may be warranted for the species; on January 12, 2016, we published a positive 90-day finding for the oceanic whitetip shark (81 FR 1376), announcing that the petition presented substantial scientific or commercial information indicating the petitioned action of listing the species may be warranted range wide, and explaining the basis for those findings. We also announced the initiation of a status

review of the species, as required by section 4(b)(3)(a) of the ESA, and requested information to inform the agency’s decision on whether the species warranted listing as endangered or threatened under the ESA.

Listing Species Under the Endangered Species Act

We are responsible for determining whether species are threatened or endangered under the ESA (16 U.S.C. 1531 *et seq.*). To make this determination, we first consider whether a group of organisms constitutes a “species” under section 3 of the ESA, then whether the status of the species qualifies it for listing as either threatened or endangered. Section 3 of the ESA defines species to include “any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife which interbreeds when mature.” On February 7, 1996, NMFS and the U.S. Fish and Wildlife Service (USFWS; together, the Services) adopted a policy describing what constitutes a DPS of a taxonomic species (61 FR 4722). The joint DPS policy identified two elements that must be considered when identifying a DPS: (1) The discreteness of the population segment in relation to the remainder of the species (or subspecies) to which it belongs; and (2) the significance of the population segment to the remainder of the species (or subspecies) to which it belongs.

Section 3 of the ESA defines an endangered species as “any species which is in danger of extinction throughout all or a significant portion of its range” and a threatened species as one “which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.” Thus, in the context of the ESA, the Services interpret an “endangered species” to be one that is presently at risk of extinction. A “threatened species,” on the other hand, is not currently at risk of extinction, but is likely to become so in the foreseeable future. In other words, a key statutory difference between a threatened and endangered species is the timing of when a species may be in danger of extinction, either now (endangered) or in the foreseeable future (threatened). The statute also requires us to determine whether any species is endangered or threatened as a result of any of the following five factors: The present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or

predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence (ESA, section 4(a)(1)(A)–(E)). Section 4(b)(1)(A) of the ESA requires us to make listing determinations based solely on the best scientific and commercial data available after conducting a review of the status of the species and after taking into account efforts being made by any State or foreign nation or political subdivision thereof to protect the species. In evaluating the efficacy of existing protective efforts, we rely on the Services' joint *Policy on Evaluation of Conservation Efforts When Making Listing Decisions* ("PECE"; 68 FR 15100; March 28, 2003) for any conservation efforts that have not been implemented, or have been implemented but have not yet demonstrated effectiveness.

Status Review

We convened a team of agency scientists to conduct the status review for the oceanic whitetip shark and prepare a report. The status review report of the oceanic whitetip shark (Young *et al.*, 2016) compiles the best available information on the status of the species as required by the ESA and assesses the current and future extinction risk for the species, focusing primarily on threats related to the five statutory factors set forth above. We appointed a biologist in the Office of Protected Resources Endangered Species Conservation Division to undertake a scientific review of the life history and ecology, distribution, abundance, and threats to the oceanic whitetip shark. Next, we convened a team of biologists and shark experts (hereinafter referred to as the Extinction Risk Analysis (ERA) team) to conduct an extinction risk analysis for the species, using the information in the scientific review. The ERA team was comprised of a natural resource management specialist from NMFS Office of Protected Resources, a fishery management specialist from NMFS' Highly Migratory Species (HMS) Management Division, and four research fishery biologists from NMFS' Southeast, Northeast, Southwest, and Pacific Island Fisheries Science Centers. The ERA team had group expertise in shark biology and ecology, population dynamics, highly migratory species management, and stock assessment science. The status review report presents the ERA team's professional judgment of the extinction risk facing the oceanic whitetip shark but makes no recommendation as to the listing status of the species. The status review report is available electronically at [http://](http://www.nmfs.noaa.gov/pr/species/fish/oceanic-whitetip-shark.html)

www.nmfs.noaa.gov/pr/species/fish/oceanic-whitetip-shark.html.

The status review report was subjected to independent peer review as required by the Office of Management and Budget Final Information Quality Bulletin for Peer Review (M–05–03; December 16, 2004). The status review report was peer reviewed by five independent specialists selected from the academic and scientific community, with expertise in shark biology, conservation and management, and specific knowledge of oceanic whitetip sharks. The peer reviewers were asked to evaluate the adequacy, appropriateness, and application of data used in the status review as well as the findings made in the "Assessment of Extinction Risk" section of the report. All peer reviewer comments were addressed prior to finalizing the status review report.

We subsequently reviewed the status review report, its cited references, and peer review comments, and believe the status review report, upon which this proposed rule is based, provides the best available scientific and commercial information on the oceanic whitetip shark. Much of the information discussed below on oceanic whitetip shark biology, distribution, abundance, threats, and extinction risk is attributable to the status review report. However, we have independently applied the statutory provisions of the ESA, including evaluation of the factors set forth in section 4(a)(1)(A)–(E), our regulations regarding listing determinations, and our DPS policy in making the 12-month finding determination.

Life History, Biology, and Status of the Petitioned Species

Taxonomy and Species Description

The oceanic whitetip shark belongs to the family Carcharhinidae and is classified as a requiem shark (Order Carcharhiniformes). The oceanic whitetip belongs to the genus *Carcharhinus*, which includes other pelagic species of sharks, such as the silky shark (*Carcharhinus falciformis*) and dusky shark (*C. obscurus*), and is the only truly oceanic (*i.e.*, pelagic) shark of its genus (Bonfil *et al.*, 2008). The oceanic whitetip shark has a stocky build with a large rounded first dorsal fin and very long and wide paddle-like pectoral fins. The first dorsal fin is very wide with a rounded tip, originating just in front of the rear tips of the pectoral fins. The second dorsal fin originates over or slightly in front of the base of the anal fin. The species also exhibits a distinct color pattern of mottled white

tips on its front dorsal, caudal, and pectoral fins with black tips on its anal fin and on the ventral surfaces of its pelvic fins. The head has a short and bluntly rounded nose and small circular eyes with nictitating membranes. The upper jaw contains broad, triangular serrated teeth, while the teeth in the lower jaw are more pointed and are only serrated near the tip. The body is grayish bronze to brown in color, but varies depending upon geographic location. The underside is whitish with a yellow tinge on some individuals (Compagno 1984).

Current Distribution

The oceanic whitetip shark is distributed worldwide in epipelagic tropical and subtropical waters between 30° North latitude and 35° South latitude (Baum *et al.*, 2006). In the western Atlantic, oceanic whitetips occur from Maine to Argentina, including the Caribbean and Gulf of Mexico. In the central and eastern Atlantic, the species occurs from Madeira, Portugal south to the Gulf of Guinea, and possibly in the Mediterranean Sea. In the western Indian Ocean, the species occurs in waters of South Africa, Madagascar, Mozambique, Mauritius, Seychelles, India, and within the Red Sea. Oceanic whitetips also occur throughout the Western and Central Pacific Ocean, including China, Taiwan, the Philippines, New Caledonia, Australia (southern Australian coast), Hawaiian Islands south to Samoa Islands, Tahiti and Tuamotu Archipelago and west to the Galapagos Islands. Finally, in the eastern Pacific, the species occurs from southern California to Peru, including the Gulf of California and Clipperton Island (Compagno 1984).

Habitat Use and Movement

The oceanic whitetip shark is a highly migratory species of shark that is usually found offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deep water, occurring from the surface to at least 152 meters (m) depth. Although the oceanic whitetip can be found in decreasing numbers out to latitudes of 30° N and 35° S, with abundance decreasing with greater proximity to continental shelves, it has a clear preference for open ocean waters between 10° S and 10° N (Backus *et al.*, 1956; Strasburg 1958; Compagno 1984; Bonfil *et al.*, 2008). The species can be found in waters between 15 °C and 28 °C, but it exhibits a strong preference for the surface mixed layer in water with temperatures above 20 °C, and is considered a surface-dwelling shark. It

is however, capable of tolerating colder waters down to 7.75 °C for short periods as exhibited by brief, deep dives into the mesopelagic zone below the thermocline (>200 m), presumably for foraging (Howey-Jordan *et al.*, 2013; Howey *et al.*, 2016). However, exposures to these cold temperatures are not sustained (Musyl *et al.*, 2011; Tolotti *et al.*, 2015a) and there is some evidence to suggest the species tends to withdraw from waters below 15 °C (e.g., the Gulf of Mexico in winter; Compagno 1984).

Little is known about the movement or possible migration paths of the oceanic whitetip shark. Although the species is considered highly migratory and capable of making long distance movements, tagging data provides evidence that this species also exhibits a high degree of philopatry (*i.e.*, site fidelity) in some locations. To date, there have been three tagging studies conducted on oceanic whitetip sharks in the Atlantic. Mark recapture data (number tagged = 645 and recaptures = 8) from the NMFS Cooperative Shark Tagging Program between 1962 and 2015 provide supporting evidence that the range of movement of oceanic whitetip sharks is large, with potential for transatlantic movements (Kohler *et al.*, 1998; NMFS, unpublished data). Maximum time at liberty was 3.3 years and the maximum distance traveled was 1,225 nautical miles (nmi) (2,270 kilometers (km)). These data indicate movements from the northeastern Gulf of Mexico to the Atlantic Coast of Florida, from the Mid-Atlantic Bight to southern Cuba, from the Lesser Antilles west into the central Caribbean Sea, from east to west along the equatorial Atlantic, and from off southern Brazil in a northeasterly direction. In the Bahamas, oceanic whitetips tagged at Cat Island stayed within 500 km of the tagging site for ~30 days before dispersing across 16,422 km² of the western North Atlantic. Maximum individual displacement from the tagging site ranged from 290–1,940 km after times at liberty from 30–245 days, with individuals moving to several different destinations (e.g., the northern Lesser Antilles, the northern Bahamas, and north of the Windward Passage). Many sharks returned to the Bahamas after ~150 days and estimated residency times within the Bahamas Exclusive Economic Zone (EEZ), were generally high (mean=68.2 percent of time; Howey-Jordan *et al.*, 2013). Oceanic whitetip sharks showed similar movement patterns and site fidelity in a tagging study conducted in Brazil. Although individuals tended to travel long distances before returning to the

tagging area, tagging and pop-up sites were relatively close to each other. In fact, five out of eight sharks ended their tracks relatively close to their starting points, even after traveling several thousand kilometers (Tolotti *et al.*, 2015a).

In the Indo-Pacific, two tagging studies of oceanic whitetip shark have been conducted: one in the central Pacific and one in the western Indian Ocean. In the central Pacific, oceanic whitetip sharks showed a complex movement pattern generally restricted to tropical waters north of the North Equatorial Countercurrent near the tagging location. Maximum time at liberty was 243 days, but the largest linear movement was 2,314 nmi (4,285 km) in 95 days (Musyl *et al.*, 2011). Similar to previously discussed studies, long distance movements were also observed in the Indian Ocean, with one tag that remained attached for 100 days. This individual displayed extensive horizontal movement covering a distance of approximately 6,500 km during the monitored period, moving from the Mozambique Channel up the African east coast of Somalia and then heading back down towards the Seychelles (Filmalter *et al.*, 2012). Overall, the available tagging data demonstrates that oceanic whitetip sharks are capable of traveling great distances in the pelagic environment, but also show a high degree of site fidelity in some locations.

Diet and Feeding

Oceanic whitetip sharks are high trophic-level predators in open ocean ecosystems feeding mainly on teleosts and cephalopods (Backus *et al.*, 1956; Bonfil *et al.*, 2008), but studies have also reported that they consume sea birds, marine mammals, other sharks and rays, molluscs, crustaceans, and even garbage (Compagno 1984; Cortés 1999). Backus *et al.*, (1956) recorded various fish species in the stomachs of oceanic whitetip sharks, including blackfin tuna, barracuda, and white marlin. Based on the species' diet, the oceanic whitetip has a high trophic level, with a score of 4.2 out of a maximum 5.0 (Cortés 1999). The available evidence also suggests that oceanic whitetip sharks are opportunistic feeders. In the Bahamas, large pelagic teleosts (e.g., billfish, tunas, and dolphin fish) are abundant and oceanic whitetips are anecdotally reported to feed heavily on recreationally caught teleosts in this region. In a recent study of an oceanic whitetip shark aggregation at Cat Island, Bahamas, SIA-based Bayesian mixing model estimates of short-term (near Cat Island) diets showed more large pelagic

teleosts (72 percent) than in long-term diets (47 percent), showing a spatiotemporal difference in oceanic whitetip feeding habits. Thus, the availability of large teleost prey and supplemental feeding from recreational sport fishermen may be possible mechanisms underpinning site-fidelity and aggregation of oceanic whitetips at this location (Madigan *et al.*, 2015).

Size and Growth

Historically, the maximum length effectively measured for the oceanic whitetip was 350 cm total length (TL; Bigelow and Schroder 1948 cited in Lessa *et al.*, 1999), with “gigantic individuals” perhaps reaching 395 cm TL (Compagno 1984), though Compagno's length seems to have never been measured (Lessa *et al.*, 1999). In contemporary times, Lessa *et al.* (1999) recorded a maximum size of 250 cm TL in the Southwest Atlantic, and estimated a theoretical maximum size of 325 cm TL (Lessa *et al.*, 1999), but the most common sizes are below 300 cm TL (Compagno 1984). The oceanic whitetip has an estimated maximum age of 17 years, with confirmed maximum ages of 12 and 13 years in the North Pacific and South Atlantic, respectively (Seki *et al.*, 1998; Lessa *et al.*, 1999). However, other information from the South Atlantic suggests the species likely lives up to ~20 years old based on observed vertebral ring counts (Rodrigues *et al.*, 2015). Growth rates (growth coefficient, K) have been estimated similarly for both sexes and range from 0.075–0.099 in the Southwest Atlantic to 0.0852–0.103 in the North Pacific (Seki *et al.*, 1998; Lessa *et al.*, 1999; Joung *et al.*, 2016). Using life history parameters from the Southwest Atlantic, Cortés *et al.* (2010; 2012) estimated productivity of the oceanic whitetip shark, determined as intrinsic rate of population increase (*r*), to be 0.094–0.121 per year (median). Overall, the best available data indicate that the oceanic whitetip shark is a long-lived species (at least 20 years) and can be characterized as having relatively low productivity (based on the Food and Agriculture Organization of the United Nations (FAO) productivity indices for exploited fish species, where *r* < 0.14 is considered low productivity), making them generally vulnerable to depletion and potentially slow to recover from overexploitation.

Reproduction

Similar to other Carcharhinid species, the oceanic whitetip shark is viviparous (*i.e.*, the species produces live young) with placental embryonic development. The reproductive cycle is thought to be

biennial, giving birth on alternate years, after a lengthy 10–12 month gestation period. The number of pups in a litter ranges from 1 to 14 (mean = 6), and a positive correlation between female size and number of pups per litter has been observed, with larger sharks producing more offspring (Compagno 1984; Seki *et al.*, 1998; Bonfil *et al.*, 2008; IOTC 2015a). Age and length of maturity estimates are slightly different depending on geographic location. For example, in the Southwest Atlantic, age and length of maturity in oceanic whitetips was estimated to be 6–7 years and 180–190 cm TL, respectively, for both sexes (Lessa *et al.*, 1999). In the North Pacific, there are two different estimates for age and length of maturity. Seki *et al.*, (1998) estimated that females reach sexual maturity at approximately 168–196 cm TL, and males at 175–189 cm TL, which corresponds to ages of 4 and 5 years, respectively (Seki *et al.*, 1998). However, more recently Joung *et al.* (2016) determined a later age of maturity in the North Pacific, with females reaching maturity at 190 cm TL (approximately 8.5–8.8 years) and males reaching maturity at 172 cm TL (approximately 6.8–8.9 years old). In the Indian Ocean, both males and females mature at around 190–200 cm TL (IOTC 2014). Size at birth also varies slightly between geographic locations, ranging from 55 to 75 cm TL in the North Pacific, around 65–75 cm TL in the northwestern Atlantic, and 60–65 cm TL off South Africa, with reproductive seasons thought to occur from late spring to summer (Bonfil *et al.*, 2008; Compagno 1984).

Tropical Pacific records of pregnant females and newborns are concentrated between 20° N and the equator, from 170° E to 140° W. In the Atlantic, young oceanic whitetip sharks have been found well offshore along the southeastern coast of the United States, suggesting that there may be a nursery in oceanic waters over this continental shelf (Compagno 1984; Bonfil *et al.*, 2008). In the southwestern Atlantic, the prevalence of immature sharks, both female and male, in fisheries catch data suggests that this area may serve as potential nursery habitat for the oceanic whitetip shark (Coelho *et al.*, 2009; Tambourgi *et al.*, 2013; Tolotti *et al.*, 2013; Frédoou *et al.*, 2015). Juveniles seem to be concentrated in equatorial latitudes, while specimens in other maturational stages are more widespread (Tambourgi *et al.*, 2013). Pregnant females are often found close to shore, particularly around the Caribbean Islands. One pregnant female was found washed ashore near

Auckland, New Zealand. These points suggest that females may come close to shore to pup (Clarke *et al.*, 2015b). In the southwestern Indian Ocean, oceanic whitetip sharks appear to mate and give birth in the early summer. The locations of the nursery grounds are not well known but they are thought to be in oceanic areas.

Population Structure and Genetics

To date, only two studies have been conducted on the genetics and population structure of the oceanic whitetip shark, which suggest there may be some genetic differentiation between various populations of the species. The first study (Camargo *et al.*, 2016) compared the mitochondrial control region (mtCR) in 215 individuals from the Indian Ocean and eastern and western Atlantic Ocean. While results showed significant genetic differentiation (based on haplotype frequencies) between the eastern and western Atlantic Ocean ($\Phi_{ST} = 0.1039$, $P < 0.001$; Camargo *et al.*, 2016), pairwise comparisons among populations within the regions revealed a complex pattern. Though some eastern Atlantic populations were significantly differentiated from western Atlantic populations ($F_{ST} = 0.09 - 0.27$, $P < 0.01$), others were not ($F_{ST} = 0.02 - 0.03$, $P > 0.01$), even after excluding populations with sample sizes of less than 10 individuals (Camargo *et al.*, 2016). Additionally, the sample size from the Indian Ocean ($N = 9$) may be inadequate to detect statistically significant genetic structure between this and other regions (Camargo *et al.*, 2016). Furthermore, since this study only used mitochondrial markers, male mediated gene flow is not reflected.

In the second study, Ruck (2016) compared the mitochondrial control region, a protein-coding mitochondrial region, and nine nuclear microsatellite loci in 171 individuals sampled from the western Atlantic, Indian, and Pacific Oceans. Using three population-level pairwise metrics (Φ_{ST} , F_{ST} , and Jost's D), Ruck (2016) did not detect fine-scale matrilineal structure within ocean basins, but mitochondrial and nuclear analyses indicated weak but significant differentiation between western Atlantic and Indo-Pacific Ocean populations ($\Phi_{ST} = 0.076$, $P = 0.0002$; $F_{ST} = 0.017$, $P < 0.05$ after correction for False Discovery Rate). Therefore, Ruck (2016) suggests that oceanic whitetip sharks consist of a minimum of two contemporary, distinct genetic populations comprising sharks from the western Atlantic and the Indo-Pacific (this study did not have any samples

from the eastern Atlantic). However, although significant inter-basin population structure was evident, it was associated with deep phylogeographic mixing of mitochondrial haplotypes and evidence of contemporary migration between the western Atlantic and Indo-Pacific Oceans (Ruck 2016).

As noted previously, although Ruck (2016) did not initially detect fine-scale matrilineal structure within ocean basins, after comparing and analyzing the genetic samples of the two studies together (*i.e.*, samples from Camargo *et al.*, 2016 and samples from Ruck 2016), Ruck (Unpublished data) detected significant maternal population structure within the western Atlantic that provides evidence of three matrilineal lineages in the western Atlantic. However, the data showing population structure within the Atlantic relies solely on mitochondrial DNA and does not reflect male mediated gene flow. Thus, while the current (albeit unpublished) data supports three maternal populations within the Atlantic, this data is preliminary and information regarding male mediated gene flow would provide an improved understanding of the fine-scale genetic structuring of oceanic whitetip in the Atlantic.

The best available information indicates that the oceanic whitetip shark has relatively low genetic diversity. Compared to eight other circumtropical elasmobranch species, including the basking shark (*Cetorhinus maximus*), smooth hammerhead (*Sphyrna zygaena*), great hammerhead (*Sphyrna mokarran*), tiger shark (*Galeocerdo cuvier*), blacktip reef shark (*Carcharhinus limbatus*), sandbar shark (*Carcharhinus plumbeus*), silky shark (*Carcharhinus falciformis*), and the whale shark (*Rhincodon typus*), the oceanic whitetip shark ranks the fourth lowest in global mtCR genetic diversity (0.33 percent \pm 0.19 percent; Ruck 2016), with diversity similar to the smooth hammerhead (0.32 percent \pm 0.18 percent (Testerman 2014) and greater than basking sharks (Hoelzel *et al.*, 2006). The mtCR genetic diversity of the oceanic whitetip is about half that of the closely related silky shark (0.61 percent \pm 0.32 percent; (Clarke *et al.*, 2015a)) and about a third that of the whale shark (1.1 percent \pm 0.6 percent; (Castro *et al.*, 2007). Ruck (2016) noted that the relatively low mtDNA genetic diversity (concatenated mtCR–ND4 nucleotide diversity $\pi = 0.32$ percent \pm 0.17 percent) compared to other circumtropical elasmobranch species raises potential concern for the future genetic health of this species. Camargo *et al.*, (2016) also observed low levels of

genetic variability for the species throughout the study area, and noted that these low genetic variability rates may represent a risk to the adaptive potential of the species leading to a weaker ability to respond to environmental changes (Camargo *et al.* 2016).

Current Status

Oceanic whitetip sharks can be found worldwide, with no present indication of a range contraction. Although generally not targeted, they are frequently caught as bycatch in many global fisheries, including pelagic longline (PLL) fisheries targeting tuna and swordfish, purse seine, gillnet, and artisanal fisheries. Oceanic whitetip sharks are also a preferred species for their large, morphologically distinct fins, as they obtain a high price in the Asian fin market, and thus they are valuable as incidental catch for the international shark fin trade.

In 2006, the International Union for Conservation of Nature (IUCN) classified the oceanic whitetip shark as Vulnerable globally based on an assessment by Baum *et al.*, (2006) and its own criteria (A2ad+3d+4ad), and placed the species on its "Red List." Under criteria A2ad, 3d and 4ad, a species may be classified as Vulnerable when its "observed, estimated, inferred or suspected" population size is reduced by 30 percent or more over the last 10 years, the next 10 years, or any 10-year time period, or over a 3-generation period, whichever is the longer, where the reduction or its causes may not have ceased or may not be understood or may not be reversible, based on a direct observation and actual or potential levels of exploitation. The IUCN's justification for the categorization is based on the species' declining populations. The IUCN notes that the species' regional trends, slow life history characteristics (hence low capacity to recover from moderate levels of exploitation), and high levels of largely unmanaged and unreported mortality in target and bycatch fisheries, give cause to suspect that the population has decreased by over 30 percent and meets the criteria to be categorized as Vulnerable globally. As a note, the IUCN classification for the oceanic whitetip shark alone does not provide the rationale for a listing recommendation under the ESA, but the classification and the sources of information that the classification is based upon are evaluated in light of the standards on extinction risk and impacts or threats to the species.

Distinct Population Segments

As described above, the ESA's definition of "species" includes "any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any species of vertebrate fish or wildlife which interbreeds when mature." As stated in the joint DPS policy, Congress expressed its expectation that the Services would exercise authority with regard to DPSs sparingly and only when the biological evidence indicates such action is warranted. NMFS determined at the 90-day finding stage that the petition to list the global species of oceanic whitetip shark was warranted. As such, we conducted the extinction risk analysis on the global oceanic whitetip shark population.

Assessment of Extinction Risk

The ESA (section 3) defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its range." A threatened species is defined as "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range." Neither we nor the USFWS have developed formal policy guidance about how to interpret the definitions of threatened and endangered with respect to what it means to be "in danger of extinction." We consider the best available information and apply professional judgment in evaluating the level of risk faced by a species in deciding whether the species is threatened or endangered. We evaluate both demographic risks, such as low abundance and productivity, and threats to the species, including those related to the factors specified in ESA section 4(a)(1)(A)–(E).

Methods

As we described previously, we convened an ERA team to evaluate extinction risk to the species. This section discusses the methods used to evaluate threats and the overall extinction risk to the oceanic whitetip shark. For purposes of the risk assessment, an ERA team comprised of fishery biologists and shark experts was convened to review the best available information on the species and evaluate the overall risk of extinction facing the oceanic whitetip shark, now and in the foreseeable future. The term "foreseeable future" was defined as the timeframe over which threats could be reliably predicted to impact the biological status of the species. After considering the life history of the

oceanic whitetip shark, availability of data, and types of threats, the ERA team decided that the foreseeable future should be defined as approximately 3 generation times for the oceanic whitetip shark, or approximately 30 years. A generation time is defined as the time it takes, on average, for a sexually mature female oceanic whitetip shark to be replaced by offspring with the same spawning capacity. This timeframe (3 generation times) takes into account the time necessary to provide for the conservation and recovery of the species. As a late-maturing species, with slow growth rate and relatively low productivity, it would likely take more than a generation time for any conservative management action to be realized and reflected in population abundance indices. In addition, the foreseeable future timeframe is also a function of the reliability of available data regarding the identified threats and extends only as far as the data allow for making reasonable predictions about the species' response to those threats. Since the main threats to the species were identified as fisheries and the inadequacy of existing regulatory measures that manage these fisheries, the ERA team felt that they had the background knowledge in fisheries management and expertise to confidently predict the impact of these threats on the biological status of the species within this timeframe.

The ability to measure or document risk factors to a marine species is often limited, where quantitative estimates of abundance and life history information are often lacking altogether. Therefore, in assessing extinction risk of a data limited species, it is important to include both qualitative and quantitative information. In assessing extinction risk to the oceanic whitetip shark, the ERA team considered the demographic viability factors developed by McElhany *et al.*, (2000) and the risk matrix approach developed by Wainwright and Kope (1999) to organize and summarize extinction risk considerations. The approach of considering demographic risk factors to help frame the consideration of extinction risk has been used in many of our status reviews (see <http://www.nmfs.noaa.gov/pr/species> for links to these reviews). In this approach, the collective condition of individual populations is considered at the species level according to four demographic viability factors: Abundance, growth rate/productivity, spatial structure/connectivity, and diversity. These viability factors reflect concepts that are

well-founded in conservation biology and that individually and collectively provide strong indicators of extinction risk.

Using these concepts, the ERA team evaluated demographic risks by assigning a risk score to each of the four demographic risk factors. The scoring for these demographic risk criteria correspond to the following values: 0—unknown risk, 1—low risk, 2—moderate risk, and 3—high risk. Detailed definitions of the risk scores can be found in the status review report.

The ERA team also performed a threats assessment for the oceanic whitetip shark by evaluating the effect that the threat was currently having on the extinction risk of the species. The levels included “unknown,” “low,” “moderate,” and “high.” The scores were then tallied and summarized for each threat. It should be emphasized that this exercise was simply a tool to help the ERA team members organize the information and assist in their thought processes for determining the overall risk of extinction for the oceanic whitetip shark.

Guided by the results from the demographic risk analysis and the threats assessment, the ERA team members were asked to use their informed professional judgment to make an overall extinction risk determination for the oceanic whitetip shark. For this analysis, the ERA team considered three levels of extinction risk: 1—low risk, 2—moderate risk, and 3—high risk, which are all temporally connected. Detailed definitions of these risk levels are as follows: 1 = Low risk: A species or DPS is at low risk of extinction if it is not at a moderate or high level of extinction risk (see “Moderate risk” and “High risk” below). A species or DPS may be at a low risk of extinction if it is not facing threats that result in declining trends in abundance, productivity, spatial structure, or diversity. A species or DPS at low risk of extinction is likely to show stable or increasing trends in abundance and productivity with connected, diverse populations; 2 = Moderate risk: A species or DPS is at moderate risk of extinction if it is on a trajectory that puts it at a high level of extinction risk in the foreseeable future (see description of “High risk”). A species or DPS may be at moderate risk of extinction due to projected threats or declining trends in abundance, productivity, spatial structure, or diversity. The appropriate time horizon for evaluating whether a species or DPS is more likely than not to be at high risk in the foreseeable future depends on various case- and species-specific factors; 3 = High risk: A

species or DPS with a high risk of extinction is at or near a level of abundance, productivity, spatial structure, and/or diversity that places its continued persistence in question. The demographics of a species or DPS at such a high level of risk may be highly uncertain and strongly influenced by stochastic or compensatory processes. Similarly, a species or DPS may be at high risk of extinction if it faces clear and present threats (e.g., confinement to a small geographic area; imminent destruction, modification, or curtailment of its habitat; or disease epidemic) that are likely to create present and substantial demographic risks. The ERA team adopted the “likelihood point” (FEMAT) method for ranking the overall risk of extinction to allow individuals to express uncertainty. For this approach, each team member distributed 10 “likelihood points” among the extinction risk levels. This approach has been used in previous NMFS status reviews (e.g., Pacific salmon, Southern Resident killer whale, Puget Sound rockfish, Pacific herring, and black abalone) to structure the team’s thinking and express levels of uncertainty when assigning risk categories. Although this process helps to integrate and summarize a large amount of diverse information, there is no simple way to translate the risk matrix scores directly into a determination of overall extinction risk. Other descriptive statistics, such as mean, variance, and standard deviation, were not calculated, as the ERA team felt these metrics would add artificial precision to the results. The scores were then tallied and summarized.

Finally, the ERA team did not make recommendations as to whether the species should be listed as threatened or endangered. Rather, the ERA team drew scientific conclusions about the overall risk of extinction faced by the oceanic whitetip shark under present conditions and in the foreseeable future based on an evaluation of the species’ demographic risks and assessment of threats.

Evaluation of Demographic Risks

Abundance

While a global population size estimate or trend for the oceanic whitetip shark is currently unavailable, numerous sources of information, including the results of a recent stock assessment and several other abundance indices (e.g., trends in occurrence and composition in fisheries catch data, catch-per-unit-effort (CPUE), and biological indicators) were available to infer and assess current regional

abundance trends of the species. Given the available data, and the fact that the available assessments were not conducted prior to the advent of industrial fishing (and thus not from virgin biomass), the exact magnitude of the declines and current abundance of the global population are unknown. However, based on the best available scientific and commercial data, the ERA team concluded, and we agree, that while the oceanic whitetip shark was historically one of the most abundant and ubiquitous shark species in tropical seas around the world, numerous lines of evidence suggest the species has not only undergone significant historical declines throughout its range, but likely continues to experience abundance declines of varying magnitude globally.

Across the Pacific Ocean, several lines of evidence indicate significant and ongoing population declines of the oceanic whitetip shark. In the eastern Pacific Ocean (EPO), the oceanic whitetip shark was historically the third most abundant shark species after blue sharks (*Prionace glauca*) and silky sharks (*C. falciiformis*). The oceanic whitetip comprised approximately 20 percent of the total shark catch in the tropical tuna purse seine fishery from 2000–2001 (Roman-Verdesoto and Orozco-Zoller 2005) and averaged 9 percent of the total shark catch from 1993–2009 (with silky sharks comprising 84 percent, the hammerhead complex comprising 5 percent, and other sharks comprising 2 percent; Hall and Román 2013). However, if only the more recent period from 2005–2009 is considered, then the proportion of silky sharks is 93 percent, followed by the scalloped hammerhead shark (1.6 percent), and the smooth hammerhead shark (1.5 percent). The changes are the result of a rapid decline in oceanic whitetip sharks (Hall and Román 2013). Data for the oceanic whitetip shark in the EPO is available from the Inter-American Tropical Tuna Commission (IATTC), the Regional Fishery Management Organization (RFMO) responsible for the conservation and management of tuna and tuna-like species in the IATTC Convention Area. The IATTC Convention Area is defined as waters of the EPO within the area bounded by the west coast of the Americas and by 50° N. latitude, 150° W. longitude, and 50° S. latitude.

Nominal catch data from the IATTC shows that purse seine sets on floating objects, unassociated sets and dolphin sets all show decreasing trends of oceanic whitetip shark since 1994 (IATTC 2007). In particular, presence of oceanic whitetip sharks on sets with floating objects, which are responsible

for 90 percent of the shark catches in the EPO purse seine fishery, has declined significantly (Hall and Román 2013). Based on nominal catches per set as well as the frequency of occurrence of oceanic whitetip sharks in floating object sets, the species has practically disappeared from the fishing grounds, with a seemingly north to south progression. Similar trends are also seen in dolphin and school sets. These declines in nominal CPUE or the frequency of occurrence translates to a decline of 80–95 percent from the population levels in the late 1990s (Hall and Román 2013). Although there are various potential reasons for such reductions, including changes in fishing areas or methods, higher utilization rates, or some combination of factors, the increasing rarity of this species in EPO purse seine sets likely tracks closely with their relative abundance (Hall and Román 2016).

Similar levels of decline have also been observed across the Western and Central Pacific Ocean. Like the eastern Pacific, the oceanic whitetip shark was once one of the most abundant pelagic shark species throughout the tropical waters of the region. For example, tuna longline survey data from the 1950s indicate oceanic whitetip sharks comprised 28 percent of the total shark catch of fisheries south of 10° N. (Strasburg 1958). Likewise, Japanese research longline records during 1967–1968 indicate that oceanic whitetip sharks were among the most common shark species taken by tuna vessels in tropical seas of the Western and Central Pacific, and comprised 22.5 percent and 23.5 percent of the total shark catch west and east of the International Date Line, respectively (Taniuchi 1990). However, numerous sources of information indicate significant and ongoing abundance declines of oceanic whitetip sharks in this region. For example, a recent stock assessment conducted in the Western and Central Pacific, based on observer data from the Secretariat of the Pacific Community (SPC), estimated an 86 percent decline in spawning biomass from 1995 to 2009, with total biomass reduced to just 6.6 percent of the theoretical equilibrium virgin biomass (*i.e.*, a total decline of 93.4 percent; Rice and Harley 2012). Based on the results from the oceanic whitetip stock assessment, the median estimate of oceanic whitetip biomass in the Western Central Pacific as of 2010 was 7,295 tons (Rice and Harley 2012), which would be equivalent to a population of roughly 200,000 individuals (FAO 2012). An updated assessment analyzing various

abundance indices, including standardized CPUE, concluded that the oceanic whitetip shark continues to decline throughout the tropical waters of the Western and Central Pacific (Rice *et al.*, 2015), indicating a severely depleted population of oceanic whitetip shark across the region with observations of the species becoming increasingly rare. Similar results were found in analyses of CPUE data from the Hawaii-based PLL fishery, where oceanic whitetip shark showed a decline in relative abundance on the order of ≥ 90 percent from 1995–2010 (Clarke *et al.*, 2012; Brodziak *et al.*, 2013). It must be recognized that the closeness of the agreement between the trends in observer data from Hawaii and the observer data from the SPC for the entire Western and Central Pacific Ocean may be partly due to the use of datasets that partially overlap for years prior to 2005. Still, even after 2005, the trends show similar results suggesting that the patterns are representative of regional trends in oceanic whitetip abundance. A preliminary update of the Brodziak *et al.* (2013) study with 4 additional years of data (2011–2014) indicates a potential relative stability in the population size at a post-decline depressed state (Young *et al.*, 2016). Nonetheless, the ERA team concluded, and we agree, that the levels of significant and ongoing population decline observed in these studies indicate that these declines are not just local or regional, but rather a Pacific-wide phenomenon, with no significant indication that these trends have reversed.

In the Northwest Atlantic, the oceanic whitetip shark was described historically as widespread, abundant, and the most common pelagic shark in the warm parts of the North Atlantic (Backus *et al.*, 1956). Several studies have been conducted to determine trends in abundance of various shark species, including the oceanic whitetip shark. Baum *et al.*, (2003) analyzed logbook data for the U.S. PLL fleets targeting swordfish and tunas, and reported a 70 percent decline in relative abundance for the oceanic whitetip shark from 1992 to 2000. Similarly, Baum and Myers (2004) compared longline CPUE from research surveys from 1954–1957 to observed commercial longline sets from 1995–1999, and determined that the oceanic whitetip had declined by more than 150-fold, or 99.3 percent (95 percent; Confidence Interval (CI): 98.3–99.8 percent) in the Gulf of Mexico during that time. However, the methods and results of Baum *et al.* (2003) and Baum and Myers

(2004) were challenged on the basis of whether correct inferences were made regarding the magnitude of shark population declines in the Atlantic (see discussions in Burgess *et al.*, (2005b) and Burgess *et al.*, (2005a)). Of particular relevance to the oceanic whitetip, Burgess *et al.*, (2005b) noted that the change from steel to monofilament leaders between the 1950s and 1990s could have reduced the catchability of all large sharks, and the increase in the average depth of sets during the same period could have reduced the catchability of the surface-dwelling oceanic whitetip (FAO 2012). Later, Driggers *et al.*, (2011) conducted a study on the effects of different leader materials on the CPUE of oceanic sharks and determined that with equivalent methods but using a wire leader, the catch rates of Baum and Myers (2004) for the recent period would have been 0.55 rather than 0.02 (as estimated by Baum and Myers (2004) using nylon leaders). Comparing the recent 0.55 value with the Baum *et al.* (2003) value of 4.62 for the 1950s gave an estimated extent of decline of 88 percent (FAO 2012). In a re-analysis of the same logbook dataset analyzed by Baum *et al.* (2003) for the Northwest Atlantic using a similar methodology, Cortés *et al.*, (2007) reported a 57 percent decline from 1992–2005. The decline was largely driven by a 37 percent decline from 1992 to 1993 and a subsequent decline of 53 percent from 1997 to 2000, after which the time series remained stable (2000–2005). However, an analysis of the observer dataset from the same fishery resulted in a less pronounced decline than that of the logbook analysis, with a 9 percent decline in abundance from the same period of 1992–2005. Finally, the ERA team conducted an updated analysis (1992–2015) using the same observer data analyzed by Cortés *et al.* (2007). Similar to previous analyses, there was high variability in the initial years of the time series, but overall, the analysis conducted by the ERA team showed ~4 percent decline over the time series, with the overall trend indicative that the population may have stabilized (Young *et al.* 2016). Although observer data are generally regarded as more reliable than logbook data for non-target shark species (Walsh *et al.*, 2002), it should be noted that the sample size of oceanic whitetip shark in the observer data was substantially smaller than for other species, and thus the trends estimated should be regarded with caution. Additionally, although misreporting and species misidentification are likely to be much more prevalent in logbooks,

which can obscure abundance trends, misidentification is not considered an issue for the oceanic whitetip, whereas it is more problematic for other species such as night shark and other *Carcharhinus* species. It should also be noted that fishing pressure on the oceanic whitetip shark began decades prior to the time series covered in these studies (with the exception of the Baum and Myers (2004) study), thus the percentage declines discussed here do not represent percentage declines from historical virgin biomass. Therefore, given all of the caveats and limitations of the studies and analyses discussed above, it is likely that the oceanic whitetip shark population in the Northwest Atlantic and Gulf of Mexico experienced significant historical declines; however, relative abundance of oceanic whitetip shark may have stabilized in the Northwest Atlantic since 2000 and in the Gulf of Mexico/Caribbean since the late 1990s at a significantly diminished abundance (Cortés *et al.* 2007; Young *et al.* 2016).

In other areas of the oceanic whitetip shark range, robust and reliable quantitative abundance data are limited or lacking altogether. In the South Atlantic, the oceanic whitetip has been characterized as one of the most abundant species of pelagic shark in the south western and equatorial region. For example, the oceanic whitetip was the third most commonly caught shark out of 33 shark species caught year-round in the prominent Brazilian Santos longline fishery, and one of 7 species that comprised >5 percent of total shark catches from 1971–1995 (Amorim 1998). In Itajai, southern Brazil, oceanic whitetip sharks were considered “abundant” and “frequent” in the surface longline and gillnet fleets, respectively, from 1994–1999 (Mazzoleni and Schwingel 1999). Likewise, in equatorial waters off the northeastern coast of Brazil, the oceanic whitetip shark was historically reported as the second most abundant elasmobranch species, outnumbered only by the blue shark (*P. glauca*), in research surveys conducted within the EEZ of Brazil, and comprised 29 percent of the total elasmobranch catch in the 1990s (Lessa *et al.*, 1999). From 1992–2002, oceanic whitetip CPUE in this area averaged 2.18 individuals/1,000 hooks (Domingo *et al.*, 2007); more recently, however, the average CPUE recorded in this same area from 2004–2010 of 0.1–0.3 individuals/1,000 hooks (Frédou *et al.*, 2015) is much lower. Additionally, none of the other areas within this region exhibit CPUE rates comparable to the rates seen in the

1990s. Further, demographic analyses from the largest oceanic whitetip shark catching country in the South Atlantic (*i.e.*, Brazil) indicate abundance declines similar to the Northwest Atlantic of 50–79 percent in recent decades (Santana *et al.*, 2004; ICMBio 2014) and coincide with significant declines in catches of oceanic whitetip shark reported by Brazil to the International Commission for the Conservation of Atlantic Tunas (ICCAT). As a result of these declining trends, the oceanic whitetip shark was designated as a “species threatened by overexploitation” in 2004 by Brazil’s Ministério do Meio Ambiente (Ministry of Environment), and listed under Annex II of Brazil’s Normative Ruling No. 5 of May 21, 2004 that recognizes endangered species and species threatened by overexploitation, including aquatic invertebrates and fish. In 2014, Brazil finalized its national assessment regarding the extinction risk of Brazilian fauna, and listed the oceanic whitetip shark as Vulnerable under Brazil’s “Lista Nacional Oficial de Espécies da Fauna Ameaçadas de Extinção—Peixes e Invertebrados Aquáticos” (National Official List of Endangered Species of Fauna—Fish and Aquatic Invertebrate; ICMBio 2014).

Elsewhere across the South Atlantic, the oceanic whitetip shark appears to be relatively rare, with low patchy abundance. For example, in 6 years of observer data from the Uruguayan longline fleet (1998–2003), catches of oceanic whitetip shark were described as “occasional” with CPUE rates of only 0.006 individuals/1,000 hooks (Domingo 2004). However, during this study, the Uruguayan longline fleet operated between latitudes 26° and 37° S. and within sea surface temperatures ranging between 16° and 23 °C, which are largely lower than the temperature preferences of the species. Domingo (2004) noted that it is unknown whether the species has always occurred in low numbers in this region of the South Atlantic, or whether the population has been affected significantly by fishing effort. More recently, Domingo *et al.* (2007) found similar results, with the highest CPUE recorded not exceeding 0.491 individuals/1,000 hooks. In total, only 63 oceanic whitetips were caught on 2,279,169 hooks and 63 percent were juveniles. All catches occurred in sets with sea surface temperatures ≥ 22.5 °C (Domingo *et al.*, 2007). Again, this data does not indicate whether a decline in the population has occurred, rather, it clearly reflects the low abundance of the species in this area (Domingo *et al.*, 2007). The low abundance of oceanic

whitetip in this area may be the result of the species’ tendency to remain in warmer, tropical waters farther north. Alternatively, it could be a result of historical fishing pressure in the region.

Finally, in a study that synthesized information on shark catch rates (based on 871,177 sharks caught on 86,492 longline sets) for the major species caught by multiple fleets in the South Atlantic between 1979 and 2011, catch rates of most species (with the exception of *P. glauca* and *A. superciliosus*), including oceanic whitetip, declined by more than 85 percent (Barreto *et al.*, 2015). However, it should be noted that there are some caveats and limitations to this study, including high and overlapping confidence intervals, raising the possibility that the trends may be noise rather than truly tracking abundance. Nonetheless, while robust abundance data is lacking in the South Atlantic, the best available information, including demographic analyses and fisheries data across the region from 1979–2011, indicate the oceanic whitetip shark has potentially experienced a significant population decline ranging from 50–85 percent (Santana *et al.* 2004; ICMBio 2014; Barreto *et al.* 2015). Overall, the ERA team concluded, and we agree, that the oceanic whitetip population in the South Atlantic has likely experienced historical declines similar to levels seen in the Northwest Atlantic, and this population decline is likely ongoing, although we acknowledge some uncertainty regarding the available data from this region.

Abundance information from the Indian Ocean is relatively deficient and unreliable. Nonetheless, historical research data shows overall declines in both CPUE and mean weight of oceanic whitetip sharks (Romanov *et al.*, 2008), and anecdotal reports suggest that oceanic whitetips have become rare throughout much of the Indian Ocean over the past 20 years (IOTC 2015a). The Indian Ocean Tuna Commission (IOTC) also reports that despite limited data, oceanic whitetip shark abundance has likely declined significantly over recent decades. Furthermore, a few quantitative studies provide some additional information indicative of declining trends of oceanic whitetip in the Indian Ocean. For example, data from an exploratory fishing survey for large pelagic species conducted off the eastern seaboard of the Maldives from 1987–1988 reported that oceanic whitetips represented 29 percent of the sharks caught by longline and 10 percent of the sharks caught by gillnet in all fishing zones (Anderson and Waheed 1990). During this survey, the

average CPUE for all sharks was 48.7 sharks/1,000 hooks. Applying the percentage of oceanic whitetips in the catch to the total CPUE, it is estimated that the CPUE of oceanic whitetip in this period was about 1.41 individuals/100 hooks (FAO 2012). More recently, Anderson *et al.* (2011) estimated that the average CPUE of oceanic whitetip in the shark longline fishery was only 0.20 individuals per fishing vessel (or approximately 0.14 sharks/100 hooks), and estimated the species contributed only 3.5 percent of the shark landings. This would represent a 90 percent decline in abundance between 1987–1988 and 2000–2004. Such a level of decline would be consistent with the decrease in the proportion of oceanic whitetip in the catch (from 29 percent of longline shark catch in 1987–1988 to just 3.5 percent of landings in 2000–2004) and also with anecdotal information reporting a marked decrease in sightings of oceanic whitetip sharks off northern and central Maldives (Anderson *et al.*, 2011; FAO 2012). The IOTC Working Party on Ecosystems and Bycatch (WPEB) noted the following on the aforementioned studies: “Data collected on shark abundance represents a consistent time series for the periods 1987–1988 and 2000–2004, collected with similar longline gear, and that the data was showing a declining trend in oceanic whitetip shark abundance, which is a potential indicator of overall stock depletion.” The WPEB further noted that it could be related to localized effects, although this was deemed unlikely as oceanic whitetip sharks are wide-ranging and abundance trends from long-term research conducted by the former Soviet Union between the 1960s and 1980s indicate a similar decline of oceanic whitetip sharks, and that “sightings of this species in Maldives and Réunion islands is now quite uncommon” (IOTC 2011).

Similarly, surveys of the tuna longline fishery in India indicate a likely decline of oceanic whitetip shark abundance. In Andaman and Nicobar waters, where catches of sharks are prominent and contribute 35.15 percent of the catch by number and 51.46 percent by weight, John and Varghese (2009) reported that the oceanic whitetip shark comprised 4.6 percent of the total shark catch from 1984–2006. However, in more recent surveys, Varghese *et al.*, (2015) report that oceanic whitetip shark comprised only 0.23 percent of the total shark catch from 2004–2010 in this area, which is significantly lower than what John and Varghese (2009) reported previously. Off the West Coast of India

in the eastern Arabian Sea, the percentage of oceanic whitetip sharks in the overall shark catch also declined slightly from 0.6 percent to 0.45 percent. Overall, Varghese *et al.* (2015) shows that the index of relative abundance of sharks was considerably lower than that found in earlier studies, indicating a decline in abundance over the years. While the lack of standardized CPUE trend information for oceanic whitetip in these studies makes it difficult to evaluate the potential changes in abundance for this species in this region, based on the best available information, it is likely that the oceanic whitetip has experienced some level of population decline in this region. Additionally, it is important to note that India has objected to IOTC Resolution 13–06, which prohibits the retention of oceanic whitetip sharks (since 2013) in IOTC managed fisheries, and thus this Resolution is not binding on India. Therefore, oceanic whitetip sharks may still be retained in Indian fisheries.

Other studies on the abundance trends of oceanic whitetip shark in the Indian Ocean, including analyses of standardized CPUE indices from Japanese and Spanish longline fisheries, also indicate potential population declines, although trends are conflicting. Two studies estimate standardized CPUE for oceanic whitetip shark in the Japanese longline fleet operating in the Indian Ocean (Semba and Yokawa 2011; Yokawa and Semba 2012). In the first 2011 study, CPUE reached its peak in 2003 and then showed a gradually decreasing trend thereafter. Prior to 2003, large fluctuations in oceanic whitetip CPUE are attributed to changes in reporting requirements rather than the actual trend of the stock, as those years represent the introduction phase of a new recording system. The data showed low values in 2000 and 2001 (attributed to extremely low catches), and a gradual decreasing trend from 2003 to 2009. The authors interpreted a 40 percent decline in CPUE as an indication of a decrease in abundance of the population (FAO 2012; Semba and Yokawa 2011). Yokawa and Semba (2012) updated the data to 2011 using a modified data filtering method, which produced a rather similar and somewhat flattened trend.

Standardized CPUE of the Spanish longline fishery from 1998 to 2011 showed large historical fluctuations and a general decreasing trend of oceanic whitetip shark from 1998–2007, followed by an increase thereafter in the last 4 years of the time series. Overall, the magnitude of decline in this study was estimated to be about 25–30 percent

(Ramos-Cartelle *et al.*, 2012); however, it should be noted that due to the high variability of the standardized catch rates between consecutive years and limited availability of specimens in some years, this index could be representative of a particular period rather than a plausible indicator of the stock abundance at large (Ramos-Cartelle *et al.*, 2012). Specifically, the data yielded support for the relatively low prevalence described for this species in the commercial fishery of surface longline fleets targeting swordfish in waters with temperatures generally lower than those selected by this species as its preferred habitat (García-Cortés *et al.*, 2012; Ramos-Cartelle *et al.*, 2012).

Finally, a study that incorporated data from the tropical French and Soviet Union purse seine fisheries analyzed the interaction between oceanic whitetip sharks and the tropical purse seine fisheries in terms of occurrence per set (not taking into account the number of individuals caught per set) from the mid-1980s to 2014. Results showed a marked change in the proportion of fish aggregating device (FAD) sets with oceanic whitetips present, fluctuating around 20 percent in the mid-1980s and 1990s, and then dropping to less than 10 percent from 2005 onwards. Taking into account that the number of FADs has greatly increased since the 1990s (Dagorn *et al.*, 2013; Maufroy *et al.*, 2015; Tolotti *et al.*, 2015b), the change in the proportion of FADs with oceanic whitetip sharks by more than 50 percent could indicate an important population decline (Tolotti *et al.*, 2015b). Alternatively, the decline of oceanic whitetip shark occurrence per FAD could be the result of a sharp increase of FAD densities combined with a small and stable population size. In this scenario, the proportion of oceanic whitetips/FAD would simply decrease because there aren't enough sharks to aggregate around that many FADs. However, although the analyzed data does not provide a straightforward interpretation (as both hypotheses seem plausible), given the declines indicated in other studies throughout the Indian Ocean, it seems more plausible that the marked decline observed in Tolotti *et al.* (2015b) is indicative of a declining abundance trend rather than a small, stable population.

Despite the varying magnitudes of reported declines of oceanic whitetip shark in the Indian Ocean, the ERA team agreed that given the significantly high fishing pressure and catches of oceanic whitetip shark in the Indian Ocean (which are likely severely underreported), combined with the

species' high at-vessel mortality rates in longlines in this area and the species' low-moderate productivity (see the *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes* section below for more details), it is likely that the species will continue to experience population declines in this region into the foreseeable future.

Overall, in areas where oceanic whitetip shark data are available, trends from throughout the species' global range show large historical declines in abundance (e.g., Eastern Pacific, Western and Central Pacific, Atlantic and Indian Oceans). Recent evidence suggests that most populations are still experiencing various levels of decline due to continued fishing pressure and associated mortality. Further, the potential stabilization of the abundance trends at depleted levels seen in observer data from the Northwest Atlantic and Hawaiian PLL fisheries represents a small contingent of the global population. Thus, the best available scientific and commercial data available suggest that the global population of oceanic whitetip continues to experience various levels of decline throughout the majority of its range.

Growth Rate/Productivity

The ERA team expressed some concern regarding the effect of the oceanic whitetip shark's growth rate and productivity on its risk of extinction. Sharks, in general, have lower reproductive and growth rates compared to bony fishes. The ERA team noted that this species has some life history parameters that are typically advantageous, and some that are likely detrimental to the species' resilience to excessive levels of exploitation. For example, in comparison to other shark species, the oceanic whitetip is relatively productive, with an intrinsic rate of population increase (r) of 0.094–0.121 per year (Cortés 2010; 2012). The oceanic whitetip also ranked among the highest in productivity when compared with other pelagic shark species in terms of its pup production, rebound potential, potential for population increase, and for its stochastic growth rate (Chapple and Botsford 2013). Although the oceanic whitetip shark has a relatively high productivity rate compared to other sharks, it is still considered low for a fish species ($r < 0.14$). Additionally, the species has a fairly late age of maturity (–6–9 years for females depending on the location), has a lengthy gestation period of 9–12 months, and only produces an average of 5–6 pups every two years. Thus,

while this species may generally be able to withstand low to moderate levels of exploitation, given the high level of fishing mortality this species has experienced and continues to experience throughout the majority of its range, its life history characteristics may only provide the species with a limited ability to compensate. Therefore, based on the best available information, these life history characteristics likely pose a risk to this species in combination with threats that reduce its abundance, such as overutilization.

Spatial Structure/Connectivity

The oceanic whitetip shark is a relatively widespread species that may be comprised of distinct stocks in the Pacific, Indian, and Atlantic oceans. The population structure and exchange between these stocks is unknown; however, based on genetic information, telemetry data, and temperature preferences it is unlikely that there is much exchange between populations in the Atlantic and Indo-Pacific Oceans. However, recent genetic data suggests potentially significant population structure within the Atlantic, which may be underpinned by the fact that this species exhibits a high degree of philopatry in some locations (i.e., the species returns to the same site for purposes of breeding or feeding, etc.). While the population structure observed in the Atlantic, despite no physical or oceanographic barrier, could result in localized depletions in areas where fishing pressure is high (e.g., Brazil), habitat characteristics that are important to this species are unknown. The species is highly mobile, and there is little known about specific migration routes. It is also unknown if there are source-sink dynamics at work that may affect population growth or species' decline. There is no information on critical source populations to suggest spatial structure and/or loss of connectivity are presently posing demographic risks to the species. Thus, based on the best available information, there is insufficient information to support the conclusion that spatial structure and connectivity currently pose a significant demographic risk to this species.

Diversity

As noted previously in the *Population Structure and Genetics* section, recent research suggests the oceanic whitetip shark has low genetic diversity (0.33 percent \pm 0.19 percent; Ruck 2016), which is about half that of the closely related silky shark (0.61 percent \pm 0.32 percent; Clarke *et al.*, (2015a)). The ERA

team noted that the relatively low mtDNA genetic diversity of the oceanic whitetip raises potential concern for the future genetic health of this species, particularly in concert with steep global declines in abundance. Based on the fact that exploitation of the oceanic whitetip shark began with the onset of industrial fishing in the 1950s, only 5–7 generations of oceanic whitetip have passed since the beginning of this exploitation. Thus, the low genetic diversity of oceanic whitetip shark likely reflects historic levels, and the significant global declines are not yet reflected genetically (Ruck 2016). The ERA team noted that this may be a cause for concern in the foreseeable future, since a species with already relatively low genetic diversity undergoing significant levels of exploitation may increase the species' risk in terms of reduced fitness and evolutionary adaptability to a rapidly changing oceanic environment as well as potential extirpations. The ERA team also noted that low genetic diversity does not necessarily equate to a risk of extinction in and of itself for all species; but, in combination with low levels of abundance and continued exploitation, low genetic diversity may pose a viable risk to the species in the foreseeable future.

Summary of Factors Affecting the Oceanic Whitetip Shark

As described above, section 4(a)(1) of the ESA and NMFS' implementing regulations (50 CFR 424.11(c)) state that we must determine whether a species is endangered or threatened because of any one or a combination of the following factors: The present or threatened destruction, modification, or curtailment of its habitat or range; overutilization for commercial, recreational, scientific, or educational purposes; disease or predation; the inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence. The ERA team evaluated whether and the extent to which each of the foregoing factors contributed to the overall extinction risk of the global oceanic whitetip shark population. We summarize information regarding each of these threats below according to the factors specified in section 4(a)(1) of the ESA. Available information does not indicate that destruction, modification or curtailment of the species' habitat or range, disease or predation, or other natural or manmade factors are operative threats on this species; therefore, we do not discuss those further here. See Young *et al.* (2016) for

additional discussion of all ESA section 4(a)(1) threat categories.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Threats to the oceanic whitetip shark related to overutilization stem from mortality in commercial fisheries, largely driven by demand of the international shark fin trade, bycatch-related mortality, as well as illegal, unreported, and unregulated (IUU) fishing. The oceanic whitetip shark is generally not a targeted species, but because of its tendency to remain in the surface mixed layer of the water column (0–152 m depth) and in tropical latitudes where fishing pressure is often most concentrated for target species such as tuna, the species is frequently encountered and suffers high mortality rates in numerous fisheries throughout its global range. The oceanic whitetip shark is also considered a preferred species for the international fin trade because its large, morphologically distinct fins obtain a high value in the Asian fin market. The high value and demand for oceanic whitetip fins incentivizes the retention and subsequent finning of oceanic whitetip sharks when caught, and thus represents the main economic driver for retention and mortality of this species in commercial fisheries throughout its global range. In fact, growth in demand from the fin trade during the 1990s coincided with a pattern of soaring catches of oceanic whitetip sharks in numerous fisheries across the globe. Catches generally peaked from 1995 to 2000 and were followed by precipitous declines over the next 10 years due to severe overfishing (Hazin *et al.*, 2007; Lawson 2011; Clarke *et al.*, 2012; Hasarangi *et al.*, 2012; Brodziak *et al.*, 2013; Hall and Román 2013). The oceanic whitetip is regularly caught incidentally with PLLs, purse seines, handlines, troll and occasionally pelagic and even bottom trawls (Compagno 1984). In addition to mortality as a result of retention and finning in commercial fisheries, oceanic whitetip sharks experience varying levels of bycatch-related fishing mortality, including at-vessel and post-release mortality. Finally, recent reports of illegal trafficking of oceanic whitetip shark fins suggest the species may be heavily impacted by IUU fishing activities. Therefore, the ERA team assessed the following factors that may have contributed or continue to contribute to the historical and ongoing overutilization of the oceanic whitetip shark: Retention and finning in commercial fisheries for purposes of the

international fin trade, incidental bycatch in commercial fisheries (including impacts of at-vessel and post-release mortality), and IUU fishing activities.

In the EPO, the oceanic whitetip shark is caught on a variety of gear, including longline and purse seine gear targeting tunas and swordfish. They are also believed to be taken in artisanal fisheries in many countries around the EPO (IATTC 2007). To date, the IATTC has not conducted a stock assessment for the oceanic whitetip shark. However, species-specific catch estimates based on observer data from the purse seine fishery are available from the IATTC observer database. As noted previously in the *Demographic Risk Assessment—Abundance section*, the oceanic whitetip was the second most abundant shark in the catches behind the silky shark, and comprised approximately 9 percent of the total shark catch from 1993–2009 (Hall and Román 2013). In floating object sets, which are responsible for 90 percent of oceanic whitetip shark catches, capture probability of the species has decreased over time from a high of 30 percent capture rate per set between 1994 and 1998, to less than 5 percent from 2004 to 2008 (Morgan 2014). Estimated catches of oceanic whitetip sharks in all purse seine sets peaked with approximately 9,709 individuals caught in 1999; however, within 10 years catches dropped dramatically to an estimated 379 oceanic whitetip sharks caught in 2005. Estimated catches of oceanic whitetip shark continue to decline in the EPO tropical tuna purse seine fishery, with only 120 individuals caught in 2015. This drastic decline in oceanic whitetip catches is in stark contrast to catches of the closely related silky shark, which have remained relatively constant over the same time period. Further, size trends in this fishery show that small oceanic whitetip sharks <90 cm, which comprised 21.4 percent of the oceanic whitetips captured in 1993, have been virtually eliminated (Hall and Román 2013), indicating the possibility of recruitment failure in the population. During this same time period, there was an increase in both the total catch of tunas by purse seiners that employ drifting FADs and the number of FADs deployed (Eddy *et al.*, 2016; Hall and Román 2016). Over the past decade, the total number of FADs deployed per year has continued to increase steadily, from about 4,000 in 2005 to almost 15,000 in 2015 (Hall and Román 2016). The total number of sets deployed has also continued increasing, with 2015 being the highest record

observed. Thus, given the continued increase in fishing effort and expansion of the tropical tuna purse seine fleet in the Eastern Pacific, fishing pressure and associated mortality of oceanic whitetip sharks are expected to continue.

Oceanic whitetip sharks are also sometimes a significant component of the bycatch in EPO longline fisheries, and are thought to be taken by local artisanal fisheries as well. While observer data is not available from these fisheries, some limited information is available from the various countries that fish in these waters. For example, the oceanic whitetip shark was identified as one of several principal species taken by Mexican fisheries targeting pelagic sharks (Sosa-Nishizaki *et al.*, 2008). Farther south, the oceanic whitetip shark has also been recorded in the catches of the Ecuadorian artisanal fishery. In an analysis of landings from the five principal ports of the Ecuadorian artisanal fishery from 2008–2012, 37.2 mt of oceanic whitetip shark were recorded out of a total 43,492.6 mt of shark catches (Martinez-Ortiz *et al.*, 2015). Although limited, this information confirms that in addition to significant fishing pressure by the tropical tuna purse seine fishery, oceanic whitetip sharks are taken in longline and artisanal fisheries in unknown quantities. Based on the foregoing information, the ERA team concluded, and we agree, that overutilization of the oceanic whitetip shark is ongoing in this region, with no indication that these pressures will cease in the foreseeable future.

In the Western and Central Pacific Ocean (WCPO), the oceanic whitetip shark commonly interacts with both longline and purse seine fisheries throughout the region, with at least 20 member nations of the Western and Central Pacific Fisheries Commission (WCPFC; the RFMO responsible for the conservation and management of tuna and tuna-like species in the region) recording the species in their fisheries. As noted previously, the oceanic whitetip historically comprised between 20–28 percent of the total shark catch in some industrial longline fisheries during the 1950s and 1960s (Strasburg 1958; Taniuchi 1990). In this region, where sharks represent 25 percent of the longline fishery catch (Molony 2007), more recent observer data show that the oceanic whitetip shark represented only 6.3 percent of the total shark catch from 1991–2011 (with blue shark comprising the large majority at ~80.5 percent; Lawson 2011). In the purse seine fishery, the oceanic whitetip was once the second most common species of shark caught as bycatch in the WCPO,

and comprised approximately 4.2 percent of the total shark catch from 1994–2011 (Lawson 2011). In addition to being caught indirectly as bycatch, observer records indicate that some targeting of oceanic whitetip shark has occurred historically in the waters near Papua New Guinea, and, given the high value of oceanic whitetip fins and low level of observer coverage in the region, it is likely that targeting has occurred in other areas as well (Rice and Harley 2012). Based on nominal and standardized catch rates for longline and purse seine fisheries, records of oceanic whitetip sharks in both fisheries have become increasingly rare over time, with catches of the species significantly declining since the late 1990s (Lawson 2011; Clarke *et al.*, 2011a). For example, estimated catches of oceanic whitetip shark in the WCPO longline fishery suggest that catches peaked in 1998 at ~249,000 individuals and declined to only ~53,000 individuals in 2009 (Lawson 2011). It should be noted that catches by the fleets of Indonesia and the Philippines were not included because neither observer nor effort data were available for these fleets. Over the same time period (from 1995 to 2009) rates of fishing mortality consistently increased, driven mainly by the increased effort in the longline fleet, and remained substantially above the maximum sustainable yield (MSY) (*i.e.*, the point at which there would be an equilibrium) for the species (Rice *et al.*, 2015). The previously discussed stock assessment report (Rice *et al.*, 2015) attributed the greatest impact on the species to bycatch from the longline fishery, and lesser impacts from target longline activities and purse-seining (Rice and Harley 2012). In fact, Rice *et al.* (2015) determined that fishing mortality on oceanic whitetip sharks in the WCPO has increased to levels 6.5 times what is sustainable, thus concluding that overfishing is still occurring.

As a result of continued and increasing fishing pressure in the WCPO, size trends for oceanic whitetip have also declined, which is indicative of overutilization of the species. For example, declining median size trends were observed in all regions and sexes in both longline and purse seine fisheries until samples became too scarce for analysis. These size trends were significant for females in the longline fishery (Regions 3 and 4; See Figure 1 in Clarke *et al.*, 2011a for the regional map), and for the purse seine fishery (Region 3). Regions 3 and 4 (*i.e.*, the equatorial region of the WCPO) represent the species' core habitat areas,

and contain 98 percent of the operational-level reported purse seine sets and the majority of longline fishing effort (Clarke *et al.*, 2011a; Rice *et al.*, 2015). The decline in median size of female oceanic whitetip sharks is particularly concerning due to the potential correlation between maternal length and litter size, which has been documented in the Atlantic and Indian Oceans (Lessa *et al.* 1999, Bonfil *et al.* 2008). While Rice *et al.* (2015) more recently report that trends in oceanic whitetip median length are now stable, the majority of sharks observed are immature. In fact, 100 percent of oceanic whitetips sampled in the purse seine fishery have been immature since 2000 (Clarke *et al.*, 2012).

In the U.S. Pacific, the oceanic whitetip shark is a common bycatch species in the Hawaii-based PLL fishery. This fishery began around 1917, and underwent considerable expansion in the late 1980s to become the largest fishery in the state (Boggs and Ito 1993). This fishery currently targets tunas and billfish and is managed under the auspices of the Western Pacific Fishery Management Council (WPFMC). From 1995–2006, oceanic whitetip sharks comprised approximately 3 percent of the total shark catch (Brodziak *et al.*, 2013). Based on observer data from the Pacific Islands Regional Observer Program (PIROP), oceanic whitetip shark mean annual nominal CPUE decreased significantly from 0.428 sharks/1,000 hooks in 1995 to 0.036 sharks/1,000 hooks in 2010. This reflected a significant decrease in nominal CPUE on longline sets with positive catch from 1.690 sharks/1,000 hooks to 0.773 sharks/1,000 hooks, and a significant increase in longline sets with zero catches from 74.7 percent in 1995 to 95.3 percent in 2010. As discussed previously in the *Evaluation of Demographic Risks—Abundance* section, oceanic whitetip CPUE declined by more than 90 percent in the Hawaii-based PLL fishery since 1995 (Walsh and Clarke 2011; Brodziak *et al.*, 2013). Brodziak *et al.* (2013) concluded that relative abundance of oceanic whitetip declined within a few years of the expansion of the longline fishery, which suggests these fisheries are contributing to the commercial overutilization of oceanic whitetip within this portion of its range. It should be noted that while the Hawaii-based PLL fishery currently catches oceanic whitetip shark as bycatch, the majority of individuals are now released alive in this fishery and the number of individuals kept has been on a declining trend. For example, according to the

U.S. National Bycatch Report First Edition Update 2 (see www.st.nmfs.noaa.gov/observer-home/first-edition-update-2) the shallow-set fishery released alive an estimated 91–96 percent of all oceanic whitetip sharks caught from 2011 to 2013. During the same time period, the deep-set fishery released alive an estimated 78–82 percent of all oceanic whitetip sharks caught. However, it is unknown how many of these sharks survived after being released. Nonetheless, this particular fishery may be less of a threat to the oceanic whitetip shark in the foreseeable future. However, across the WCPO as a whole, given the ongoing impacts to the species from significant fishing pressure (with the majority of effort concentrated in the species' core tropical habitat area), including significant declines in CPUE, biomass, and size indices, and combined with the species' relatively low-moderate productivity, it is likely that overutilization has been and continues to be an ongoing threat contributing to the extinction risk of the oceanic whitetip shark across the region.

The oceanic whitetip shark was also once described as the most common pelagic shark throughout the warm-temperate and tropical waters in the Atlantic and beyond the continental shelf in the Gulf of Mexico (Mather and Day 1954; Strasburg 1958). Oceanic whitetip sharks are taken in the Atlantic Ocean by longlines, purse seine nets, gillnets, trawls, and handlines; however, the large majority of the catch from 1990–2014 reported to ICCAT was caught by longline gear (Young *et al.*, 2016). Oceanic whitetip sharks have exhibited a range of at-vessel mortality rates in longline gear in the Atlantic Ocean between 11–34 percent (Beerkircher *et al.*, 2002; Coelho *et al.*, 2012; Fernandez-Carvalho *et al.*, 2015) and have been ranked as the 5th most vulnerable pelagic shark in an Ecological Risk Assessment that assessed 11 species of pelagic elasmobranchs (Cortes *et al.*, 2010). In total, approximately 2,430 mt of oceanic whitetip catches were reported to ICCAT from 1990–2014; however, this is likely a severe underestimation of the total amount of oceanic whitetip sharks taken from the Atlantic. For example, Clarke (2008) calculated trade-based estimates that indicate between 80,000–210,000 oceanic whitetip sharks were sourced from the Atlantic Ocean in 2003 alone to supply the Hong Kong fin market, which translates to approximately 3,000–8,000 mt.

In the Northwest Atlantic, the oceanic whitetip is caught incidentally as bycatch by a number of fisheries,

including (but not limited to) the U.S. Atlantic PLL fishery, the Cuban “sport” fishery (“sport” = private artisanal and commercial), and the Colombian oceanic industrial longline fishery operating in the Caribbean (E-CoP16Prop.42, 2013). In the United States, oceanic whitetip sharks are caught as bycatch in PLL fisheries targeting tuna and swordfish in this region, with an estimated 8,526 individuals recorded as captured in U.S. fisheries logbooks from 1992 to 2000 (Baum *et al.*, 2003) and a total of 912 individuals recorded by observers in the NMFS Pelagic Observer Program from 1992–2015. Relative to target species, oceanic whitetip sharks are caught infrequently and only incidentally on PLL vessels fishing for tuna and tuna-like species. Landings and dead discards of sharks by U.S. PLL fishers in the Atlantic are monitored every year and reported to ICCAT. Overall, very few oceanic whitetip sharks were landed by the commercial fishery, except for two peaks of about 1,250 and 1,800 fish in 1983 and 1998, respectively, but otherwise total catches never exceeded 450 fish (NMFS 2009). Commercial landings of oceanic whitetip sharks in the U.S. Atlantic have been variable, but averaged approximately 1,077.4 lb (488.7 kg; 0.4887 mt) per year from 2003–2013. Although oceanic whitetip sharks have been prohibited on U.S. Atlantic commercial fishing vessels with pelagic longline gear onboard since 2011, they can still be caught as bycatch, caught with other gears, and are occasionally landed. However, since the ICCAT retention prohibition was implemented in 2011, estimated commercial landings of oceanic whitetip declined from 1.1 mt in 2011 to only 0.03 mt in 2013 (NMFS 2012; 2014). As discussed previously, the oceanic whitetip population size has likely declined significantly in this region due to historical exploitation of the species since the onset of industrial fishing (refer back to the *Demographic Risk Assessment—Abundance* section); however, results of the ERA team’s analysis show that the oceanic whitetip shark population in this region has potentially stabilized since the 1990s/early 2000s (Young *et al.*, 2016). The potential stabilization of oceanic whitetip sharks occurred concomitantly with the first Federal Fishery Management Plan for Sharks in the Northwest Atlantic Ocean and Gulf of Mexico, which directly manages oceanic whitetip shark under the pelagic shark group, and includes regulations on trip limits and quotas. This indicates the

potential efficacy of these management measures for reducing the threat of overutilization of the oceanic whitetip shark population in this region; therefore, under current management measures, including the implementation of ICCAT Recommendation 10–07 (see *Factor D—Inadequacy of Existing Regulatory Mechanisms* for more details), the threat of overutilization is not likely as significant in this area relative to other portions of the species’ range.

In Cuba, some evidence suggests a historical decline of oceanic whitetip shark may have occurred, although this is uncertain. In the 1960s, the oceanic whitetip shark was characterized as the most abundant species off the northwestern coast of Cuba, but since 1985, a substantial decline was observed in some species, including the oceanic whitetip. Variations in fishing effort and changes in the fishery make it difficult to assess the present condition of the resource, but since 1981 there has been a tendency towards decline (Claro *et al.*, 2001). Recent monitoring studies of a prominent fishing base in Cojimar, Cuba recorded the oceanic whitetip shark comprising only 2–5 percent of the shark landings from 2008–2011 (Cuba Department of Fisheries 2016). In contrast, Valdés *et al.*, (2016) show a steady pattern of abundance for the oceanic whitetip shark in Cuban fishery landings along the northwestern coast from 2010 to 2016. However, sharks caught in Cuban fisheries are never discarded, but rather utilized for either human consumption or bait. Cuba is not a member of ICCAT, and thus ICCAT Recommendation 10–07 on the retention prohibition of oceanic whitetip sharks is not applicable in Cuban waters. Further, evidence suggests there is a prevalence of small, immature individuals in Cuban catches, which suggests the possibility of an important nursery area for this species in the region. However, because these animals are small and of less value to the fishermen, they are typically using the juvenile *C. longimanus* as bait while at sea, a practice which is likely in conflict with sustainable fisheries management and conservation objectives (Valedz *et al.*, 2016) and may be contributing to overutilization of the species.

Farther south, it is likely that overutilization is an ongoing threat in the South Atlantic. Although fishing effort has been high and began intensifying in the southern Atlantic Ocean after the 1990s (Camhi *et al.*, 2008), there is limited information on the catch rates or trends of oceanic whitetip sharks in this region. Oceanic

whitetip sharks are taken as bycatch in numerous fisheries operating in the South Atlantic, including Brazilian, Uruguayan, Taiwanese, Japanese, Venezuelan, Spanish and Portuguese longline fisheries; however, the largest oceanic whitetip catching country in this region is Brazil. As noted in the *Evaluation of Demographic Risks—Abundance* section of this proposed rule, oceanic whitetips were historically reported as the second-most abundant shark in research surveys from northeastern Brazil between 1992 and 1997 (FAO 2012), with a high CPUE rate of 2.18 individuals per 1,000 hooks (Domingo *et al.*, 2007). More recently, however, average CPUE in this same area has seemingly declined. It also appears that the percentage of mature sharks has declined in recent years compared to surveys conducted in the 1990s. For example, the frequency of mature sharks ≥ 180 cm was higher in the 1990s than in years 2005–2009. It should be noted that the data from 2005–2009 represents a much larger area of the southwestern and equatorial Atlantic and has a much larger sample size ($n = 1218$; Tolotti *et al.*, 2013) than the results from the surveys conducted in the 1990s ($n = 258$; Lessa *et al.*, 1999). However, the two study areas do overlap and provide some indication that the size composition of oceanic whitetip sharks in the southwestern Atlantic may be shifting downwards. Catches of oceanic whitetip in the Brazilian tuna longline fishery have also shown a substantial decline, decreasing from ~640t in 2000 to only 80t in 2005 (Hazin *et al.*, 2007). According to the ICCAT nominal catch database, catches of oceanic whitetip shark by Brazilian vessels continued to decline, with 0 mt reported from 2009–2012 and only 12 mt from 2013–2014. Although robust standardized CPUE data are not available for the species, making it difficult to evaluate whether the decline in catches resulted from decreased abundance or from changes in catchability, related, for instance, to targeting strategies (Hazin *et al.*, 2007), a recent tagging study indicates that the preferred horizontal and vertical habitat of oceanic whitetip shark, including potential nursery areas, is heavily impacted by the industrial longline fishery. Telemetry data provides evidence that the equatorial region off Northeast Brazil is an area where the oceanic whitetip shark shows a high degree of philopatry (*i.e.*, site fidelity). This same area also happens to be where the highest level of fishing effort is concentrated. For example, from 1999–2011, despite a wide distribution

of fishing sets, the area with the highest effort concentration by the Brazilian longline fleet was bound by the 5° N. and the 15° S. parallels and by the 040° W. and 035° W. meridians (*i.e.*, the equatorial region of Northeast Brazil). Thus, the majority of fishing effort by the Brazilian fleet directly overlaps the preferred habitat area of oceanic whitetip sharks (Tolotti *et al.*, 2015a). Further, many studies show a substantially high percentage of juveniles in the catches from this region (Coelho *et al.*, 2009; Tambourgi *et al.*, 2013; Tolotti *et al.*, 2013; Frédou *et al.*, 2015), which suggests the presence of nursery habitat. For example, Tambourgi *et al.* (2013) found that 80.5 percent of females were immature and 72.4 percent of males were immature in the Brazilian pelagic longline fishery between December 2003 and December 2010. Thus, it is likely that the intensive fishing pressure of oceanic whitetip across its preferred vertical and horizontal habitat, including nursery areas in Brazilian waters, is negatively impacting oceanic whitetip sharks at all life stages, and contributing to the overutilization of the species. In addition to information from Brazil, a recent study that synthesized information on shark catch rates for the major shark species caught by multiple fleets in the South Atlantic from 1979 and 2011 (*e.g.*, Belize, Bolivia, Brazil, Canada, Spain, Guyana, Honduras, Iceland, Japan, Saint Kitts and Nevis, Korea, Morocco, Panama, Portugal, Taiwan, United Kingdom, Uruguay, United States, Saint Vincent and the Grenadines, and Vanuatu) concluded that declines of many shark species, including the oceanic whitetip, coincided with significant fishing effort expansion, a lack of regulatory measures to deal with shark bycatch, finning and directed fishing for sharks by some fleets (Barreto *et al.*, 2015). Based on the foregoing information, the ERA team concluded, and we agree, that overutilization in the South Atlantic Ocean is likely a threat contributing to the oceanic whitetip's risk of extinction in the foreseeable future.

Overutilization is also likely a threat to oceanic whitetip sharks in the Indian Ocean. The oceanic whitetip is reported as bycatch in all three major fisheries operating in the Indian Ocean; the species is considered "frequent" in both longline and purse seine fisheries, and "very frequent" in the gillnet fishery (Murua *et al.*, 2013b), with gillnet fisheries reporting the highest nominal catches of sharks in 2014, and making up nearly 40 percent of total catches (Ardill *et al.*, 2011; IOTC 2015a).

Although information from this region is limited and catch data are severely underreported, the IOTC (the RFMO that manages tuna and tuna-like species in the Indian Ocean and adjacent waters) reports that catches of oceanic whitetip shark are ranked as "High," meaning the accumulated catches from 1950–2010 make up 5 percent or more of the total catches of sharks recorded (Herrera and Pierre 2011). In fact, a recent study estimated that the oceanic whitetip shark comprises 11 percent of the total estimated shark catch in the Indian Ocean (Murua *et al.*, 2013a). It is also ranked as the 5th most vulnerable shark species caught in longline fisheries in the region (out of 16 species assessed) and the most vulnerable shark species caught in purse seine gear due to its high susceptibility (Murua *et al.*, 2012; IOTC 2015a). Oceanic whitetip sharks also exhibit relatively higher at-vessel mortality rates in longlines in this region compared to other regions (*i.e.*, 58 percent; IOTC 2015a) and likely have high mortality rates in purse seine and gillnet fisheries as well.

The main fleets catching oceanic whitetip in the Indian Ocean in recent years (2011–2014) include: Indonesia, Sri Lanka, I.R. Iran, EU (Spain), China, Madagascar, and Seychelles. The reporting of catches of oceanic whitetip sharks shows an unusual trend in 2013 and 2014, with 5,000+ mt reported to the IOTC. These trends are dominated by the Sri Lankan combination longline-gillnet fisheries, and an addition of proportionately very large catches by India (IOTC 2015b). Prior to the unusual trend in 2013 and 2014, the trend in oceanic whitetip catch shows a substantial increase throughout the 1990s, which likely corresponds with the rise in the shark fin trade (Clarke *et al.*, 2007), a peak at 3,050 mt in 1999, followed by a sharp and continued decline in the 2000s. Although the IOTC database is constrained by a number of limitations, information from some fleets catching oceanic whitetip shark indicate declines in catches as well. For example, from 1996–2004, landings of oceanic whitetip in Sri Lanka peaked at approximately 3,000 mt in 1999 and show a declining trend thereafter (Hasarangi *et al.*, 2012) to less than 300 mt in 2014. It is only in the last two years (2013 and 2014) that annual shark production has seen a significant decline in Sri Lanka due to regulatory measures (Jayathilaka and Maldeniya 2015). Most recently, Sri Lanka reported only 88 mt of oceanic whitetip shark catches to IOTC in 2015. Thus, the decline in oceanic whitetip catches in Sri Lanka occurred prior to the

implementation of any regulatory measures, and may therefore be indicative of a population decline in Sri Lankan waters as a result of overutilization. Similarly, the substantial decline of oceanic whitetip sharks in the Maldives, from comprising 29 percent of the longline shark catch in the 1980s to only 3.5 percent of landings from 2000–2004 (refer back to the *Demographic Assessment—Abundance* section of this proposed rule), is likely the result of overutilization of the species. In fact, Anderson *et al.* (2011) determined that the shark stocks that supported the shark fishery were sequentially overfished, with the decline in pelagic shark catches the result of high (and likely unsustainable) levels of fishing by overseas fisheries.

The IOTC's Working Group on Ecosystems and Bycatch stated that at current catch levels (*i.e.*, average of 347 mt prior to 2013), the Indian Ocean stock of oceanic whitetip was at considerable risk. Given the previous discussion regarding likely abundance declines in this region, combined with the high level of fishing pressure on oceanic whitetip sharks in the Indian Ocean and the species' low-moderate productivity, it is therefore likely that the substantially high catches of oceanic whitetip sharks in the Indian Ocean (5,000+ mt estimated for 2013 and 2014) are in excess of what is sustainable and are likely contributing to overutilization of the species in the Indian Ocean.

Finally, the ERA team determined that demand from the international shark fin trade is the main economic force driving the retention and subsequent finning of oceanic whitetip sharks taken as bycatch in commercial fisheries worldwide, as they are considered a preferred species for their fins, command high prices in the international market (U.S. \$45–85/kg; E-CoP16Prop.42 (2013)) and make up part of the "first choice" category in the China, Hong Kong Special Administrative Region (SAR) fin market (Vannuccini 1999). From 2000 to 2011, China, Hong Kong SAR maintained its position as the world's largest trader of shark fins, controlling the majority of global trade. In order to determine the species composition of the shark fin trade, Clarke *et al.*, (2006a) analyzed 1999–2001 Hong Kong trade auction data in conjunction with species-specific fin weights and genetic information to estimate the annual number of globally traded shark fins. Using this approach, the authors discovered that oceanic whitetip sharks are sold under their own category "Liu Qiu" and represent approximately 1.8 percent of the Hong Kong shark fin

market (Clarke *et al.*, 2006a). This level of oceanic whitetip shark fins in the trade translates to an estimated median of 700,000 oceanic whitetip sharks (range: 200,000–1,200,000 individuals), with an equivalent median biomass of around 21,000 mt (range 9,000–48,000 mt), traded annually (Clarke *et al.*, 2006b). The lack of estimates of the global population makes it difficult to put these trade-based estimates into perspective. However, given the minimum estimate of ~9,000 mt traded annually is in excess of the total biomass estimated for oceanic whitetip for the entire Western and Central Pacific Ocean in 2010 (*i.e.*, 7,295 mt), the effect of the removals (for the shark fin trade) on the ability of the overall population to sustain this level of exploitation is likely substantial.

In more recent years, genetic testing conducted in various fish markets provides additional confirmation of the ongoing utilization of oceanic whitetip shark in the shark fin trade. For example, a genetic sampling study conducted on shark fins collected from several fish markets throughout Indonesia determined that oceanic whitetip shark fins were present and comprised approximately 1.72 percent of the fins tested (Sembiring *et al.*, 2015). In a genetic barcoding study of shark fins from markets in Taiwan, the oceanic whitetip was 1 of 20 species identified and comprised 0.38 percent of average landings from 2001–2010 (Liu *et al.*, 2013). In another genetic barcoding study of fins at the Deira fish market in Dubai, United Arab Emirates (with sharks originating from Oman), oceanic whitetip shark comprised 0.45 percent of fins tested (Jabado *et al.*, 2015). Although it is uncertain whether these studies are representative of the entire market within each respective country, results of these genetic tests confirm the continued presence of oceanic whitetip shark fins in various markets throughout its range.

Recent studies indicate that due to a waning interest in fins as well as increased regulations to curb shark finning, the shark fin market is declining. In fact, the trade in shark fins through China, Hong Kong SAR, which has served as an indicator of the global trade for many years, fell by 22 percent in 2012. Additionally, current indications are that the shark fin trade through Hong Kong SAR and China will continue to contract (Dent and Clarke 2015). The pattern of trade decline closely matches the pattern in chondrichthyan capture production and thus suggests a strong link between the quantity harvested and the quantity traded. However, a government-led

backlash against conspicuous consumption in China, combined with global conservation momentum, appears to have had some impact on traded volumes as well (Eriksson and Clarke 2015). Despite the potential improvements in the trade, it is clear that the shark fin trade has asserted and continues to assert significant pressure on oceanic whitetip sharks. Given that oceanic whitetip fins are among the most prized in the international shark fin trade and obtain a high value per kg, combined with recent evidence of oceanic whitetip fins in several prominent markets, the incentive to take oceanic whitetip sharks for their fins remains high and is an ongoing threat contributing to the overutilization of the species. This is further evidenced by recent incidents of illegal trafficking of oceanic whitetip fins, which indicate that oceanic whitetip sharks are still sought after for their fins and continue to experience pressure from demands of the fin trade (see *Inadequacy of Existing Regulatory Mechanisms* section below for more details). In addition, a surge in the trade of shark meat has occurred in recent years. This could be the result of a number of factors, but taking the shark fin and shark meat aggregate trends together indicate that shark fin supplies are limited by the existing levels of chondrichthyan capture production, but shark meat is underutilized by international markets (Dent and Clarke 2015). This suggests that historically underutilized chondrichthyan species will be increasingly utilized for their meat. The ERA team considered whether the recent shift in demand away from shark fins to shark meat would have any considerable impact on the oceanic whitetip shark. Although there are markets for low-value shark meat such as oceanic whitetip, the retention bans for the species in all relevant RFMOs will likely dampen this threat. Thus, the ERA team did not think this increase in demand for shark meat would create a significant new threat to the species.

Overall, based on the best available information, the ERA team concluded, and we agree, that overutilization is the single most important threat contributing to the extinction risk of the oceanic whitetip shark. Due to the paucity of available data from some regions, the ERA team acknowledged that there are some uncertainties in assessing the contribution of the threat of overutilization to the extinction risk of the oceanic whitetip shark throughout its range. As results from the Cortés *et al.* (2012) and Murua *et al.* (2012) Ecological Risk Assessments

demonstrated, the threat of overutilization of oceanic whitetip sharks may be exacerbated by the species' low-moderate productivity combined with the species' tendency to remain in the surface mixed layer of the water column (*i.e.*, 0–152 m) and within warm, tropical waters where the majority of fishing effort is often most concentrated. The severity of the threat of overutilization is dependent upon other risks and threats to the species, such as its abundance (as a demographic risk) as well as its level of protection from fishing mortality throughout its range. Given the above analysis and best available information, as well as evidence that the species' current trends in abundance place its future persistence in question due to overutilization, we find that overutilization for commercial purposes is a threat that places the species on a trajectory towards being in danger of extinction in the foreseeable future throughout all or a significant portion of its range.

Inadequacy of Existing Regulatory Mechanisms

The ERA team evaluated existing regulatory mechanisms to determine whether they may be inadequate to address threats to the oceanic whitetip shark. Existing regulatory mechanisms assessed include federal, state, and international regulations for commercial fisheries, as well as the international trade in shark products. Below is a description and evaluation of current and relevant domestic and international management measures that may affect the oceanic whitetip shark. More information on these management measures can be found in the status review report (Young *et al.*, 2016) and other recent status reviews of other shark species (Miller *et al.*, 2013; 2014). The following section will first discuss U.S. domestic regulatory measures applicable to the oceanic whitetip shark, followed by international regulations that may affect sharks in general, as well as the oceanic whitetip shark in particular.

U.S. Domestic Regulatory Mechanisms

In the U.S. Pacific, highly migratory species (HMS) fishery management is the responsibility of adjacent states and three regional management councils that were established by the Magnuson-Stevens Fishery Conservation and Management Act: The Pacific Fishery Management Council (PFMC), the North Pacific Fishery Management Council, and the Western Pacific Fishery Management Council (WPFMC). The PFMC manages highly migratory species

off the coasts of Washington, Oregon, and California; however, the oceanic whitetip shark is not one of the species they actively manage, as its distribution favors more tropical waters. The PFMC is, however, actively engaged in international fishery management organizations that manage fish stocks that migrate through the PFMC's area of jurisdiction. In 2011, NMFS published a final rule (76 FR 68332) issuing regulations to implement decisions of the IATTC, including the Resolution Prohibiting the Retention of Oceanic Whitetip Sharks (C-11-10), which is described in more detail below in the International Regulatory Mechanisms section of this proposed rule. According to the final rule mentioned previously, U.S. fisheries that target highly migratory species rarely retain, transship, land, or sell this species in the IATTC Convention Area.

The WPFMC has jurisdiction over the EEZs of Hawaii, Territories of American Samoa and Guam, Commonwealth of the Northern Mariana Islands, and the Pacific Remote Island Areas, as well as the domestic fisheries that occur on the adjacent high seas. The WPFMC developed the Pelagics Fishery Ecosystem Plan (FEP; formerly the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region) in 1986 and NMFS, on behalf of the U.S. Secretary of Commerce, approved the Plan in 1987. Under the FEP, the oceanic whitetip shark is designated as a Pelagic Management Unit Species and is subject to regulations. These regulations are intended to minimize impacts to targeted stocks as well as protected species. Fishery data are also analyzed in annual reports and used to amend the FEP as necessary. In Hawaii and American Samoa, oceanic whitetip sharks are predominantly caught in longline fisheries that operate under extensive regulatory measures, including gear, permit, logbook, vessel monitoring system, and protected species workshop requirements. In 2015, NMFS published a final rule to implement decisions of the WCPFC to prohibit the retention of oceanic whitetip sharks in fisheries operating within the WCPFC's area of competence (or Convention Area), which comprises the majority of the Western and Central Pacific Ocean. The regulations were published in the **Federal Register** on February 19, 2015 (80 FR 8807) and include prohibitions on the retention of the oceanic whitetip shark, as well as requirements to release any oceanic whitetip caught. These regulations are applicable to all U.S. fishing vessels

used for commercial fishing for HMS in the Convention Area (PIRO 2015). As noted previously in the *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes* section of this proposed rule, oceanic whitetip sharks are still caught as bycatch in this fishery, but the majority of individuals are now released alive. Though post-release survival rates are unknown, it is likely these regulations are helping to reduce overall mortality of the species to some degree.

In the Northwest Atlantic, the U.S. Atlantic HMS Management Division within NMFS develops regulations for Atlantic HMS fisheries, and primarily coordinates the management of Atlantic HMS fisheries in Federal waters (domestic) and the high seas (international), while individual states establish regulations for HMS in state waters. The NMFS Atlantic HMS Management Division currently manages 42 species of sharks (excluding spiny dogfish) under the Consolidated Atlantic HMS FMP (NMFS 2006). The management of these sharks is divided into five species groups: Large coastal sharks, small coastal sharks, pelagic sharks, smoothhound sharks, and prohibited sharks. Oceanic whitetip sharks are managed under the pelagic sharks group. One way that the HMS Management Division controls and monitors commercial harvest is by requiring U.S. commercial Atlantic HMS fishermen who fish for or sell sharks to have a Federal Atlantic Directed or Incidental shark limited access permit. These permits are administered under a limited access program, and NMFS is no longer issuing new shark permits. As of October 2015, 224 U.S. fishermen are permitted to target sharks managed by the HMS Management Division in the Atlantic Ocean and Gulf of Mexico, and an additional 275 fishermen are permitted to land sharks incidentally (NMFS 2015). Under a directed shark permit, there is no directed numeric retention limit for pelagic sharks, subject to quota limitations. An incidental permit allows fishers to keep up to a total of 16 pelagic or small coastal sharks (all species combined) per vessel per trip. Current authorized gear types for oceanic whitetip sharks include: Bottom longline, gillnet, rod and reel, handline, or bandit gear. There are no restrictions on the types of hooks that may be used to catch oceanic whitetip sharks, and there is no commercial minimum size limit. The annual quota for pelagic sharks (other than blue sharks or porbeagle sharks) is currently 488 mt dressed weight. NMFS monitors the

different shark quota complexes annually and will close the fishing season for each fishery after 80 percent of the respective quota has been landed or is projected to be landed. Atlantic sharks and shark fins from federally permitted vessels may be sold only to federally permitted dealers. Logbook reporting is required for selected fishers with a federal commercial shark permit. In addition, fishers may be selected to carry an observer onboard, and some fishers are subject to vessel and electronic monitoring systems depending on the gear used and where they fish. In terms of processing sharks landed, the head may be removed and the shark may be gutted and bled, but the shark cannot be filleted or cut into pieces while onboard the vessel and all fins, including the tail, must remain naturally attached to the carcass through offloading.

In 2011, NMFS published final regulations to implement decisions of ICCAT (*i.e.*, Recommendation 10-07 for the conservation of oceanic whitetip sharks), which prohibits retention of oceanic whitetip sharks in the PLL fishery and on recreational (HMS Angling and Charter headboat permit holders) vessels that possess tuna, swordfish, or billfish (76 FR 53652). The implementation of regulations to comply with ICCAT Recommendation 10-07 for the conservation of oceanic whitetip sharks is likely the most influential regulatory mechanism in terms of reducing mortality of oceanic whitetip sharks in the U.S. Atlantic. It should be noted that oceanic whitetip sharks are still occasionally caught as bycatch and landed in this region despite its prohibited status in ICCAT associated fisheries (NMFS 2012; 2014), as retention is permitted in other authorized gears other than pelagic longlines (*e.g.*, gillnets, bottom longlines); however, these numbers have decreased. Prior to the implementation of the retention prohibition on oceanic whitetip, an analysis of the 2005-2009 HMS logbook data indicated that, on average, a total of 50 oceanic whitetip sharks were kept per year, with an additional 147 oceanic whitetip sharks caught per year and subsequently discarded (133 released alive and 14 discarded dead). Thus, without the prohibition, approximately 197 oceanic whitetip sharks could be caught and 64 oceanic whitetip sharks (32 percent) could die from being discarded dead or retained each year (NMFS 2011). Since the prohibition was implemented in 2011, estimated commercial landings of oceanic whitetip declined from only 1.1 mt in

2011 to only 0.03 mt (dressed weight) in 2013 (NMFS 2012; 2014). In fact, from 2013–2014, NMFS reported a total of 81 oceanic whitetip interactions, with 83 percent (67 individuals) released alive and 17 percent (14 individuals) discarded dead (NMFS 2014; 2015). While the retention ban for oceanic whitetip does not prevent incidental catch or subsequent at-vessel and post-release mortality, it likely provides minor ecological benefits to oceanic whitetip sharks via a reduction in overall fishing mortality in the Atlantic PLL fishery (NMFS 2011).

In addition to general commercial fishing regulations for management of highly migratory species, the United States has implemented a couple of significant laws for the conservation and management of sharks: the Shark Finning Prohibition Act and the Shark Conservation Act. The Shark Finning Prohibition Act was enacted in December 2000 and implemented by final rule on February 11, 2002 (67 FR 6194), and prohibited any person under U.S. jurisdiction from: (i) Engaging in the finning of sharks; (ii) possessing shark fins aboard a fishing vessel without the corresponding carcass; and (iii) landing shark fins without the corresponding carcass. It also implemented a five percent fin to carcass ratio, creating a rebuttable presumption that fins landed from a fishing vessel or found on board a fishing vessel were taken, held, or landed in violation of the Act if the total weight of fins landed or found on board the vessel exceeded five percent of the total weight of carcasses landed or found on board the vessel. The Shark Conservation Act was signed into law on January 4, 2011, and implemented by final rule on June 29, 2016 (81 FR 42285), and, with a limited exception for smooth dogfish (*Mustelus canis*), prohibits any person from removing shark fins at sea, or possessing, transferring, or landing shark fins unless they are naturally attached to the corresponding carcass.

As expected, U.S. exports of dried shark fins dropped significantly after the passage of the Shark Finning Prohibition Act. In 2011, with the passage of the U.S. Shark Conservation Act, exports of dried shark fins dropped again, by 58 percent, to 15 mt, the second lowest export amount since 2001. This is in contrast to the price per kg of shark fin, which was at its highest price of ~\$100/kg, and suggests that existing regulations have likely been effective at discouraging fishing for sharks solely for the purpose of the fin trade. Thus, although the international shark fin trade is likely a driving force

behind the overutilization of many global shark species, including the oceanic whitetip, the U.S. participation in this trade appears to be diminishing. In 2012, the value of fins also decreased, suggesting that the worldwide demand for fins may be on a decline. For example, a decrease in U.S. fin prices coincided with the implementation of fin bans in various U.S. states in 2012 and 2013, and U.S. shark fin exports have continued on a declining trend (Miller *et al.*, 2013). However, it should be noted that the continued decline is also likely a result of the waning global demand for shark fins altogether. Similarly, many U.S. states, especially on the West Coast, and U.S. Flag Pacific Island Territories have also passed fin bans and trade regulations, subsequently decreasing the United States' contribution to the fin trade. For example, after the State of Hawaii prohibited finning in its waters and required shark fins to be landed with their corresponding carcasses in the state in 2000, the shark fin exports from the United States into Hong Kong declined significantly in 2001 (54 percent decrease, from 374 to 171 t) as Hawaii could therefore no longer be used as a fin trading center for the international fisheries operating and finning in the Central Pacific (Clarke *et al.*, 2007). With regard to oceanic whitetip sharks, the finning regulations introduced in 2001 in the U.S. Hawaii-based longline fishery have acted to reduce mortality on oceanic whitetip and other large shark species (Walsh *et al.*, 2009). Prior to the ban, from 1995–2000, the fins were taken from a large proportion of captured oceanic whitetip with the remaining carcass being discarded (72.3 percent in deep sets and 52.7 percent from shallow sets), as was the case with other large sharks (Walsh *et al.*, 2009). From 2004–2006, following the implementation of the new regulations, almost all sharks were released, although some were dead on release. Overall, minimum mortality estimates declined substantially as a result of the finning regulations, from 81.9 percent to 25.6 percent in deep sets and from 61.3 percent to 9.1 percent in shallow sets (Walsh *et al.*, 2009). However, aside from this example, there is little information on the level of compliance with the various fisheries management measures for sharks, including oceanic whitetip, with compliance likely variable among other countries and regions.

Overall, regulations to control for overutilization of oceanic whitetip sharks in U.S. waters, including fisheries management plans with quotas

and trip limits, species-specific retention prohibitions in PLL gear, and finning regulations are not in and of themselves inadequate such that they are contributing to the global extinction risk of the species. In fact, it is likely that the stable CPUE trend observed for the oceanic whitetip shark in the Northwest Atlantic is largely a result of the implementation of management measures for pelagic sharks under the U.S. HMS FMP. However, because oceanic whitetip sharks are highly migratory and frequently move beyond U.S. jurisdiction, these regulatory mechanisms are limited on the global stage in that they only provide protections to oceanic whitetip sharks while in U.S. waters. While this does not make them inadequate in terms of their purpose of protecting oceanic whitetip sharks while in U.S. waters, finning and retention bans are likely inadequate in other parts of the world to prevent further population declines of oceanic whitetip as a result of overutilization (as discussed in detail below). Therefore, given the significant abundance declines observed for the species as a result of overutilization, and the fact that regulatory mechanisms are largely inadequate elsewhere across the species' range, it is unlikely that U.S. regulatory mechanisms alone are enough to mitigate for threats contributing to the species' global extinction risk.

International Regulatory Mechanisms

Regarding international regulatory mechanisms, the ERA team expressed significant concern regarding existing regulations to control bycatch-related mortality, finning of oceanic whitetip sharks for the international shark fin trade, and illegal fishing and trafficking activities. The ERA team recognized that the number of international regulatory mechanisms for sharks in general, and the oceanic whitetip shark in particular, have been on the rise in recent years. For example, the oceanic whitetip shark was listed under Appendix II of the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) in 2014. CITES is an international agreement between governments, with the aim of ensuring that international trade in specimens of wild animals and plants does not threaten their survival. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate. No import permit is necessary for these species under CITES (although a permit is needed in some countries that have taken stricter measures than CITES requires).

However, recent data from Hong Kong's Agriculture Fisheries Conservation Department (AFCD) suggests that these measures are not adequately implemented or enforced by all CITES Parties with respect to the oceanic whitetip shark. Specifically, since the oceanic whitetip shark was listed under CITES Appendix II in 2014, approximately 1,263 kg (2,784 lbs) of oceanic whitetip fins have been confiscated upon entry into Hong Kong because the country of origin did not include the required CITES permits and paperwork. Since 2014, confiscated oceanic whitetip fin shipments included 940.46 kg from Colombia, 10.96 kg from the Seychelles, and 272.49 kg from the United Arab Emirates (AFCD, Unpublished data).

In addition to trade regulations, finning bans have been implemented by a number of countries, including the European Union (EU), as well as by nine RFMOs. These finning bans range from requiring fins remain attached to the body, to allowing fishers to remove shark fins provided that the weight of the fins does not exceed 5 percent of the total weight of shark carcasses landed or found onboard. In fact, all of the relevant RFMOs prohibit fins onboard that weigh more than 5 percent of the weight of sharks to curb the practice of shark finning (*i.e.*, the fins-to-carcass ratio). Although the fins-to-carcass weight ratios have the potential to reduce the practice of finning, these regulations do not prohibit the fishing of sharks and a number of issues associated with reliance on the 5 percent fins-to-carcass weight ratio requirement have been identified, including: the percentage of fins-to-carcass weight varies widely among species, fin types used in calculation, the type of carcass weight used (whole or dressed) and fin cutting techniques; under the fins-to-carcass weight ratio measure, sharks that are not landed with fins attached to the body make it difficult to match fins to a carcass (Lack and Sant 2009). There are also issues with using the ratios for dried vs. fresh fins, which can change the ratio substantially. Further, despite their existence, laws and regulations are rapidly changing and are not always effectively enforced by countries and RFMOs (Biery and Pauly 2012).

Numerous RFMOs and countries have also implemented various regulations regarding shark fishing in general, which are described in detail in the Status Review Report (Young *et al.*, 2016). A number of countries have enacted complete shark fishing bans (*i.e.*, bans on retention and possession of sharks and shark products), with the

Bahamas, Marshall Islands, Honduras, Sabah (Malaysia), and Tokelau (an island territory of New Zealand) adding to the list in 2011, the Cook Islands in 2012, and the Federated States of Micronesia in 2015. These "shark sanctuaries" (*i.e.*, locations where harvesting sharks is prohibited) can also be found in the Eastern Tropical Pacific Seascape (which encompasses around two million km² and includes the Galapagos, Cocos, and Malpelo Islands), in waters off the Maldives, Mauritania, Palau, French Polynesia, New Caledonia and Raja Ampat, Indonesia. However, it should be noted that sharks can still be caught as bycatch in these areas and enforcement is likely difficult; thus, their efficacy for reducing bycatch-related mortality of sharks is uncertain.

In addition to international regulatory mechanisms for the conservation of sharks in general via shark finning and fishing bans, a number of species-specific measures have been implemented for the conservation of oceanic whitetip sharks in particular. Specifically, the oceanic whitetip is the only shark species that has a no-retention measure in every tuna RFMO, which underscores the species' conservation status. However, the ERA team noted that international regulations specific to oceanic whitetip sharks are likely inadequate to mitigate threats that will result in further population declines throughout the species' global range. Notably, these measures likely have varying rates of implementation and enforcement and they do not prevent oceanic whitetip sharks from being caught in the first place, nor the subsequent at-vessel and post-release mortality that may result from being captured. Additionally, evidence suggests illegal trafficking and exportation activities of oceanic whitetip sharks are ongoing.

In 2011, the IATTC adopted Resolution C-11-10 for the conservation of oceanic whitetip sharks, which provides that IATTC Members and Cooperating non-Members shall prohibit retaining onboard, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in the IATTC Convention Area. However, this measure is not likely adequate to prevent capture and a substantial amount of mortality in the main fishery that catches oceanic whitetip sharks in this region (*i.e.*, the tropical tuna purse seine fishery). Though published mortality rates of the oceanic whitetip shark in purse seine fisheries are not available, it is likely the species experiences high mortality rates similar to congener *C. falciformis* during and

after interactions with purse seine fisheries (*i.e.*, ~85 percent in Western and Central Pacific and Indian Ocean tropical purse seine fisheries; Poisson *et al.*, (2014); Hutchinson *et al.*, (2015)). Given that oceanic whitetip sharks are captured in a net where they are unable to swim, and they are also subjected to the weight of whatever tonnage is on top of them, the sharks likely experience high levels of stress that can lead to mortality even if they are released alive. In addition, rough handling techniques utilized after sharks are brought onboard can also increase mortality. Thus, the ERA team concluded, and we agree, that the retention prohibition enacted for oceanic whitetip sharks in the eastern Pacific, particularly for the tropical tuna purse seine fishery, is not likely effective in reducing the threat of overutilization in this region.

In the Western and Central Pacific, the WCPFC also has regulatory measures for the conservation of sharks in general, as well as specific measures for the conservation of oceanic whitetip sharks. Likely the most influential management measure for the conservation of oceanic whitetip sharks in the Western and Central Pacific is Conservation Management Measure (CMM) 2011-04, which prohibits WCPFC vessels from retaining onboard, transshipping, storing on a fishing vessel, or landing any oceanic whitetip shark, in whole or in part, in the fisheries covered by the Convention. However, observations from the longline fishery have shown that CMM 2011-04 for the retention prohibition of oceanic whitetip is not being strictly followed (or not yet fully implemented), with non-negligible proportions of oceanic whitetips still being retained or finned. In fact, both in number and proportionally more oceanic whitetip sharks were retained in 2013 (the first year of the CMM) than 2012 in the longline fishery (Rice *et al.*, 2015). In addition, observations from the Western and Central tropical tuna purse seine fishery suggest similar issues discussed previously for the eastern Pacific purse seine fishery: Even if live release is strictly practiced in purse seine fisheries, the number of sharks surviving is expected to be low.

In addition to finning controls and species-specific retention bans, the WCPFC has also adopted some conservation measures related to fisheries gear to reduce bycatch of oceanic whitetip sharks in the first place. For example, CMM 2014-05, which became effective in July 2015, requires each national fleet to either ban wire leaders or ban shark lines, both of which have potential to reduce shark

bycatch. However, while it is predicted that oceanic whitetip shark mortality may be reduced by up to 40 percent if both measures are used, this CMM allows flag-states to choose which fishing technique they exclude. Using Monte Carlo simulations, Harley and Pilling (2016) determined the following: if flag-states choose to exclude the technique least used by their vessels, the median predicted reduction in fishing-related mortality is only 10 percent for the oceanic whitetip shark. If flag-states exclude the technique most used by their vessels, this would reduce the fishing mortality rate by 30 percent. This compares to a reduction of 40 percent if choice was removed and both techniques are prohibited. Therefore, given the high levels of fishing mortality experienced by this species, it is unlikely that the options under CMM (2014–05) of either banning shark lines or wire traces will result in sufficient reductions in fishing mortality (Harley *et al.*, 2015). Thus, based on the foregoing information, the ERA team concluded, and we agree, that despite the increasing species-specific management measures in this region, given the severely depleted state of the oceanic whitetip population and the significant levels of fishing mortality the species experiences in this region, less-than-full implementation will erode the benefits of any mitigation measures.

In the Atlantic Ocean, ICCAT is the main regulatory body for the conservation and management of tuna and tuna-like species. In 2010, ICCAT developed Recommendation 10–07, which specifically prohibits the retention, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of oceanic whitetip sharks in any fishery; however, like other previously described retention bans, the retention ban implemented by ICCAT does not necessarily prevent all fisheries-associated mortality. Although oceanic whitetip sharks have a relatively higher at-vessel survivorship rate than other pelagic sharks in the Atlantic, some will still likely die as a result of being caught. As previously discussed in the *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes* section of this proposed rule, Brazil is one of the top 26 shark-catching countries in the world and the largest oceanic whitetip catching country in the Atlantic Ocean, comprising 89 percent of the total oceanic whitetip catch reported to ICCAT from 1992–2014. Thus, the following text focuses on existing regulatory mechanisms and their

efficacy for reducing fishing pressure on oceanic whitetip sharks in Brazil. Since the implementation of ICCAT Recommendation 10–07, Brazil reported 12 mt of oceanic whitetip from 2013–2014, which indicates the species is still being caught and continues to experience fisheries-related mortality in this portion of its range. In addition to ICCAT regulations, sharks in Brazil must be landed with corresponding fins and a 5 percent fin to carcass weight ratio is required. In addition, all carcasses and fins must be unloaded and weighed and the weights reported to authorities. Pelagic gillnets and trawls are prohibited in waters less than 3 nm (5.6 km) from the coast; however, given that the oceanic whitetip is a pelagic species, a gillnet ban within 3 nm of the coast is not likely going to be beneficial to the species. Further, it is generally recognized that these regulations are poorly enforced (Chiaramonte and Vooren 2007). In December 2014, the Brazilian Government's Chico Mendes Institute for Biodiversity Conservation approved the National Plan of Action for the Conservation of Elasmobranchs of Brazil (No 125). However, this plan will not be fully implemented until 2019, and it focuses on a list of 12 priority species that does not include the oceanic whitetip shark. As noted previously, the oceanic whitetip shark was designated as a “species threatened by overexploitation” in 2004 by Brazil's Ministry of Environment, and listed under Annex II of Brazil's Normative Ruling No. 5 of May 21, 2004. In 2014, Brazil finalized its national assessment regarding the extinction risk of Brazilian fauna, and listed the oceanic whitetip shark as “Vulnerable” under Brazil's National Official List of Endangered Species of Fauna—Fish and Aquatic Invertebrate (ICMBio 2014). Species listed as “Vulnerable” enjoy full protection, including, among other measures, the prohibition of capture, transport, storage, custody, handling, processing and marketing. The capture, transport, storage, and handling of specimens of the species shall only be allowed for research purposes or for the conservation of the species, with the permission of the Instituto Chico Mendes. However, whether these regulations are adequately implemented and enforced is unclear. In fact, there is strong opposition from the fishing industry and some ordinances guaranteeing protection to endangered species in the country have recently been canceled (Di Dario *et al.*, 2014). Additionally, systematic data collection from fleets fishing over Brazilian

jurisdiction ended in 2012, and onboard observer programs have been cancelled, which renders any further monitoring of South Atlantic shark populations difficult or impossible (Barreto *et al.*, 2015). Given the foregoing information, it appears that existing regulatory mechanisms in Brazil may not be adequate to effectively manage the significant threat of fishing pressure and associated mortality on oceanic whitetip sharks in this region.

The ERA team also identified several issues with regulations in the Indian Ocean. The IOTC, the main regulatory body for managing tuna and tuna-like species, has management measures in place for sharks in general, and also specifically for the oceanic whitetip shark. In 2013, the IOTC passed Resolution 13–06 that prohibits the retention, transshipment, landing, or storing of any part or whole carcass of oceanic whitetip sharks. However, unlike similar regulations implemented by other RFMOs, the IOTC retention prohibition of oceanic whitetip shark exempts “artisanal fisheries operating exclusively in their respective EEZ for the purpose of local consumption.” However, the definition of artisanal vessels in the IOTC encompasses a wide array of boats with vastly different characteristics. They range from the pirogue that fishes close to shore for subsistence with no motor, no deck and no holding facilities, to a longliner, gillnetter or purse seiner of less than 24 m with an inboard motor, deck, communications, fish holding facilities, and in some cases chilling or freezing capabilities. This latter vessel could potentially conduct fishing operations offshore, including outside its EEZ (Moreno and Herrera 2013). For example, in 2014 and 2015 the Islamic Republic of Iran and Sri Lanka reported 239 mt of oceanic whitetip sharks caught by gillnets that fall under the definition of “artisanal fisheries.” Additionally, while some no-retention measures ban the “selling or offering for sale” of any products from the specified shark species, the IOTC oceanic whitetip shark measure does not (Clarke 2013). Further, this measure is not binding on India, which is one of the main oceanic whitetip shark catching countries identified by the IOTC in the Indian Ocean. Finally, IOTC Resolution 13–06 was passed as an interim pilot measure; therefore, it is highly uncertain as to whether this measure will be ongoing into the foreseeable future. As a result, it appears that the retention ban of oceanic whitetip in the Indian Ocean is limited in scope relative to other RFMO no-retention measures, and only

partially protective depending on whether the measure is adequately implemented and enforced. For example, in Indonesia, which is the largest shark fishing nation in the world, oceanic whitetip sharks are protected in order to comply with IOTC Resolution 13–06. However, evidence suggests that this Resolution may not be strictly adhered to. For instance, in a genetic barcoding study of shark fin samples throughout traditional fish markets in Indonesia from mid-2012 to mid-2014, oceanic whitetip shark was identified as present (Sembiring *et al.*, 2015) despite being prohibited in 2013. In addition, authorities confiscated around 3,000 oceanic whitetip shark fins from sharks caught in waters near Java Island as recent as October 2015 (South China Morning Post 2015). Thus, while it generally appears that the IOTC has increased its number of management measures for sharks, including the oceanic whitetip, these regulations are likely inadequate to prevent further population declines of the oceanic whitetip shark in this region as a result of overutilization.

It is clear that many countries and RFMOs have implemented shark finning bans or have prohibited the sale or trade of shark fins or products, and have even prohibited the retention of oceanic whitetip sharks in their respective fisheries, with declining trends in finning and catches of oceanic whitetip sharks evident in some locations as a result of these regulations (*e.g.*, Fiji, Australia and the United States; see Young *et al.*, 2016 for more details). It also evident that the international trade in shark fins may be gradually slowing. In fact, as described previously, the trade in shark fins through China, Hong Kong SAR, which has served as an indicator of the global trade for many years, fell by 22 percent in 2012. Additionally, current indications are that the shark fin trade through Hong Kong SAR and China will continue to contract (Dent & Clarke 2015). However, although the overall situation regarding the shark fin trade appears to be improving due to current regulations (*e.g.*, increasing number of finning bans) and trends (*e.g.*, waning demand for shark fins), and it may not be as severe a threat to some species of sharks compared to others, evidence suggests that oceanic whitetip fins are considered to be preferred or “first choice” in the Hong Kong market (Vannuccini 1999; E-CoP16Prop.42 2013) and the high demand for oceanic whitetip fins is ongoing. This is evidenced by recent genetic studies that confirm the presence of oceanic

whitetip shark fins in several markets throughout its range, as well as several recent incidents of illegal finning and trafficking of oceanic whitetip fins despite national and international regulations. For example, in February 2013, oceanic whitetip fins were found in a large seizure of fins from a Taiwanese vessel illegally fishing in the Marshall Islands. In 2014, illegal oceanic whitetip shark fins were discovered in a random sample inspection of three 40 kg sacks slated for export from Costa Rica to Hong Kong (Tico Times 2014). Additionally, and as previously noted, Indonesian authorities seized 3,000 shark fins belonging to oceanic whitetip sharks that were reportedly caught in waters around Java Island in October 2015. The fins, which were about to be flown to Hong Kong, were seized at the international airport that serves the capital Jakarta. This haul was worth an estimated U.S. \$72,000 in Indonesia, but would reportedly fetch several times that amount in Hong Kong (South China Morning Post 2015). Therefore, it is clear that the oceanic whitetip shark is subject to illegal fishing and trafficking, particularly for its valuable fins. Given the recent downturn in the shark fin trade (Dent & Clarke, 2015; Eriksson & Clarke 2015), the threat of this IUU fishing for the sole purpose of shark fins may not be as significant into the future. However, based on the best available information on the species’ declining population trends throughout its range, as well as current utilization levels, the present mortality rates associated with illegal fishing and its impacts on oceanic whitetip shark populations may be contributing to the overutilization of the species. Therefore, based on the foregoing information, the ERA team concluded that despite national and international regulations to protect the oceanic whitetip, illegal finning and exportation activities are ongoing. As such, and based on the best available information, existing regulatory mechanisms to control for overutilization by the shark fin trade are likely inadequate to significantly reduce this threat to the oceanic whitetip shark at this time.

Overall, and based on the above review of regulatory measures (in addition to the regulations described in Young *et al.*, 2016), the ERA team concluded, and we agree, that existing regulatory mechanisms to control for overutilization are largely inadequate to significantly reduce this global threat to the oceanic whitetip shark at this time. The ERA team acknowledged that in some locations, regulatory measures

may be effective for reducing the threat of overutilization to some degree. For example, as noted in the U.S. Domestic Regulatory Mechanisms section, in the U.S. Northwest Atlantic and Pacific Island States and Territories oceanic whitetip sharks are managed under comprehensive management plans and regulations with trip limits, quotas, logbook and protected species requirements, and other various fishing restrictions. In the Northwest Atlantic, oceanic whitetip sharks are managed under the pelagic species complex of the Atlantic HMS FMP, with commercial quotas imposed that restrict the overall level of oceanic whitetip sharks taken in this part of its range. Pelagic longline gear is heavily managed and strictly monitored. The use of pelagic longline gear (targeting swordfish, tuna and/or shark) also requires specific permits, with all required permits administered under a limited access program. Presently, no new permits are being issued; thus, persons wishing to enter the fishery may only obtain these permits by transferring the permit from a permit holder who is leaving the fishery, and transferees are currently subject to vessel upgrading restrictions. These national regulations, as detailed in the 2006 Consolidated HMS FMP and described in this Status Review Report, combined with ICCAT’s Recommendation 10–07 on the retention prohibition of oceanic whitetip shark, have likely led to the recent stabilization of the Northwest Atlantic population. In Hawaii, finning and no-retention regulations have resulted in a significant decline in the number of oceanic whitetip sharks finned and an increase in the number of sharks released alive. Thus, these U.S. conservation and management measures in and of themselves are not inadequate such that they contribute to the extinction risk of the oceanic whitetip shark by increasing demographic risks (*e.g.*, further abundance declines) or the threat of overutilization (*e.g.*, unsustainable catch rates) currently and in the foreseeable future. However, the oceanic whitetip shark is highly migratory and often moves beyond U.S. jurisdiction. For example, in just one tagging study conducted in the Northwest Atlantic, five tagged oceanic whitetip sharks made transboundary movements, spending time in waters managed by different countries (United States, Cuba, and several of the windward Caribbean islands) or the high seas that are managed by international bodies (Howey-Jordan *et al.* 2013). Additionally, the ERA team emphasized that regulatory mechanisms

to control for overutilization of the species are largely inadequate throughout the rest of the species' global range. Therefore, based on the best available information, and given the significant global abundance declines of the oceanic whitetip shark as a result of overutilization, the inadequacy of existing regulatory mechanisms is likely a threat contributing to the species' risk of extinction throughout its range.

Overall Risk Summary

Guided by the results and discussions from the demographic risk analysis and threats assessment, the ERA team members used their informed professional judgment to make an overall extinction risk determination for the oceanic whitetip shark now and in the foreseeable future. The ERA team concluded, and we agree, that the oceanic whitetip shark currently has a "moderate" risk of extinction globally. The ERA team was fairly confident in determining the overall level of extinction risk of the oceanic whitetip shark, placing more than half of their likelihood points in the "moderate risk" category. To express some uncertainty, particularly regarding the lack of robust abundance trends and catch data for populations in certain areas (*e.g.*, South Atlantic and Indian Ocean), as well as potential stabilizing trends observed in two areas (*e.g.*, Northwest Atlantic and Hawaii), the team placed some of their likelihood points in the "low risk" and "high risk" categories as well. Likelihood points attributed to the overall level of extinction risk categories were as follows: Low Risk (20/60), Moderate Risk (34/60), High Risk (6/60). The ERA team reiterated that the once abundant and ubiquitous oceanic whitetip shark has likely experienced significant historical population declines throughout its global range, with multiple data sources and analyses, including a stock assessment and trends in relative abundance, suggesting declines greater than 70–80 percent in most areas. The ERA team concluded that declining abundance trends of varying magnitudes are likely ongoing in all three ocean basins.

In terms of threats to the species, the ERA team noted that the most significant threat to the continued existence of the oceanic whitetip shark in the foreseeable future is ongoing and significantly high rates of fishing mortality driven by demands of the international trade in shark fins and meat, as well as impacts related to incidental bycatch and IUU fishing. The ERA team emphasized that the oceanic whitetip shark's vertical and horizontal distribution significantly increases its

exposure to industrial fisheries, including pelagic longline and purse seine fisheries operating within the species' core tropical habitat throughout its global range. In addition to declines in oceanic whitetip catches throughout its range, there is also evidence of declining average size over time in some areas, which is particularly concerning given evidence that litter size is potentially correlated with maternal length. With such extensive declines in the species' global abundance and the ongoing threat of overutilization, the species' slow growth and relatively low fecundity may limit its ability for compensation. Related to this, the low genetic diversity of oceanic whitetip is also cause for concern and a viable risk over the foreseeable future for this species. This is particularly concerning since it is possible (though uncertain) that a reduction in genetic diversity following the large reduction in population size due to overutilization has not yet manifested in the species. Loss of genetic diversity can lead to reduced fitness and a limited ability to adapt to a rapidly changing environment, thus increasing the species' overall risk of extinction.

Finally, the species' extensive distribution, ranging across entire oceans and across multiple international boundaries complicates management of the species. The ERA team agreed that implementation and enforcement of management measures that could reduce the threat of overutilization to the species are likely highly variable and/or lacking altogether across the species' range. The ERA team acknowledged a significant increase in species-specific management measures to control for overutilization of oceanic whitetip shark across its range; however, the ERA team also noted that most of these regulations, particularly the retention prohibitions enacted by all relevant RFMOs throughout the range of the species, are too new to truly determine their efficacy in reducing mortality of oceanic whitetip shark. Despite this limitation, and with the exception of the Northwest Atlantic and Pacific Island States and Territories, the ERA team was not confident in the adequacy of these regulations to reduce the threat of overutilization and prevent further abundance declines in the foreseeable future. First, the ERA team discussed the fact that retention prohibitions do not prevent at-vessel and post-release mortality, which is likely high in some fisheries. In addition, the biggest concern to the ERA team with regard to these regulatory mechanisms going forward is the lack of

full implementation and enforcement. The ERA team noted that proper implementation and enforcement of these regulations would likely result in a reduction in overall mortality of the species over time. However, the best available information suggests that this may not currently be the case. Given the species' depleted state throughout its range, the ERA team agreed that less than full implementation and enforcement of current regulations is likely undermining any conservation benefit to the species.

Based on all of the foregoing information, which represents the best scientific and commercial data available regarding current demographic risks and threats to the species, the ERA team concluded that the oceanic whitetip shark currently has a moderate risk of extinction throughout its range. We concluded that the species does not currently have a high risk of extinction because of the following: The species has a significantly broad distribution and does not seem to have been extirpated in any region, even in areas where there is heavy harvest bycatch and utilization of the species' high-value fins; there appears to be a potential for relative stability in population sizes on the order of 5–10 years at the post-decline depressed state, as evidenced by the potential stabilization of two populations (*e.g.*, NW Atlantic and Hawaii) at a diminished abundance, which suggests that this species is potentially capable of persisting at a low population size; and the overall reduction of the fin trade as well as increasing management regulations will likely reduce the threat of overutilization to some extent, and thus reduce the species' overall risk of extinction. However, given the species' significant historical and ongoing abundance declines of varying magnitudes in all three ocean basins, slow growth, low fecundity, and low genetic diversity, combined with ongoing threats of overutilization and largely inadequate regulatory mechanisms, the ERA team concluded that the oceanic whitetip shark currently has a moderate risk of extinction throughout its global range. In other words, due to significant and ongoing threats of overutilization and largely inadequate regulatory mechanisms, current trends in the species' abundance, productivity and genetic diversity place the species on a trajectory towards a high risk of extinction in the foreseeable future of ~30 years.

Conservation Efforts

Section 4(b)(1)(A) of the ESA requires the Secretary, when making a listing determination for a species, to take into account those efforts, if any, being made by any State or foreign nation to protect the species. In judging the efficacy of protective efforts, we rely on the Services' joint "Policy for Evaluation of Conservation Efforts When Making Listing Decisions" ("PECE;" 68 FR 15100; March 28, 2003). The PECE is designed to guide determinations on whether any conservation efforts that have been recently adopted or implemented, but not yet proven to be successful, will result in recovering the species to the point at which listing is not warranted or contribute to forming a basis for listing a species as threatened rather than endangered. The purpose of the PECE is to ensure consistent and adequate evaluation of future or recently implemented conservation efforts identified in conservation agreements, conservation plans, management plans, and similar documents developed by Federal agencies, State and local governments, Tribal governments, businesses, organizations, and individuals when making listing decisions. The PECE provides direction for the consideration of such conservation efforts that have not yet been implemented, or have been implemented but have not yet demonstrated effectiveness. The policy is expected to facilitate the development by states and other entities of conservation efforts that sufficiently improve a species' status so as to make listing the species as threatened or endangered unnecessary. The PECE established two basic criteria: (1) The certainty that the conservation efforts will be implemented, and (2) the certainty that the efforts will be effective. Satisfaction of the criteria for implementation and effectiveness establishes a given protective effort as a candidate for consideration, but does not mean that an effort will ultimately change the risk assessment for the species. Overall, the PECE analysis ascertains whether the formalized conservation effort improves the status of the species at the time a listing determination is made.

The concern regarding the practice of finning and its effect on global shark populations has been growing both domestically and internationally. Notably, the push to stop shark finning and curb the trade of shark fins is evident overseas and even in Asian countries, where the demand for shark fin soup is highest. For example, in a recent report from WildAid, Whitcraft *et*

al. (2014) reported the following regarding the declining demand for shark fins: An 82 percent decline in sales reported by shark fin vendors in Guangzhou, China and a decrease in prices (47 percent retail and 57 percent wholesale) over the past 2 years; 85 percent of Chinese consumers surveyed online said they gave up shark fin soup within the past 3 years, and two-thirds of these respondents cited awareness campaigns as a reason for ending their shark fin consumption; 43 percent of consumers responded that much of the shark fin in the market is fake; 24 airlines, 3 shipping lines, and 5 hotel groups have banned shark fins from their operations; there has been an 80 percent decline from 2007 levels in prices paid to fishermen in Tanjung Luar and Lombok in Indonesia and a decline of 19 percent since 2002–2003 in Central Maluku, Southeastern Maluku and East Nusa Tenggara; and of 20 Beijing restaurant representatives interviewed, 19 reported a significant decline in shark fin consumption. While there seems to be a growing trend to prohibit and discourage shark finning domestically and internationally, it is difficult to predict at this time whether the trend will be effective in reducing the threat of overutilization to the oceanic whitetip shark. Nonetheless, we conclude that these conservation measures are not likely to be effective in reducing current threats to oceanic whitetip shark to the point that listing would no longer be warranted.

There are also many other smaller national and international organizations with shark-focused goals that include advocating the conservation of sharks through education and campaign programs and conducting shark research to fill data gaps regarding the status of shark species. Some of these organizations include: The Pew Environment Group, Oceana, Ocean Conservancy, Shark Trust, Bite-Back, Shark Project, Pelagic Shark Research Foundation, Shark Research Institute, and Shark Savers. More information on the specifics of these programs and groups can be found on their Web sites. Important research on oceanic whitetip sharks is also being conducted in a joint partnership by Nova Southeastern University and the Guy Harvey Research Institute. To facilitate conservation and management efforts for oceanic whitetip sharks, the Guy Harvey Research Institute/Guy Harvey Ocean Foundation and their project partners are using integrative approaches to investigate the population connectivity of this species, including ongoing studies of the global stock structure of oceanic whitetip

sharks by using genetic techniques, as well as migration patterns of this species in the western Atlantic with the aid of satellite tracking technologies. All of these conservation efforts and non-regulatory mechanisms are beneficial to the persistence of the oceanic whitetip shark. The implementation of many of these efforts, especially the shark research programs, will help to fill current data gaps in oceanic whitetip abundance, genetics, and movement patterns, which can ultimately help inform other conservation and management measures. However, it is too soon to tell whether the collective conservation efforts of both non-governmental and academic organizations will be effective in reducing threats to the species, particularly those related to overutilization of the oceanic whitetip shark.

Proposed Determination

Section 4(b)(1) of the ESA requires that NMFS make listing determinations based solely on the best scientific and commercial data available after conducting a review of the status of the species and taking into account those efforts, if any, being made by any state or foreign nation, or political subdivisions thereof, to protect and conserve the species. We have independently reviewed the best available scientific and commercial information, including the petition, public comments submitted on the 90-day finding (81 FR 1376; January 12, 2016), the status review report (Young *et al.*, 2016), and other published and unpublished information, and we have consulted with species experts and individuals familiar with the oceanic whitetip shark. We considered each of the section 4(a)(1) factors to determine whether it contributed significantly to the extinction risk of the species on its own. We also considered the combination of those factors to determine whether they collectively contributed significantly to the extinction risk of the species. Therefore, our determination set forth below is based on a synthesis and integration of the foregoing information, factors and considerations, and their effects on the status of the species throughout its range. With respect to the term "foreseeable future," we accept the ERA team's definition and rationale of approximately 30 years as reasonable for the reliable prediction of threats on the biological status of the species. That rationale for a foreseeable future of approximately 30 years was provided in detail previously (refer back to the

Assessment of Extinction Risk—Methods section of this proposed rule).

We conclude that the oceanic whitetip shark is not presently in danger of extinction, but is likely to become so in the foreseeable future throughout all of its range. We summarize the factors supporting this conclusion as follows: (1) The best available information indicates that the species has experienced significant and ongoing abundance declines in all three ocean basins (*i.e.*, globally); (2) oceanic whitetip sharks possess life history characteristics that increase their vulnerability to harvest, including slow growth, relatively late age of maturity, and low fecundity; (3) the species' low genetic diversity in concert with steep global abundance declines and ongoing threats of overutilization may pose a viable risk to the species in the foreseeable future; (4) due to the species' preferred vertical and horizontal habitat, the oceanic whitetip shark is extremely susceptible to incidental capture in both longline and purse seine fisheries throughout its range, and thus experiences substantial levels of fishing mortality from these fisheries; (5) the oceanic whitetip shark is a preferred species in the international fin market for its large, morphologically distinct fins, which incentivizes the retention and/or finning of the species; and (6) despite the increasing number of regulations for the conservation of the species, existing regulatory mechanisms are largely inadequate for addressing the most important threat of overutilization throughout a large portion of the species' range. We conclude that the species is not presently in danger of extinction as a result of the following supporting factors: (1) The species is broadly distributed over a large geographic range, and does not seem to have been extirpated in any region, even in areas where there is heavy harvest bycatch and utilization of the species' high-value fins; (2) there appears to be a potential for relative stability in population sizes on the order of 5–10 years at the post-decline depressed state, as evidenced by the potential stabilization of two populations (*e.g.*, NW Atlantic and Hawaii) at a diminished abundance, which suggests that this species is potentially capable of persisting at a low population size; (3) there is no evidence of a range contraction and there is no evidence of habitat loss or destruction; (4) the overall reduction of the fin trade as well as increasing management regulations will likely reduce the threat of overutilization to some extent in the

foreseeable future, and thus reduce the species' current overall risk of extinction; (5) there is no evidence that disease or predation are contributing to an increased risk of extinction of the species; and (6) there is no evidence that other natural or manmade factors are contributing to an increased risk of extinction of the species.

As a result of the foregoing findings, which are based on the best scientific and commercial data available, we conclude that while the oceanic whitetip shark is not presently in danger of extinction throughout all or a significant portion of its range, it is likely to become so within the foreseeable future. Accordingly, the oceanic whitetip shark meets the definition of a threatened species, and thus, the oceanic whitetip shark warrants listing as a threatened species at this time.

Effects of Listing

Conservation measures provided for species listed as endangered or threatened under the ESA include the development and implementation of recovery plans (16 U.S.C. 1533(f)); designation of critical habitat, if prudent and determinable (16 U.S.C. 1533(a)(3)(A)); a requirement that Federal agencies consult with NMFS under section 7 of the ESA to ensure their actions do not jeopardize the species or result in adverse modification or destruction of designated critical habitat (16 U.S.C. 1536); and prohibitions on "taking" (16 U.S.C. 1538). Recognition of the species' plight through listing may also promote conservation actions by Federal and state agencies, foreign entities, private groups, and individuals.

Identifying Section 7 Consultation Requirements

Section 7(a)(2) (16 U.S.C. 1536(a)(2)) of the ESA and NMFS/FWS regulations require Federal agencies to confer with us on actions likely to jeopardize the continued existence of species proposed for listing, or that result in the destruction or adverse modification of proposed critical habitat. If a proposed species is ultimately listed, Federal agencies must consult on any action they authorize, fund, or carry out if those actions may affect the listed species or its critical habitat and ensure that such actions do not jeopardize the species or result in adverse modification or destruction of critical habitat should it be designated. Examples of Federal actions that may affect the oceanic whitetip shark include, but are not limited to: Alternative energy projects, discharge of pollution from point

sources, non-point source pollution, contaminated waste and plastic disposal, dredging, pile-driving, development of water quality standards, vessel traffic, military activities, and fisheries management practices.

Critical Habitat

Critical habitat is defined in section 3 of the ESA (16 U.S.C. 1532(3)) as: (1) The specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (a) essential to the conservation of the species and (b) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed upon a determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures needed to bring the species to the point at which listing under the ESA is no longer necessary. Section 4(a)(3)(a) of the ESA (16 U.S.C. 1533(a)(3)(A)) requires that, to the extent prudent and determinable, critical habitat be designated concurrently with the listing of a species. Designations of critical habitat must be based on the best scientific data available and must take into consideration the economic, national security, and other relevant impacts of specifying any particular area as critical habitat. If we determine that it is prudent and determinable, we will publish a proposed designation of critical habitat for the oceanic whitetip shark in a separate rule. Public input on features and areas in U.S. waters that may meet the definition of critical habitat for the oceanic whitetip shark is invited.

Protective Regulations Under Section 4(d) of the ESA

We are proposing to list the oceanic whitetip shark, *Carcharhinus longimanus*, as a threatened species under the ESA. In the case of threatened species, ESA section 4(d) leaves it to the Secretary's discretion whether, and to what extent, to extend the section 9(a) "take" prohibitions to the species, and authorizes us to issue regulations necessary and advisable for the conservation of the species. Thus, we have flexibility under section 4(d) to tailor protective regulations based on the needs of and threats to the species. The section 4(d) protective regulations may prohibit, with respect to threatened species, some or all of the acts which section 9(a) of the ESA prohibits with respect to endangered species. We are

not proposing such regulations at this time, but may consider potential protective regulations pursuant to section 4(d) for the oceanic whitetip in a future rulemaking. In order to inform our consideration of appropriate protective regulations for the species, we seek information from the public on the threats to oceanic whitetip shark and possible measures for their conservation.

Role of Peer Review

The intent of the peer review policy is to ensure that listings are based on the best scientific and commercial data available. In December 2004, the Office of Management and Budget (OMB) issued a Final Information Quality Bulletin for Peer Review establishing minimum peer review standards, a transparent process for public disclosure of peer review planning, and opportunities for public participation. The OMB Bulletin, implemented under the Information Quality Act (Pub. L. 106–554), is intended to enhance the quality and credibility of the Federal government's scientific information, and applies to influential or highly influential scientific information disseminated on or after June 16, 2005. To satisfy our requirements under the OMB Bulletin, we obtained independent peer review of the status review report. Independent specialists were selected from the academic and scientific community for this review. All peer reviewer comments were addressed prior to dissemination of the final status review report and publication of this proposed rule.

Public Comments Solicited on Listing

To ensure that the final action resulting from this proposal will be as accurate and effective as possible, we solicit comments and suggestions from the public, other governmental agencies, the scientific community, industry, environmental groups, and any other interested parties. Comments are encouraged on this proposal (See **DATES** and **ADDRESSES**). Specifically, we are interested in information regarding: (1) New or updated information regarding the range, distribution, and abundance of the oceanic whitetip shark; (2) new or updated information regarding the genetics and population structure of the oceanic whitetip shark; (3) habitat within the range of the oceanic whitetip shark that was present in the past, but may have been lost over time; (4) new or updated biological or other relevant data concerning any threats to the oceanic whitetip shark (e.g., post-release mortality rates, finning rates in commercial fisheries, etc.); (5) current or

planned activities within the range of the oceanic whitetip shark and their possible impact on the species; (6) recent observations or sampling of the oceanic whitetip shark; and (7) efforts being made to protect the oceanic whitetip shark.

Public Comments Solicited on Critical Habitat

We request quantitative evaluations describing the quality and extent of habitats for the oceanic whitetip shark, as well as information on areas that may qualify as critical habitat for the species in U.S. waters. Specific areas that include the physical and biological features essential to the conservation of the species, where such features may require special management considerations or protection, should be identified. Areas outside the occupied geographical area should also be identified, if such areas themselves are essential to the conservation of the species. ESA implementing regulations at 50 CFR 424.12(g) specify that critical habitat shall not be designated within foreign countries or in other areas outside of U.S. jurisdiction. Therefore, we request information only on potential areas of critical habitat within waters under U.S. jurisdiction.

Section 4(b)(2) of the ESA requires the Secretary to consider the “economic impact, impact on national security, and any other relevant impact” of designating a particular area as critical habitat. Section 4(b)(2) also authorizes the Secretary to exclude from a critical habitat designation those particular areas where the Secretary finds that the benefits of exclusion outweigh the benefits of designation, unless excluding that area will result in extinction of the species. For features and areas potentially qualifying as critical habitat, we also request information describing: (1) Activities or other threats to the essential features or activities that could be affected by designating them as critical habitat; and (2) the positive and negative economic, national security and other relevant impacts, including benefits to the recovery of the species, likely to result if these areas are designated as critical habitat. We seek information regarding the conservation benefits of designating areas within waters under U.S. jurisdiction as critical habitat. In keeping with the guidance provided by OMB (2000; 2003), we seek information that would allow the monetization of these effects to the extent possible, as well as information on qualitative impacts to economic values.

Data reviewed may include, but are not limited to: (1) Scientific or

commercial publications; (2) administrative reports, maps or other graphic materials; (3) information received from experts; and (4) comments from interested parties. Comments and data particularly are sought concerning: (1) Maps and specific information describing the amount, distribution, and use type (e.g., foraging or migration) by the oceanic whitetip shark, as well as any additional information on occupied and unoccupied habitat areas; (2) the reasons why any habitat should or should not be determined to be critical habitat as provided by sections 3(5)(A) and 4(b)(2) of the ESA; (3) information regarding the benefits of designating particular areas as critical habitat; (4) current or planned activities in the areas that might be proposed for designation and their possible impacts; (5) any foreseeable economic or other potential impacts resulting from designation, and in particular, any impacts on small entities; (6) whether specific unoccupied areas may be essential to provide additional habitat areas for the conservation of the species; and (7) potential peer reviewers for a proposed critical habitat designation, including persons with biological and economic expertise relevant to the species, region, and designation of critical habitat. We seek information regarding critical habitat for the oceanic whitetip shark as soon as possible, but no later than March 29, 2017.

Public Hearings

If requested by the public by February 13, 2017, hearings will be held regarding the proposal to list the oceanic whitetip shark as a threatened species under the ESA. If hearings are requested, details regarding location(s), date(s), and time(s) will be published in a subsequent **Federal Register** notice.

References

A complete list of all references cited herein is available upon request (see **FOR FURTHER INFORMATION CONTACT**).

Classification

National Environmental Policy Act

Section 4(b)(1)(A) of the ESA restricts the information that may be considered when assessing species for listing and sets the basis upon which listing determinations must be made. Based on the requirements in section 4(b)(1)(A) of the ESA and the opinion in *Pacific Legal Foundation v. Andrus*, 675 F. 2d 825 (6th Cir. 1981), we have concluded that ESA listing actions are not subject to the environmental assessment requirements

of the National Environmental Policy Act (NEPA).

Executive Order 12866, Regulatory Flexibility Act, and Paperwork Reduction Act

As noted in the Conference Report on the 1982 amendments to the ESA, economic impacts cannot be considered when assessing the status of a species. Therefore, the economic analysis requirements of the Regulatory Flexibility Act are not applicable to the listing process.

In addition, this proposed rule is exempt from review under Executive Order 12866. This proposed rule does not contain a collection-of-information requirement for the purposes of the Paperwork Reduction Act.

Executive Order 13132, Federalism

In accordance with E.O. 13132, we determined that this proposed rule does not have significant Federalism effects and that a Federalism assessment is not required. In keeping with the intent of the Administration and Congress to

provide continuing and meaningful dialogue on issues of mutual state and Federal interest, this proposed rule will be given to the relevant state agencies in each state in which the species is believed to occur, and those states will be invited to comment on this proposal. We have considered, among other things, Federal, state, and local conservation measures. As we proceed, we intend to continue engaging in informal and formal contacts with the state, and other affected local or regional entities, giving careful consideration to all written and oral comments received.

List of Subjects in 50 CFR Part 223

Endangered and threatened species, Exports, Imports, Transportation.

Dated: December 22, 2016.

Samuel D Rauch, III,

Deputy Assistant Administrator for Regulatory Programs, National Marine Fisheries Service.

For the reasons set out in the preamble, 50 CFR part 223 is proposed to be amended as follows:

PART 223—THREATENED MARINE AND ANADROMOUS SPECIES

■ 1. The authority citation for part 223 continues to read as follows:

Authority: 16 U.S.C. 1531–1543; subpart B, § 223.201–202 also issued under 16 U.S.C. 1361 *et seq.*; 16 U.S.C. 5503(d) for § 223.206(d)(9).

■ 2. In § 223.102, in paragraph (e), add a new entry for “Shark, oceanic whitetip” under Fishes in alphabetical order by Common Name to read as follows:

§ 223.102 Enumeration of threatened marine and anadromous species.

* * * * *

(e) * * *

| Common name | Species ¹ | | Citation(s) for listing determination(s) | Critical habitat | ESA rules |
|-----------------------------|--------------------------------|------------------------------|---|------------------|-----------|
| | Scientific name | Description of listed entity | | | |
| * | * | * | * | * | * |
| FISHES | | | | | |
| * | * | * | * | * | * |
| Shark, oceanic whitetip ... | <i>Carcharhinus longimanus</i> | Entire species | [Insert Federal Register page where the document begins], [Insert date of publication when published as a final rule]. | NA | NA |
| * | * | * | * | * | * |

¹ Species includes taxonomic species, subspecies, distinct population segments (DPSs) (for a policy statement, see 61 FR 4722; February 7, 1996), and evolutionarily significant units (ESUs) (for a policy statement, see 56 FR 58612; November 20, 1991).