DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[Docket No. 141219999–6234–02]

RIN 0648–XD680

Endangered and Threatened Wildlife and Plants; Notice of 12-Month Finding on Petitions to List the Common Thresher Shark and Bigeye Thresher Shark as Threatened or Endangered Under the Endangered Species Act (ESA)

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

ACTION: Notice of 12-month finding and availability of status review report.

SUMMARY: NMFS has completed comprehensive status reviews under the Endangered Species Act (ESA) for two species of thresher shark in response to petitions to list those species. These species are the common thresher shark (*Alopias vulpinus*) and the bigeye thresher shark (*Alopias superciliosus*). Based on the best scientific and commercial information available, including the status review report (Young *et al.,* 2015), and after taking into account efforts being made to protect these species, we have determined that the common thresher (*A. vulpinus*) and bigeye thresher (*A. superciliosus*) do not warrant listing at this time. We conclude that neither species is currently in danger of extinction throughout all or a significant portion of its range nor likely to become so within the foreseeable future.

DATES: This finding was made on April 1, 2016.

ADDRESSES: The status review report for common and bigeye thresher sharks is available electronically at: *http://www.nmfs.noaa.gov/pr/species/fish/common-thresher-shark.html* and *http://www.nmfs.noaa.gov/pr/species/fish/bigeye-thresher-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: Thresher Shark 12-month Finding.

FOR FURTHER INFORMATION CONTACT: Chelsey Young, NMFS, Office of Protected Resources, (301) 427–8491.

SUPPLEMENTARY INFORMATION:

Background

On August 26, 2014, we received a petition from Friends of Animals to list the common thresher shark (*Alopias vulpinus*) as threatened or endangered under the ESA throughout its entire range, or, as an alternative, to list 6 distinct population segments (DPSs) of the common thresher shark, as described in the petition, as threatened or endangered, and designate critical habitat. On April 27, 2015, we received a separate petition from Defenders of Wildlife to list the bigeye thresher shark as threatened or endangered throughout its range, or, as an alternative, to list any identified DPSs, should we find they exist, as threatened or endangered species pursuant to the ESA, and to designate critical habitat. We found that the petitioned actions may be warranted for both species; on March 3, 2015, and August 11, 2015, we published positive 90-day findings for the common thresher (80 FR 11379) and bigeye thresher (80 FR 48061), respectively, announcing that the petitions presented substantial scientific or commercial information indicating the petitioned actions of listing each species may be warranted, and explaining the basis for those findings. We also announced the initiation of a status review of both 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 the common and bigeye thresher sharks 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 not yet demonstrated effectiveness.

Status Review

We convened a team of agency scientists to conduct the status review for the common and bigeye thresher sharks and prepare a report. The status review report of common and bigeye thresher sharks (Young *et al.,* 2015) compiles the best available information on the status of both species as required by the ESA, provides an evaluation of the discreteness and significance of populations in terms of the DPS policy, and assesses the current and future extinction risk for both 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 common and bigeye thresher sharks. Next, we convened a team of biologists and shark experts (hereinafter referred to as the Extinction Risk Analysis (ERA) team) to conduct extinction risk analyses for both species, using the information in the scientific review. The ERA team was comprised of a fishery management specialist from NMFS' Highly Migratory Species Management Division, four research fishery biologists from NMFS' Southeast, Northeast, Southwest, and Pacific Island Fisheries Science Centers, and two natural resource management specialists with NMFS' Office of Protected Resources. 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 common and bigeye thresher sharks but makes no recommendation as to the listing status of the species. The status review report is available electronically at *http://www.nmfs.noaa.gov/pr/species/fish/common-thresher-shark.html* and *http://www.nmfs.noaa.gov/pr/species/fish/bigeye-thresher-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 three independent specialists selected from the academic and scientific community, with expertise in shark biology, conservation and management, and knowledge of thresher 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 12-month finding is based, provides the best available scientific and commercial information on the common and bigeye thresher sharks. Much of the information discussed below on thresher 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 Common Thresher Shark (*Alopias vulpinus*)

Taxonomy and Species Description

All thresher sharks belong to the family Alopiidae, genus *Alopias,* and are classified as mackerel sharks (Order Lamniformes). Thresher sharks are recognized by their elongated upper caudal lobe (tail fin) almost equal to its body length, which is unique to the Alopiidae family. There are currently three recognized species of thresher shark: common thresher (*Alopias vulpinus*), bigeye thresher (*Alopias superciliosus*), and pelagic threhser (*Alopis pelagicus*). Eitner (1995) used allozymes to infer phylogenetic relationships in the genus *Alopias,* and suggested the existence of an unrecognized fourth thresher shark species. Results from a recent genetics study (Cardeñosa *et al.,* 2014) suggest that this fourth thresher shark species may be a second species of pelagic thresher shark; however, more information is needed to confirm this. The common thresher shark (*Alopias vulpinus*) is the largest of the thresher shark species and is distinguished from other thresher sharks by the presence of labial furrows, the origin of the second dorsal fin posterior to the end of the pelvic fin free rear tip, and the white color of the abdomen extending upward over the pectoral fin bases, and again rearward of the pelvic fins. The common thresher shark has moderately large eyes, a broad head, short snout, narrow tipped pectoral fins, and lateral teeth without distinct cusplets. Dorsal coloration may vary from brown, blue slate, slate gray, blue gray, and dark lead to nearly black, with a metallic, often purplish, luster. The lower surface of the snout (forward of the nostrils) and pectoral fin bases are generally not white and may be the same color as the dorsal surface (Compagno, 1984; Goldman, 2009).

Current Distribution

The common thresher shark is found throughout the world in temperate and tropical seas, with a noted tolerance for cold waters as well; however, highest concentrations tend to occur in coastal, temperate waters (Moreno *et al.,* 1989; Goldman, 2009). In the North Atlantic, common thresher sharks occur from Newfoundland, Canada, to Cuba in the west and from Norway and the British Isles to the African coast in the east (Gervelis and Natanson, 2013). Landings along the South Atlantic coast of the United States and in the Gulf of Mexico are rare. Common thresher sharks also occur along the Atlantic coast of South America from Venezuela to southern Argentina. In the eastern Atlantic, the common thresher ranges from the central coast of Norway south to, and including, the Mediterranean Sea and down the African coast to the Ivory Coast. They appear to be most abundant along the Iberian coastline, particularly during spring and fall. Specimens have also been recorded at Cape Province, South Africa (Goldman, 2009). In the Indian Ocean, the common thresher is found along the east coast of Somalia, and in waters adjacent to the the Maldive Islands and Chagos archipelago. The species is also present off Australia (Tasmania to central Western Australia), Sumatra, Pakistan, India, Sri Lanka, Oman, Kenya, the northwestern coast of Madagascar and South Africa. A few specimens have been taken from southwest of the Chagos archipelago, the Gulf of Aden, and northwest Red Sea. However, Romanov (2015) raises serious questions regarding the occurrence of common thresher in the equatorial and northern tropical Indian Ocean, suggesting the species demonstrates strong fidelity to subtropical and temperate coasts of South Africa and Australia. In the western Pacific Ocean, the range of common thresher includes southern Japan, Korea, China, parts of Australia and New Zealand. They are also present around several Pacific Islands, including New Caledonia, Society Islands, Fanning Islands, Hawaii and American Samoa. In the Northeast Pacific Ocean, the geographic range of common thresher sharks extends from Goose Bay, British Columbia, Canada to the Baja Peninsula, Mexico and out to about 200 miles (322 km) from the coast (Goldman, 2009). Additionally, they are found off Chile and records exist from Panama (Compagno, 1984; Ebert *et al.,* 2014).

Habitat Use and Movement

The common thresher shark is a highly migratory, pelagic species of shark that is both coastal, ranging over continental and insular shelves, and epipelagic, ranging far from land, though they are most abundant near land approximately 40–50 nautical miles (74–93 km) from shore (Strasburg, 1958; Bedford, 1992). Although the species is migratory, *A. vulpinus* appears to exhibit little to no immigration and emigration between geographic areas; namely between the Pacific and Northwest Atlantic populations (Gubanov, 1972; Moreno *et al.,* 1989; Bedford, 1992; Trejo, 2005). In the eastern Pacific, conventional tagging data (N = 110 tag returns) from NMFS' Southwest Fisheries Science Center (SWFSC) show that common threshers often migrate between the United States and Mexico on the West Coast. While these data confirm active transboundary migration in this species between the United States and Mexico, there is no evidence to support regular migration beyond the West Coast of North America. Similarly, in the Atlantic, mark recapture data (number tagged = 203 and recaptures = 4) from the NMFS Cooperative Shark Tagging Program (CSTP) between 1963 and 2013 provide supporting evidence that common thresher sharks do not make transatlantic movements (Kohler *et al.,* 1998; NMFS, unpublished data). The range of movement for common threshers based on CSTP data was relatively small, with an observed maximum straight-line distance travelled of 86 nautical miles (nmi; 159 km) in the Northwest Atlantic and 271 nmi (502 km) in the Northeast Atlantic.

Several studies have shown that common thresher sharks make daily vertical migrations, moving to deeper water during the day, with a maximum depth reported to 640 m in Australia. In the Marshall Islands, common thresher sharks showed a preference for an optimum swimming depth, water temperature, salinity and dissolved oxygen range of 160–240 m, 18–20 °C, 34.5–34.8 ppt and 1.0–1.5 ml/l, respectively, during daytime (Cao *et al.,* 2011). These studies indicate that common thresher sharks may spend most of the day at deeper depths below the thermocline (≤200 m) and most of the night in shallower waters between 0–200 m. Juveniles occupy relatively shallow water over the continental shelf (<200 m), while adults are found in deeper water (up to at least 366 m, with dive depths up to at least 640 m), but rarely range beyond 200 nmi (321.87 km) from the coast. Both adults and juveniles are associated with highly biologically productive waters, found in regions of upwelling or intense mixing (PFMC, 2003; Smith *et al.,* 2008).

Diet

Common thresher sharks feed at mid-trophic levels on a mix of small pelagic fish and cephalopods (Cortés, 1999; Bowman *et al.,* 2000; Estrada *et al.,* 2003; MacNeil *et al.,* 2005). Studies from the U.S. West Coast and southern coast of Australia showed common thresher sharks exhibit narrower dietary preferences in comparison to other local pelagic shark species (Preti *et al.,* 2012; Rogers *et al.,* 2012). Given their more specialized diet, they are more likely to exert top-down effects on their prey, although this remains to be demonstrated. Based on studies at NMFS' SWFSC, the top six prey species, in order, are northern anchovy, Pacific sardine, Pacific hake, Pacific mackerel, jack mackerel, and market squid (Preti *et al.,* 2001; 2004; 2012).

Reproduction

Compared to the other *Alopias* species, the common thresher (*A. vulpinus*) has the fastest growth rate and also attains the largest size, and thus matures at an earlier age, between 5 and 12 years depending on the geographic location (Smith *et al.,* 2008; Gervelis and Natanson, 2013). In terms of size, females attain maturity generally around 315–400 cm total length (TL) while males reach maturity at similar sizes (generally around 314–420 cm TL) (see Table 1 in Young *et al.,* 2015). Female common thresher sharks utilize a mode of reproduction of aplacental ovoviviparity and oophagy (*i.e.,* eggs are deposited into one of two uterine horns and developing embryos are nourished by feeding on other eggs), and gestation is thought to be around 9 months (PFMC, 2003; Smith *et al.,* 2008). Litter sizes are typically small, and may vary depending on geographic location; they range from only 2 pups in the Indian Ocean to between 3 and 7 in the Northeast Atlantic, while 3–4 pups are common in the Eastern Pacific (with occasional litters of up to 6 pups off California). Pupping is thought to occur in the springtime, with mating thought to occur in the summer in both the Northeast Atlantic and Eastern Pacific. However, pregnant females in the western Indian Ocean have been observed in August and November, indicating that birth of young common thresher sharks may occur throughout the year in this area (Goldman, 2009).

Size and Growth

Historical records indicate the common thresher can reach maximum lengths of 690–760 cm TL (Bigelow and Schroeder, 1948; Hart, 1973). More recent studies report *A. vulpinus* reaching 573 cm TL and possibly up to 600 cm depending on sex and geographic location (Smith *et al.,* 2008; Goldman, 2009). The lifespan of common threshers has been broadly estimated to be between 15 and 50 years (Gervelis and Natanson, 2013); however, most recently, longevity of common threshers was estimated to be 38 years based on bomb radiocarbon validation (Natanson *et al.,* in press). Male common thresher sharks are thought to grow faster than females (with a growth coefficient, k, of 0.17/year for males and 0.09/year for females) but reach a smaller asymptotic size (225.4 cm fork length (FL) for males versus 274.5 cm FL for females) (Gervelis and Natanson, 2013). Using life history parameters from the eastern North Pacific, Cortés *et al.* (2012) estimated productivity of the common thresher shark, determined as intrinsic rate of population increase (*r*), to be 0.121 per year (median). However, it should be noted that this study relied on an earlier estimated age at maturity for *A. vulpinus* females from the eastern North Pacific (*i.e.,* 5–6 years) and did not take into account more recent age at maturity estimates calculated for *A. vulpinus* females in the Northwest Atlantic (*i.e.,* 12 years), which may slightly decrease the species' overall productivity. Overall, the best available data indicate that the common thresher shark is a long-lived species (at least 20–40 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.

Current Status

Common thresher sharks can be found worldwide, with no present indication of a range contraction. Although potentially rare in a large portion of its range and generally not targeted, they are caught as bycatch in many global fisheries, including bottom and pelagic longline tuna and swordfish fisheries, purse seine fisheries, coastal gillnet fisheries, and artisanal fisheries. Common thresher sharks are more commonly utilized for their meat than fins, as they are a preferred species for human consumption; however, they are also valuable as incidental catch for the international shark fin trade.

In 2009, the International Union for Conservation of Nature (IUCN) considered the common thresher shark to be Vulnerable globally, based on an assessment by Goldman *et al.* (2009) and its own criteria (A2bd, 3bd and 4bd), and placed the species on its ''Red List.'' Under criteria A2bd, 3bd and 4bd, 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 an index of abundance appropriate to the taxon and/or the 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 common thresher 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 Segment Analysis

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 common thresher shark as six DPSs (Eastern Central Pacific, Indo-West Pacific, Northwest and Western Central Atlantic, Southwest Atlantic, Mediterranean, and Northeast Atlantic) did not present substantial scientific or commercial information to support the identification of these particular DPSs. As such, we conducted the extinction risk analysis on the global common thresher 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 species. 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 common thresher 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 common thresher shark, availability of data, and type of threats, the ERA team decided that the foreseeable future should be defined as approximately 3 generation times for the common thresher shark, or 30 years. A generation time is defined as the time it takes, on average, for a sexually mature female common thresher 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. This is supported by the fact that we have a well-documented example of how this species responds to intense fishing pressure, and the time required for the initial implementation of regulatory measures to be reflected in population abundance indices. For the northeastern Pacific stock of common thresher, the time period from being in an overfished state (*i.e.,* lowest point was approximately 30% of virgin reproductive output in 1995) to almost fully recovered after the implementation of management measures in 1985 was approximately 20–30 years (which comports with 3 generation times of the species).

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.

Often the ability to measure or document risk factors is limited, and information is not quantitative or is lacking altogether. Therefore, in assessing risk, it is important to include both qualitative and quantitative information. In assessing extinction risk to the species, 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 common thresher shark by evaluating the effect that the threat was currently having on the extinction risk of the species. The levels included ''low effect,'' ''moderate effect'' and ''high effect.'' 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 common thresher 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 common thresher shark. For this analysis, the ERA team defined 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 may be at a low risk of extinction if it exhibits a trajectory indicating that it is not currently experiencing a moderate risk of extinction now, nor is it likely to have a high risk of extinction in the foreseeable future (see definitions of ''Moderate Risk'' and ''High Risk'' below). More specifically, a species may be at low risk of extinction due to projected threats and its likely response to those threats (*i.e.,* stable or increasing trends in abundance/population growth, spatial structure and connectivity, and/or diversity and resilience); 2 = Moderate risk: A species is at moderate risk of extinction if it exhibits a trajectory indicating that it is likely to be at a high risk of extinction in the foreseeable future (see description of ''High Risk'' below). More specifically, a species may be at moderate risk of extinction due to projected threats and its likely response to those threats (*i.e.,* declining trends in abundance/population growth, spatial structure and connectivity, and/or diversity and resilience); 3 = High risk: A species is at high risk of extinction when it is currently at or near a level of abundance, spatial structure and connectivity, and/or diversity and resilience that place its persistence in question. Demographic risk may be strongly influenced by stochastic or depensatory processes. Similarly, a species 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 such imminent 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 or accuracy 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 common thresher 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

There is currently a lack of reliable estimates of global population size for the common thresher shark, with most of the available information indicating that the species is naturally rare in a large portion of its range. The ERA team expressed some concern regarding the common thresher shark's global abundance, particularly given that the species likely experienced localized population declines over the past few decades. Given the lack of data, and the fact that most of these assessments are not specific to common thresher, the extent of the decline and current status of the global population are unclear. However, some information, including a recent stock assessment and a species-specific analysis of observer data provide some insight into current abundance levels of the species.

In the eastern North Pacific, the NMFS SWFSC conducted the only species-specific stock assessment of the common thresher shark to date, which incorporates data from the United States and Mexico for the period 1969–2014. The U.S. fisheries included the swordfish/shark drift gillnet, recreational, nearshore setnet and small-mesh drift gillnet, and miscellaneous fisheries. The Mexican fisheries included the swordfish/shark drift gillnet, pelagic longline, and artisanal (panga) fisheries. This assessment incorporated fisheries-dependent data (including estimated removals, size compositions, indices of relative abundance, and conditional age-at-length) as well as fisheries-independent data (*e.g.,* size compositions and a relative abundance index for juvenile common thresher sharks). The results of this stock assessment indicate that the common thresher shark stock along the West Coast of North America (including Mexico and Canada) experienced a large decline (>70 percent) in spawning output with the advent of the drift gillnet fishery in the late 1970s; however, the decline was arrested in the mid-1980s with a series of regulations restricting the fishery and the stock has recovered gradually over time. In fact, the spawning output in 2014 was estimated to be 94.4 percent of its unexploited level. Therefore, the stock is not likely in an overfished condition or experiencing overfishing at this time (Teo *et al.,* in prep). The ERA team accepted the results of this stock assessment and concluded that common thresher shark abundance is likely increasing in this portion of its range.

In the Northwest Atlantic, several studies have been conducted to determine trends in abundance of various shark species, including the common thresher shark. In the Northwest Atlantic longline fisheries, thresher sharks (both common and bigeye threshers) are typically recorded at the genus level by observers as well as in logbooks, with the bigeye thresher shark typically dominant in the catches. Baum *et al.* (2003) analyzed logbook data for the U.S. pelagic longline fleets targeting swordfish and tunas, and reported an 80 percent decline in relative abundance for thresher sharks (common and bigeye threshers combined) from 1986 to 2000. However, these results were challenged (see discussions in Burgess *et al.* 2005a and Burgess *et al.* 2005b) on the basis of whether correct inferences were made regarding the magnitude of shark population declines in the Atlantic. In a more recent re-analysis of the same logbook dataset using a similar methodology, Cortés *et al.* (2007) reported an overall 63 percent decline from 1986–2005, and a 50 percent decline from 1992–2005. In contrast, the analysis of the observer dataset from the same fishery resulted in an opposite trend to that of the logbook analysis, with a 28 percent increase in abundance for the same period of 1992–2005 (Cortés *et al.,* 2010). Baum and

Blanchard (2010) also analyzed observer data from 1992–2005 and reported no change in the population trend over the time period, concluding that individual year estimates for thresher sharks suggest that the population potentially stabilized. It should be noted that while the sample size in the latter observer analysis was very small (n = 14–84) compared to that in the logbook analysis (n = 112–1292) (Kyne *et al.,* 2012), observer data are generally regarded as more reliable than logbook data for non-target shark species (Walsh *et al.,* 2002). As such, and using a similar approach as Cortés *et al.* (2007), the ERA team analyzed the most recent species-specific observer data for the common thresher shark from 1992–2013, and found no obvious change in the population trend over time, indicating that the population in the Northwest Atlantic Ocean has stabilized.

In other areas of the common thresher shark range, species-specific abundance data are absent, rare, or presented as a thresher complex. In the Northeast Atlantic and Mediterranean, only one study provided a time-series analysis of fishery data specific to common thresher sharks (Ferretti *et al.,* 2008). The study, which compiled 9 time series of abundance indices from commercial and recreational fishery landings, scientific surveys, and sighting records, used generalized linear models to extract instantaneous rates of change from each data set, and conducted a meta-analysis to compare population trends. Results of this study indicate that common thresher abundance in this area decreased by 96–99 percent over the last two centuries. Most of the other scientific information that we and the ERA team reviewed presented data on other species of threshers or a thresher complex (see Young *et al.,* 2015). For example, one study compared estimates of body mass and indices of abundance and biomass derived from data collected in recent years by observers on commercial longliners in the tropical Pacific with those from a scientific survey conducted in the same general region in the early 1950s (Ward and Myers, 2005). This study estimated a decline in combined thresher abundance (all three *Alopias* spp.) of 83 percent, with a decline in biomass to approximately 5 percent of virgin levels and significant reductions in mean body mass. Mean body mass (kg) also declined by nearly 30 percent (from 17 kg to 12 kg). However, in addition to the fact that this study does not present data for any particular thresher species, the ERA team identified several caveats of this study, including variation in locations between surveys and differences in data sources (*e.g.,* fishery-independent data vs. fishery-dependent data), and seriously questioned the conclusions regarding the magnitude of thresher abundance decline. Further, to use a thresher complex or other thresher species as a proxy for common thresher abundance is erroneous because of the differences in their distributions and life history, as well as the proportions they make up in commercial catches. When identified to species level, common thresher sharks do not appear to be a significant part of the direct or incidental shark catch throughout most of their range (*e.g.,* Western and Central Pacific Ocean, Indian Ocean, South Atlantic). In fact, some evidence suggests that this species may be naturally rare in fisheries throughout the tropical Western and Central Pacific and Indian Oceans due to its more coastal and temperate distribution. This is evidenced by the species' rarity in fisheries data as well as information (albeit limited) from genetic studies of shark fins throughout these regions. As such, the common thresher's predominantly coastal and temperate distribution may buffer the species from exposure to high levels of industrial high-seas fishing pressure in a large portion of its range that could reduce its abundance. Finally, in most areas showing overall declines in Alopiids, the declines are not attributed to common threshers, with the exception of the Mediterranean.

Based on the very limited abundance information available, from both fishery-independent and -dependent surveys, and its general rarity in fisheries catch in a large portion of its range, the ERA team concluded that the common thresher shark has likely declined from historical numbers as a result of fishing mortality; however, based on the best available information, current common thresher abundance is either stable, recovered, or shows no clear trend for most areas. While the level of decline in the Mediterranean is concerning, the ERA team concluded, and we agree, that the Mediterranean represents a small portion of the common thresher shark's global range and likely does not affect the global population, particularly given the lack of evidence for trans-Atlantic migrations from the Mediterranean to other portions of the species' range. Therefore, we conclude that there is no evidence to suggest that the species is at a high risk of extinction throughout its range, now or in the foreseeable future, due to environmental variation, anthropogenic perturbations, or depensatory processes based on its current abundance levels.

Growth Rate/Productivity

Similar to abundance, the ERA team expressed some concern regarding the effect of the common thresher shark's growth rate and productivity on its risk of extinction. Sharks, in general, have lower reproductive and growth rates compared to bony fishes; however, common thresher sharks exhibit life-history traits and population parameters that are intermediary among other shark species. As previously noted, common thresher shark productivity, determined as intrinsic rate of population increase (*r*), has been estimated at 0.121 per year (Cortés *et al.,* 2012). The species' demographic parameters place it towards the moderate to faster growing sharks along a ''fast-slow'' continuum of population parameters that have been calculated for 38 species of sharks by Cortés (2002, Appendix 2). In fact, a number of studies have shown common thresher sharks to be among the most productive species of sharks. For example, a recent study found that common thresher sharks ranked among the highest in productivity when compared with other pelagic shark species (ranking 9 out of 26 overall) in terms of its egg production, rebound potential, potential for population increase, and stochastic growth rate (Chapple and Botsford, 2013). However, primarily based on the fact that most species of elasmobranchs require many years to mature, and have relatively low fecundity compared to teleosts (bony fishes), these life history characteristics could pose a risk to this species in combination with threats that reduce its abundance.

Spatial Structure/Connectivity

The ERA team did not identify habitat structure or connectivity as a potential risk to the common thresher shark. Habitat characteristics that are important to the common thresher shark are largely unknown, as are nursery areas. The common thresher is a relatively widespread species, with multiple stocks in the Pacific, Indian, and Atlantic oceans. The population exchange between these stocks is unknown but probably low, so loss of a single stock would not constitute a risk to the entire species. Additionally, there is currently no evidence of female philopatry, 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. Finally, 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, the ERA team concluded, and we agree, that there is insufficient information to support the conclusion that spatial structure and connectivity pose significant risks to this species' continued existence.

Diversity

The ERA team concluded that the current level of information regarding the common thresher's diversity is either unavailable or unknown, such that the contribution of this factor to the extinction risk of the species cannot be determined at this time. There is no evidence that the species is at risk due to a substantial change or loss of variation in genetic characteristics or gene flow among populations. This species is found in a broad range of habitats and appears to be well-adapted and opportunistic. Additionally, there are no restrictions to the species' ability to disperse and contribute to gene flow throughout its range, nor is there evidence of a substantial change or loss of variation in life-history traits, population demography, morphology, behavior, or genetic characteristics. Based on this information, the ERA team concluded, and we agree, that there is insufficient information to support the conclusion that diversity poses significant risks to this species' continued existence.

Summary of Factors Affecting the Common Thresher 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 common thresher shark population. This section briefly summarizes the ERA team's findings and our conclusions regarding threats to the common thresher shark. More details can be found in the status review report (Young *et al.,* 2015).

The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range

The ERA team did not identify habitat destruction as a potential threat to the common thresher shark. As described earlier (see *Species Description—Habitat Use and Movement* section), the common thresher shark is found worldwide, and resides in coastal temperate and tropical seas, with a noted tolerance for colder waters. Common thresher sharks are both coastal, ranging over continental and insular shelves, and epipelagic, ranging far from land, though they are most abundant near land approximately 40–50 nautical miles (nmi; 74–93 km) from shore (Strasburg, 1958; Bedford, 1992). However, little else is known regarding specific habitat preferences or characteristics.

In the U.S. exclusive economic zone (EEZ), the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq.*) requires NMFS to identify and describe essential fish habitat (EFH) in fishery management plans (FMPs), minimize the adverse effects of fishing on EFH, and identify actions to encourage the conservation and enhancement of EFH. To that end, NMFS has funded two cooperative survey programs intended to help delineate shark nursery habitats in the Atlantic and Gulf of Mexico. The Cooperative Atlantic States Shark Pupping and Nursery Survey and the Cooperative Gulf of Mexico States Shark Pupping and Nursery Survey are designed to assess the geographical and seasonal extent of shark nursery habitat, determine which shark species use these areas, and gauge the relative importance of these coastal habitats for use in EFH determinations. For the common thresher, results from the surveys indicate the importance of coastal waters off the East Coast of the Atlantic, from Maine to the Florida Keys, areas scattered in the Gulf of Mexico from the southern coast of Florida to Texas, and areas south and southwest of Puerto Rico (NMFS, 2009). As a side note, insufficient data are available to differentiate EFH by size classes in the Atlantic; therefore, EFH is the same for all life stages. Since common thresher shark EFH is defined as the water column or attributes of the water column, NMFS determined that there are minimal or no cumulative anticipated impacts to the EFH from gear used in U.S. Highly Migratory Species (HMS) and non-HMS fisheries, basing its finding on an examination of published literature and anecdotal evidence (NMFS, 2006).

On the U.S. West Coast, common thresher pups are found in near-shore waters of the Southern California Bight. Essential fish habitat is described for three age classes in this area: Neonate/early juveniles, late juveniles/subadults, and adults. For neonate/early juveniles (<102 cm FL), EFH includes epipelagic, neritic and oceanic waters off beaches, in shallow bays, in near surface waters from the U.S.-Mexico EEZ border north to off Santa Cruz, over bottom depths of 6 to 400 fathoms (fm; 11–732 m), particularly in water less than 100 fm (183 m) deep and to a lesser extent farther offshore between 200–300 fm (366–549 m). For late juveniles/subadults (>101 cm FL and <167 cm FL), EFH is described as epipelagic, neritic and oceanic waters off beaches and open coast bays and offshore, in near-surface waters from the U.S.-Mexico EEZ border north to off Pigeon Point, California, from the 6 to 1,400 fm (11–2,560 m) isobaths. For adults (>166 cm FL), EFH is described as epipelagic, neritic and oceanic waters off beaches and open coast bays, in near surface waters from the U.S.-Mexico EEZ border north seasonally to Cape Flattery, WA, from the 40 fm (73 m) isobath westward to approximately north of the Mendocino Escarpment and from the 40 to 1,900 fm (73–3,474 m) isobaths south of the Mendocino Escarpment. In the U.S. Western Pacific, including Hawaii, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands, EFH for common thresher sharks is broadly defined as the water column down to a depth of 1,000 m (547 fm) from the shoreline to the outer limit of the EEZ (WPFMC, 2009).

Common thresher shark habitat in other parts of its range is assumed to be similar to that in the Northwest Atlantic and Gulf of Mexico, comprised of open ocean environments occurring over broad geographic ranges and characterized primarily by the water column attributes. As such, large-scale impacts, such as global climate change, that affect ocean temperatures, currents, and potentially food chain dynamics, may pose a threat to this species. Studies on the impacts of climate change specific to thresher sharks have not been conducted; however, there are a couple of studies on other pelagic shark species that occur in the range of the common thresher shark. For example, Chin *et al.* (2010) conducted an integrated risk assessment for climate change to assess the vulnerability of pelagic sharks, as well as a number of other chondrichthyan species, to climate change on the Great Barrier Reef (GBR). The assessment examined individual species but also lumped species together in ecological groups (such as freshwater and estuarine, coastal and inshore, reef, shelf, etc.) to determine which groups may be most vulnerable to climate change. The assessment took into account the *in situ* changes and effects that are predicted to occur over the next 100 years in the GBR and assessed each species' exposure, sensitivity, and adaptive capacity to a number of climate change factors including: water and air temperature, ocean acidification, freshwater input, ocean circulation, sea level rise, severe weather, light, and ultraviolet radiation. Of the 133 GBR shark and ray species, the assessment identified 30 as being moderately or highly vulnerable to climate change. The pelagic shark species included in the assessment, however, were not among these species. In fact, the pelagic shark group was ranked as having a low overall vulnerability to climate change, with low vulnerability to each of the assessed climate change factors. In another study on potential effects of climate change to sharks, Hazen *et al.* (2012) used data derived from an electronic tagging project (Tagging of Pacific Predators Project) and output from a climate change model to predict habitat and diversity shifts in top marine predators in the Pacific out to the year 2100. Results of the study showed significant differences in habitat change among species groups, which resulted in species-specific ''winners'' and ''losers.'' The shark guild as a whole had the greatest risk of pelagic habitat loss. However, the model predictions in Hazen *et al.* (2012) and the vulnerability assessment in Chin *et al.* (2010) represent only two very broad analyses of how climate change may affect pelagic sharks, and do not account for factors such as species interactions, food web dynamics, and fine-scale habitat use patterns that need to be considered to more comprehensively assess the effects of climate change on the pelagic ecosystem. Further, results of these studies are not specific to thresher sharks, and finally, the complexity of ecosystem processes and interactions complicate the interpretation of modeled climate change predictions and the potential impacts on populations. Thus, the potential effects of climate change on common thresher sharks and their habitat are highly uncertain.

Overall, the common thresher shark is highly mobile throughout its range, and although very little information is known on habitat use or pupping and nursery areas, there is no evidence to suggest its access to suitable habitat is restricted. The ERA team noted that common threshers are not reliant on estuarine habitats, which are thought to be one of the most vulnerable habitat types to climate change. Additionally, common threshers are likely more confined by temperature and prey distributions than a particular habitat type. The highly migratory nature of the common thresher shark gives it the ability to shift its range or distribution to remain in an environment conducive to its physiological and ecological needs. Therefore, while effects from climate change have the potential to pose a threat to sharks in general, including habitat changes (*e.g.,* changes in currents and ocean circulation) and potential impacts to prey species, species-specific impacts to common threshers and their habitat are currently unknown, but likely minimal. Overall, it is very unlikely that the loss or degradation of any particular habitat type would have a substantial effect on the common thresher population. Thus, based on the best available information, we conclude that current evidence does not indicate that there exists a present or threatened destruction, modification, or curtailment of the common thresher shark's habitat or range.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The common thresher shark is considered desirable for human consumption and a highly prized game fish; thus, it is a valuable bycatch and target species, which increases its susceptibility to being overfished. The ERA team assessed three different factors that may contribute to the overutilization of the common thresher shark: Bycatch in commercial fisheries (including at-vessel and post-release mortality rates), targeting in recreational fisheries, and the global shark trade (including the trade of both common thresher fins and meat). Common thresher sharks are caught as bycatch in many global fisheries, including bottom and pelagic longline fisheries, purse seine fisheries, coastal gillnet fisheries, and artisanal fisheries. As a primarily coastal and temperate species, the common thresher shark is relatively rare in catches of tropical fisheries, particularly in the Western and Central Pacific and Indian Oceans. They are also rare in catches of fisheries operating in the South Atlantic. Though it is generally not a target species in commercial fisheries, it is valued for both its meat and fins, and is therefore valued as incidental catch for the international shark trade (Clarke *et al.,* 2006a; Dent and Clarke, 2015).

As noted previously in the *Evaluation of Demographic Risks—Abundance* section, there is very little information on the historical abundance, catch, and trends of common thresher sharks, with the exception of U.S. data from the Northeast Pacific and Northwest Atlantic. The species is only occasionally mentioned in fisheries records from the Western and Central Pacific and Indian Oceans, and is considered rare in fisheries of the South Atlantic. Although more countries and regional fisheries management organizations (RFMOs) are working towards better reporting of fish catches down to species level, catches of common threshers have gone and continue to go unrecorded in many countries. Additionally, many catch records that do include thresher sharks do not differentiate between the *Alopias* species or shark species in general, and if they do, they are often plagued by species misidentifications. These numbers are also likely under-reported in catch records, as many records do not account for discards (*e.g.,* where the fins are kept but the carcass is discarded) or reflect dressed weights instead of live weights. Thus, the lack of catch data for common thresher sharks makes it difficult to estimate rates of fishing mortality or conduct detailed quantitative analyses of the effects of fishing on common thresher populations.

In the eastern North Pacific, common thresher sharks were historically targeted and caught in the California drift gillnet swordfish/pelagic shark fishery beginning in the late 1970s. The California fishery for common threshers peaked in 1982 with estimated landings of approximately 1,800 mt, and then sharply declined in 1986, when all subadults were virtually eliminated from the population due to overfishing (Camhi *et al.,* 2009; Goldman, 2009). As a result, the common thresher population experienced a significant historical decline, with approximately 77 percent of the spawning potential relative to the unfished stock removed by fishing during that period. Catch-per-unit-effort (CPUE) also declined during this time period. By 1990, the fishery shifted to a swordfish fishery primarily due to economic drivers, but also to protect pupping female thresher sharks (PFMC, 2003), with a series of regulations restricting the time-areas allowed for fishing, gear configurations, and bycatch limitations. Commercial landings from the U.S. West Coast swordfish/shark drift gillnet fishery declined from 1,800 mt in the early 1980s to approximately 10 mt by 18 vessels in 2014. From 2004–2014, annual U.S. commercial landings averaged around 115 mt (PFMC, 2015), which is below the current established sustainable and precautionary harvest level of 340 mt and well below the current maximum sustainable yield (MSY) of the species (*i.e.,* 806 mt).

Overall, the California drift gill net fishery serves as a well-documented case of marked population depletion of a small, localized stock of common thresher shark over a short time period (less than a decade) followed by a gradual recovery after the implementation of regulatory measures. Based on the recent stock assessment results of Teo *et al.* (in prep), the common thresher stock along the West Coast of North America is not considered overfished and overfishing is not occurring. In fact, the eastern North Pacific stock of common thresher has recovered to approximately 94 percent of its pre-fished levels.

In other areas of the Eastern Pacific, the level of utilization of common thresher is unclear. Common threshers are taken in artisanal, pelagic longline and gillnet fisheries targeting pelagic sharks off Mexico's Pacific Coast (Sosa-Nishizaki *et al.,* 2008); however, the recent stock assessment for the eastern North Pacific stock of common thresher (described above) includes removals from these Mexican fisheries, and deemed these removal levels as sustainable (Teo *et al.,* in prep). Farther south, the common thresher shark is reportedly caught in longline and gillnet fisheries in Peru and has been reported as the sixth most important commercial shark species in Peruvian fisheries, representing 6 percent of total shark landings (Romero Camarena and Bustamante Ruiz, 2007; Gonzalez-Pestana *et al.,* 2014). However, it is highly likely that these records were misidentified pelagic thresher sharks, as a recent genetic study focused on landings of the small-scale Peruvian shark fishery discovered a long-term misidentification between common and pelagic thresher sharks at landing points (Velez-Zuazo *et al.,* 2015). Although the common thresher is the only species listed in official Peruvian landing reports, all samples in the aforementioned study labeled as thresher shark corresponded to pelagic thresher shark (n = 12), indicating that landing reports in Peru may be pooled for all *Alopias* species, (Velez-Zuazo *et al.,* 2015) with the majority possibly comprised of pelagic threshers. Reports of common thresher shark landings are uncommon in Costa Rica and Ecuador. According to observer data recorded on Costa Rican longline vessels, a total of only 23 common thresher sharks were caught from 1999–2010 (Dapp *et al.,* 2013). Additionally, while both pelagic and bigeye thresher sharks are listed as commonly caught species in Ecuadorian waters, the common thresher is not listed, and pelagic threshers are the dominant thresher species in thresher shark landings (Jacquet *et al.,* 2008; Reardon *et al.,* 2009; Martinez-Ortiz *et al.,* 2015). Thus, the common thresher shark is seemingly rare in tropical fisheries of the Eastern Pacific, likely due to its more temperate distribution.

In the Western and Central Pacific Ocean, all three thresher shark species interact with longline fisheries, with recent catch estimates from 1992–2009 indicating that the genus *Alopias* comprises approximately 3 percent of the total shark catch (Clarke, 2014). However, most of the available fisheries data from the Western and Central Pacific are for the thresher complex (all three *Alopias* spp.). While records of bigeye and pelagic threshers are recorded in the catches of fisheries operating in this region, albeit very under-reported, very little information is available on catches of common thresher shark. Both historical observations and the best available current information indicate that common threshers are relatively rare in this region, as they are not frequently encountered in tropical fisheries due to their distribution in more coastal and temperate waters. This is evidenced by the lack of catch and genetic records of common thresher sharks in areas of high fishing effort, which is seemingly concentrated in more tropical waters. For example, in the Republic of the Marshall Islands (RMI), while both pelagic and bigeye threshers are two of only five species that comprise 80 percent of the total annual shark catch, the common thresher is observed in substantially lower numbers; only 87 common threshers were taken in RMI longline fisheries from 2005–2009, compared to 1,636 bigeye thresher sharks, and 1,353 pelagic thresher sharks (Bromhead *et al.,* 2012). Likewise, common thresher occurrence in Hawaiian pelagic longline fisheries in the Central Pacific is considered uncommon, while the bigeye thresher is considered the dominant thresher species encountered. For example, Hawaii observer data from 1995–2006 indicated a low catch of common thresher sharks (only 7 individuals identified as *A. vulpinus* and 1,246 individuals for the combined category of *A. vulpinus/A. pelagicus* on 26,507 sets total (4.7 percent of total sets), both fishery sectors combined) (Young *et al.,* 2015).

Further, in several analyses of fisheries data from the Western and Central Pacific (based on data holdings of the Secretariat of the Pacific Community (SPC)) common thresher sharks were characterized as ''rare'' or ''not frequently encountered'' with the exception of the more temperate waters of Australia and New Zealand. For example, in analyses of Japanese longline data, where thresher sharks comprise approximately 3.44 percent of the total shark catch, the bigeye thresher was the dominant thresher species encountered. In order to determine the stock status of key shark species in the Western and Central Pacific Ocean (including thresher sharks) Clarke *et al.* (2011) conducted an indicator analysis by examining data holdings from the Secretariat of the Pacific Community-Oceanic Fisheries Programme (SPC–OFP) for sharks taken in longline and purse seine fisheries. In summary, the indicator analysis showed that the three thresher species have divergent, but not necessarily distinct, distributions and interact with longline fisheries throughout the Western and Central Pacific Ocean. Threshers comprise a notable portion of the longline catch only in one particular region of the Central Pacific (just south of Hawaii), and mainly in deep sets. While catch rate analysis produced no clear trends for the group as a whole, decreasing size trends were identified in tropical regions; however, the authors determined that these trends were most likely reflective of trends in bigeye thresher rather than common or pelagic threshers. Finally, the most recent analysis to date of standardized longline CPUE data shows a decline for the thresher shark complex in recent years in the region (Rice *et al.,* 2015), and when combined with decreasing size trends, likely indicates some level of population decline of the thresher complex in this area. However, based on catch data and the differing distributions between the thresher species, the ERA team concluded, and we agree, that it is more likely these trends largely reflect those of bigeye thresher rather than the common thresher.

As mentioned previously, common thresher sharks are more prevalent in temperate waters, and are more commonly encountered in Australian and New Zealand fisheries. Common thresher sharks are caught in a number of fisheries operating off the eastern and western coasts of Australia, including the Eastern Tuna and Billfish Fishery (ETBF), Southern and Eastern Scale Fish and Shark Fishery (SESSF) and the Western Tuna and Billfish Fishery (WTBF). A number of risk assessments have been conducted for these fisheries, in which the common thresher received various scores based on its productivity, susceptibility, and encounterability. However, although these risk assessments are informative, without any corresponding catch and effort data, it is difficult to discern what the status of the common thresher shark is in Australian waters. In New Zealand, the common thresher is reported as bycatch in New Zealand's surface longline fishery. According to observer data, an estimated 1,304 thresher sharks were caught as bycatch in the New Zealand longline fishery from 2006–2009. In 2009, only 37.5 percent of threshers were retained, with the remaining 62.5 percent released alive. Additionally, a large reduction in longline effort has occurred since 2004. We could not find any additional information regarding temporal abundance trends in this fishery, but according to the New Zealand Fisheries Department, bycatch numbers are considered stable at this time (New Zealand Ministry of Fisheries, 2015).

In the Northwest Atlantic, common threshers are taken predominantly in the U.S. pelagic longline (PLL) fishery. Based on the best available data, the common thresher population size has likely declined in this region due to historical exploitation of the species (see *Abundance* section; Baum *et al.* (2003), Cortés (2007)). However, as previously described, these data are largely based on fisheries logbooks and are not species-specific, with the bigeye thresher representing the majority of the catch. Since 2006 (the last year of the fisheries data from the Baum *et al.* (2003) and Cortés (2007) papers), the trend is unclear, with some evidence that the population has actually stabilized (Baum and Blanchard, 2010). In order to discern abundance trends specific to the common thresher, the ERA team conducted a species-specific analysis using standardized abundance indices derived from U.S. PLL fishery observer data. Results of this analysis show that the common thresher shark population in this region has likely stabilized since 1990. Reported landings for common thresher in the Northwest Atlantic have also remained stable in recent years at approximately 21 mt. This indicates that current levels of catch and bycatch and associated mortality may be sustainable in this portion of the species' range. There is still uncertainty and the problem could get worse if longline fishing effort were to increase; however, the stabilization of thresher shark populations in the 1990s coincided with the first Federal Fishery Management Plan for Sharks in the Northwest Atlantic Ocean and Gulf of Mexico, which includes regulations on trip limits and quotas (see *Factor D—Inadequacy of Existing Regulatory Mechanisms* for more details). Therefore, under current management measures, the ERA team concluded that overutilization is not currently occurring in this portion of the common thresher's range to the point that it significantly contributes to the species' global risk of extinction, now or in the foreseeable future.

In the Northeast Atlantic and Mediterranean, fisheries data for thresher shark landings are scarce and unreliable because they are reported irregularly and variably, and it is likely that the two thresher species (*A. vulpinus* and *A. superciliosus*) are mixed in the records (ICES, 2014). Though both adult and juvenile common threshers have been reported as bycatch in all fishing gears used in the Mediterranean basin, including longline, purse seine, trawl, driftnet, trammel net, gillnet, fish traps, and mid-water fisheries, they are caught mainly in longline fisheries for tunas and swordfish. The main landing nations of thresher sharks in the Northeast Atlantic and Mediterranean are Portugal, Spain and France. As discussed earlier in the *Demographic Assessment—Abundance* section, only one study is available to suggest that common thresher sharks have declined between an estimated 96 and 99 percent in abundance and biomass in the Mediterranean Sea over the past two centuries (Ferretti *et al.,* 2008). Data from this region suggest that both annual catches and mean weights of common thresher shark have fallen significantly as a result of fishing mortality. For example, a significant population reduction has been observed in Tunisian waters, with small-scale fisheries now targeting neonates. Recent investigations also show common thresher sharks are being increasingly targeted in the Alboran Sea by the illegal large-scale swordfish driftnet fleet based primarily in Morocco. Of concern is the fact that the Alboran Sea has been identified as a potential nursery area for common threshers, as aggregations of gravid females have been observed in this area (Moreno and Moron, 1992; Tudela *et al.,* 2005). The intensive fishing pressure and potential targeting of common thresher sharks by the swordfish driftnet fleet in the Alboran Sea has the potential to significantly impact the local population of common threshers in the area, as well as affect recruitment into the local population. However, landings of thresher shark reported to International Commission for the Conservation of Atlantic Tunas (ICCAT) by the European Union (EU) have declined significantly in recent years, which may be the result of recent regulations enacted by Spain, a top thresher catching country, that prohibit the retention and sale of all thresher species (including the common thresher shark). As previously mentioned, although the level of utilization and potential population decline of common thresher shark in the Mediterranean is concerning, the ERA team concluded, and we agree, that the Mediterranean is a small portion of the common thresher shark's global range and likely does not affect the global population. In fact, despite the reported declines, the common thresher is still considered one of the most common bycatch species in some fisheries operating in this region.

In the Southwest Atlantic, there is little information on the catch rates or trends of thresher sharks. Some countries still fail to collect shark data while others collect it but fail to report (Frédou *et al.,* 2015). Thresher sharks are taken as bycatch in various fisheries, including Cuban, Brazilian, Uruguayan, Taiwanese, Japanese, Venezuelan, and Portuguese longline fisheries. However, based on the best available information, catches of common thresher sharks are relatively rare in the South Atlantic. For example, from 1994–2000, the common thresher shark represented only 1.6 percent of the total shark catch in the Venezuelan pelagic longline fishery. Likewise, although the common thresher has been reported in catches of Brazilian Santos longline fishery, the species is characterized as ''occasional,'' with almost 100 percent of thresher catch in Brazil represented by the bigeye thresher. In Uruguayan longline fisheries, common thresher CPUE was low from 2001–2005 (ranging from 0.13 in 2002 to 0.004 in 2005); however, these low CPUE values were directly related to the spatial distribution of effort in areas where the occurrence of common thresher is naturally lower (Berrondo *et al.,* 2007). Additionally, no real trend could be discerned from this dataset. As such, the ERA team concluded, and we agree, that the common thresher is likely naturally rare in this portion of its range given its more temperate distribution and rarity in catches of longline fisheries operations in this region. Thus, we conclude that overutilization as a result of fishing mortality is not likely occurring in the Southwest Atlantic such that it places the species at an increased risk of extinction throughout its global range, now or in the foreseeable future.

In an effort to evaluate the vulnerability of specific shark stocks to pelagic longline fisheries in the Atlantic Ocean, Cortés *et al.* (2012) conducted an Ecological Risk Assessment using observer information collected from a number of fleets operating under ICCAT (which is the RFMO responsible for the conservation of tunas and tuna-like species in the Atlantic Ocean and its adjacent seas). Ecological Risk Assessments are popular modeling tools that take into account a stock's biological productivity (evaluated based on life history characteristics) and susceptibility to a fishery (evaluated based on availability of the species within the fishery's area of operation, encounterability, post capture mortality and selectivity of the gear) in order to determine its overall vulnerability to overexploitation (Cortés *et al.,* 2012). Ecological Risk Assessment models are useful because they can be conducted on a qualitative, semi-quantitative, or quantitative level, depending on the type of data available for input. Results from the Cortés *et al.* (2012) Ecological Risk Assessment indicate that common thresher sharks face a relatively low risk in ICCAT fisheries. Out of the 20 assessed shark stocks, common thresher sharks ranked 9th in terms of their susceptibility to pelagic longline fisheries in the Atlantic Ocean. The population's estimated productivity value (r = 0.121) ranked 8th; however, this was based on older life history information and recent data suggest common thresher sharks are slightly less productive. Overall vulnerability ranking scores (using three different calculation methods, and ranked on a scale of 1 to 20 where 1 = highest risk) ranged from 9 to 14, indicating that common thresher sharks have moderately low vulnerability and face a relatively low risk to overexploitation by ICCAT pelagic longline fisheries (Cortés *et al.,* 2012).

There are currently no quantitative stock assessments or basic fishery indicators available for common thresher sharks or even thresher sharks in general in the Indian Ocean. Thus, the level of common thresher shark utilization in this region is highly uncertain. Both common and bigeye thresher sharks have been reported as bycatch in Indian Ocean longline and gillnet fisheries, with thresher sharks as a genus comprising an estimated 16 percent of the total shark catch in the Indian Ocean, and having reportedly high hooking mortality (Murua *et al.* 2012; IOTC, 2014). However, results from an Ecological Risk Assessment that examined the impact of longline fisheries of the Indian Ocean on sharks indicate that common thresher sharks face a low risk; in fact, common threshers were ranked as the least vulnerable out of a total of 16 pelagic shark species (based on their relatively high productivity and lower susceptibility scores) (Murua *et al.,* 2012). We could not find any studies on the trends in abundance or catch rates of common threshers in the Indian Ocean, making it difficult to determine the level of exploitation of these species within the ocean basin. In fact, we could only find one study from India that reported CPUE rates over time for sharks in general. In the Andaman and Nicobar region, where catch of common thresher is reportedly most prevalent, total shark CPUE declined sharply (approximately 81 percent) from peak CPUE in years 1992–1993 to years 1996–1997 (John and Varghese, 2009). However, the lack of species-specific CPUE information for common thresher sharks, or even genus-level information for thresher sharks, makes it difficult to evaluate the potential changes in abundance for the species in this region based on John and Varghese (2009) alone. In addition, given that common thresher sharks are more commonly found in temperate waters, and the prevalence of pelagic threshers in the catch of Indonesian fisheries fishing in nearby waters, the reported *A. vulpinus* catch may be misidentified pelagic thresher sharks. Although the Indian Ocean Tuna Commission (IOTC) reports that catches and associated mortality of thresher sharks are high in the Indian Ocean, the available data do not show extensive utilization of common thresher shark by these fisheries relative to other shark species, or even other thresher species. In fact, a recent working paper from the IOTC suggests that common threshers may not even occur in the equatorial and northern tropical Indian Ocean, and previous observations of this species are likely misidentifications (Romanov, 2015). Thus, we conclude that the common thresher's distribution likely buffers it from significant impacts as a result of fishing mortality in this part of its range, where fishing pressure and inadequate regulatory measures may be more problematic. We noted that this threat may also be tempered by the species' relatively low vulnerability to high seas fisheries due to its wide range and relatively high productivity for a pelagic shark species.

In addition to overutilization in commercial fisheries, the ERA team also assessed whether recreational fisheries could be a threat driving overutilization of the common thresher shark. Common thresher sharks are highly prized game fish in recreational fisheries due to their large size and fighting abilities. Information regarding recreational fisheries data for common threshers is severely lacking, with the exception of the United States, where common threshers are popular in both East and West Coast recreational fisheries. In particular, the common thresher shark is the focus of a popular southern California recreational fishery that targets individuals using multiple fishing gears and techniques. Of concern are the high post-release mortality rates reported for common threshers after being foul-hooked in the tail and hauled in backwards. Because the common thresher shark is an obligate ram-ventilator, which means it requires forward motion to ventilate the gills, the reduced ability to extract oxygen from the water during capture, as well as the stress induced from these capture methods, may influence recovery following release. In fact, results from Heberer (2010) revealed that large tail-hooked common thresher sharks with prolonged fight times (≥85 min) experienced 100 percent mortality. However, the recent stock assessment for the eastern North Pacific common thresher population includes removals from this recreational fishery, and shows that the current amount of recreational fishing pressure and associated post-release mortality is sustainable. In the Northwest Atlantic, common thresher sharks have increased in popularity in U.S. shark fishing tournaments in recent years. For example, an estimated 17,834 common thresher sharks were caught in the rod and reel fishery in the U.S. Northwest Atlantic from 2004–2013, with approximately 70 percent retained. In order to glean information on the relative abundance of common thresher sharks in the Northwest Atlantic using recreational fisheries data, the ERA team analyzed data collected by the NMFS Northeast Fisheries Science Center (NEFSC) at five recreational fishing tournaments from 1978 through 2014. These shark tournament data from the Northwest Atlantic (including several tournaments in New York and New Jersey), accounting for changes in effort, show a fairly stable trend in relative abundance through the 1990s followed by an increasing trend through the end of the time series. The ERA team acknowledged that due to the high quality of the meat, the majority of common threshers caught in recreational fisheries are kept, but these numbers are likely minor, especially compared to commercial catches. With most species retained, high post-release mortality rates seen in the southern California recreational fisheries are irrelevant in the Northwest Atlantic. Further, fishing techniques between southern California and the Northwest Atlantic are typically different, resulting in mostly mouth-hooked and higher survivorship of thresher sharks in the Atlantic, compared to mostly tail-hooked thresher sharks and lower survivorship in California (Pers. comm. NMFS Fisheries Statistics Division, 2015).

Finally, the ERA team also assessed whether the shark trade could be a threat driving overutilization of the common thresher shark. Based on Hong Kong fin trade auction data from 1999–2001 and fin weights and genetic information, Clarke *et al.* (2006b) estimated that up to 4 million thresher sharks (all three *Alopias* spp.) (range: 2–4 million), with an equivalent biomass of around 60,000 mt, are traded annually. Thresher sharks as a genus comprised approximately 2.3 percent of the total fins traded annually in the Hong Kong market (Clarke *et al.,* 2006a). The lack of estimates of the global, or even regional, population makes it difficult to put these numbers into perspective. As a result, the effect at this time of the removals (for the shark fin trade) on the ability of the overall population to survive is unknown. While the relative proportion of each thresher shark species comprising the shark fin trade is not available in this genus-level assessment by Clarke *et al.* (2006a), genetic testing conducted in some fish markets provides some (albeit limited) insight into the species-specific prevalence of threshers in the shark fin trade. Genetic sampling was conducted on shark fins collected from several fish markets throughout Indonesia, and revealed that five species (including pelagic and bigeye threshers) represented more than 50 percent of the total fins sampled (n = 582). Pelagic and bigeye threshers collectively represented nearly 15 percent of the total fins sampled; however, the common thresher was not detected in these samples (Sembiring *et al.,* 2015). Likewise, in Taiwan, which has recently surpassed Hong Kong as the world's largest fin-trading center (Dent and Clarke, 2015), common thresher sharks were not identified in 548 genetically tested meat samples from several markets (whereas pelagic and bigeye threshers were both identified as present). In yet another genetic barcoding study of fins from the United Arab Emirates, the fourth largest exporter in the world of raw dried shark fins to Hong Kong, the Alopiidae family represented 5.9 percent of the trade from Dubai (Jabado *et al.,* 2015); however, common threshers were once again not identified in the samples. In fact, we could only find one genetic study of fins, from Chile, in which common threshers were identified as present in very small numbers. Although it is uncertain whether these studies are representative of the entire market within each respective country, results of these genetic tests provide some information (albeit limited) that suggests the common thresher may not be as utilized in the fin trade as other shark species, or even its congeners, *A. pelagicus* and *A. superciliosus.* Additionally, it should be noted that historically, thresher sharks were not identified as ''preferred'' or ''first choice'' species for fins, with some traders considering thresher fins to be of low quality and value (Rose, 1996; FAO, 2002; Gilman *et al.,* 2007; Clarke, pers. comm., 2015). Furthermore, 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 Special Administrative Region (SAR), which has served as an indicator of the global trade for many years, rose by 10 percent in 2011 but 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). In contrast, 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. However, because the common thresher shark has historically been fully utilized for both its fins and meat when captured, it is unlikely that this shift in the shark trade would create new or increasing demand for the species. Additionally, thresher sharks in general tend to have relatively low survival rates on longlines (the main gear type catching them) as they are obligate ram ventilators (*i.e.,* they have to swim to survive). As a result, a change in market demand would not necessarily change the species' mortality rates in longline fisheries. Further, in cases where the species is alive upon capture, threshers are considered dangerous to handle onboard because of their large caudal fin. In fact, some fishermen will even cut and release marketable sharks, including threshers, unless they are dead or dying to minimize bodily injury during onboard handling (Gilman *et al.,* 2007; Clarke, 2011). Thus, based on the best available information, the ERA team concluded, and we agree, that the common thresher shark is likely not as prevalent in the shark fin trade relative to other shark species or even other thresher species. Likewise, the shark trade as a whole, including increasing demand for shark meat, is not likely a threat contributing to the overutilization of the species such that it faces a high risk of extinction throughout its global range, now or in the foreseeable future.

Overall, based on the best available information, the ERA team concluded that overutilization is not likely significantly contributing to the common thresher's risk of global extinction, now or in the foreseeable future. However, due to the paucity of available data, the ERA team acknowledged that there are some uncertainties in assessing the contribution of the threat of overutilization to the extinction risk of the common thresher shark. As results from the Cortés *et al.* (2012) and Murua *et al.* (2012) Ecological Risk Assessments demonstrated, the threat of overutilization of common thresher sharks may be tempered by the species' relatively low vulnerability to certain fisheries, a likely condition of their wide range, rare presence on common fishing grounds where fishing pressure is likely most concentrated, and their relatively high productivity. Given the above analysis and best available information, we do not find evidence that overutilization is a threat that is currently placing the species in danger of extinction throughout its global range, now or in the foreseeable future. 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. However, at this time, there is no evidence to suggest the species is at or near a level of abundance that places its current or future persistence in question due to overutilization.

Disease or Predation

The ERA team did not identify disease or predation as potential threats to the common thresher shark, as they could not find any evidence to suggest that either is presently contributing significantly to the species' risk of extinction. Common thresher sharks likely carry a range of parasites, including copepods and cestodes (Love and Moser, 1983). Specifically, nine species of copepods, genus *Nemesis,* parasitize thresher sharks. These parasites attach themselves to gill filaments and can cause tissue damage, which can then impair respiration in the segments of the gills (Benz and Adamson, 1999); however, there are no existing data to suggest these parasites are affecting common thresher shark abundance levels.

Predation is also not thought to be a factor influencing common thresher numbers. The most significant predator on thresher sharks is likely humans; however, a study from New Zealand documented predation of *A. vulpinus* by killer whales (Visser, 2005). In a 12-year period that documented 108 encounters with New Zealand killer whales, only three individuals of *A. vulpinus* were taken; thus, predation on *A. vulpinus* by killer whales is likely opportunistic and not a contributing factor to abundance levels of common threshers. It is likely that juvenile common thresher sharks experience predation by adult sharks; as a result, juveniles spend approximately the first 3 years of life in nursery areas until they attain a large enough size to avoid predation. The rate of juvenile predation and the subsequent impact on the status of common thresher sharks is unknown; however, because thresher sharks are born alive, and are already about 150 cm TL at birth, predation upon juvenile threshers is likely to be minimal (Calliet and Bedford, 1983).

Therefore, based on the best available information, the ERA team concluded, and we agree, that neither disease nor predation is currently placing the species in danger of extinction throughout its global range, now or in the foreseeable future.

Inadequacy of Existing Regulatory Mechanisms

The ERA team evaluated existing regulatory mechanisms to determine whether they may be inadequate to address threats to the common thresher shark. Existing regulatory mechanisms may include Federal, state, and international regulations for commercial and recreational fisheries, as well as the shark trade. Below is a brief description and evaluation of current and relevant domestic and international management measures that may affect the common thresher shark. More information on these domestic and international management measures can be found in the status review report (Young *et al.,* 2015) and other recent status reviews of other shark species (Miller *et al.,* 2013 and 2014).

In the U.S. Pacific, HMS fishery management is the responsibility of adjacent states and three regional management councils that were established by the Magnuson-Stevens Act: The Pacific Fishery Management Council (PFMC), the North Pacific Fishery Management Council (NPFMC), and the Western Pacific Fishery Management Council (WPFMC). On the U.S. West Coast, common thresher sharks are managed by the PFMC, under the Pacific HMS FMP, as well as the states of California, Oregon, and Washington. As a result of declining abundance, and because common threshers are considered vulnerable to overexploitation due to their low fecundity, long gestation periods, and relatively high age at maturation, the HMS FMP proposed a precautionary annual harvest guideline of 340 mt for common thresher sharks to prevent localized depletion. This guideline was implemented in 2004. Additionally, specific measures implemented for the California drift gillnet fishery for the purposes of protecting other species also help to protect common thresher sharks. Both participation and fishing effort (measured by the number of sets) have declined over the years, and industry representatives attribute the decline in vessel participation and annual effort to regulations implemented to protect marine mammals, endangered sea turtles, and seabirds. For example, in 2001, NMFS implemented two Pacific sea turtle conservation areas on the West Coast with seasonal drift gillnet restrictions to protect endangered leatherback and loggerhead turtles. In the larger of the two closures (which spans the EEZ north of Point Conception, California (34°27′ N. latitude) to mid-Oregon (45° N. latitude) and west to 129° W. longitude), drift gillnet fishing is prohibited annually within this conservation area from August 15 to November 15 to protect leatherback sea turtles. The smaller closure was implemented to protect Pacific loggerhead turtles from drift gillnet gear during a forecasted or concurrent El Niño event and is located south of Point Conception, California and west of 120° W. longitude from June 1 to August 31 (72 FR 31756). Since the leatherback closure was enacted, the number of active participants in the drift gillnet fishery declined by nearly half, from 78 vessels in 2000 to 40 in 2004, and has remained under 50 vessels since then. Although implemented for sea turtle protection, these closures help protect common thresher sharks from fishing pressures related to gillnet fishing (PFMC, 2015). The drift gillnet fishery is also managed by a limited entry permit system, with mandatory gear standards. The permit is linked to an individual fisherman, not a vessel, and is only transferable under very restrictive conditions; thus, the value of the vessel does not become artificially inflated. To keep a permit active, current permittees are required to purchase a permit from one consecutive year to the next; however, they are not required to make landings using drift gillnet gear. In addition, a general resident or non-resident commercial fishing license and a current vessel registration are required to catch and land fish caught in drift gillnet gear. A logbook is also required. The HMS FMP requires a Federal permit with a drift gillnet gear endorsement for all U.S. vessels that fish for HMS within the West Coast EEZ and for U.S. vessels that pursue HMS on the high seas (seaward of the EEZ) and land their catch in California, Oregon, or Washington. In Washington, drift gillnet fishing gear is prohibited and landings of thresher sharks are restricted under Washington Administrative Code 220–44–050. As previously mentioned, the recovery of the eastern North Pacific stock of common thresher is largely attributed to these regulatory mechanisms.

The WPFMC has jurisdiction over the EEZs of Hawaii, Territories of American Samoa, 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, thresher sharks are designated as Pelagic Management Unit Species and are 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, thresher 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 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 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. Thresher sharks are managed under the pelagic sharks group, which includes both common and bigeye thresher sharks. One way that the HMS Management Division controls and monitors this commercial harvest is by requiring U.S. commercial Atlantic HMS fishermen who fish for or sell common thresher sharks to have a Federal Atlantic Directed or Incidental shark limited access permit. These permits are administered under a limited access program, and the HMS Management Division 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. Authorized gear types include: Pelagic or 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 common thresher 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. In addition to permitting and trip limit requirements, logbook reporting or carrying an observer onboard may be required for selected commercial fishermen. 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 addition to Federal regulations, individual state fishery management agencies have authority for managing fishing activity in state waters, which usually extends from 0–3 nmi (5.6 km) off the coast in most cases, and 0–9 nmi (16.7 km) off Texas and the Gulf coast of Florida. Federally permitted shark fishermen along the Atlantic coast and in the Gulf of Mexico and Caribbean are required to follow Federal regulations in all waters, including state waters. To aid in enforcement and reduce confusion among fishermen, in 2010, the Atlantic States Marine Fisheries Commission, which regulates fisheries in state waters from Maine to Florida, implemented a Coastal Shark Fishery Management Plan that mostly mirrors the Federal regulations for sharks, including common thresher sharks.

Overall, regulations to control for overutilization of common threshers in U.S. Atlantic commercial fisheries, including quotas and trip limits, are seemingly adequate, as evidenced by stable CPUE trends for the species since the 1990s, which corresponds with the implementation of management measures for pelagic sharks under the U.S. HMS FMP. From 2009 through 2014, commercial landings of common thresher sharks have ranged from approximately 15 mt dw to 53 mt dw, and the population has seemingly stabilized under existing regulatory mechanisms in this region.

In other parts of the common thresher shark's range, the ERA team noted that effective international regulations specific to common thresher sharks are lacking, particularly in the Mediterranean. Despite several laws and regulatory mechanisms within the region (*e.g.,* EU Ban on driftnet fishing in EU waters, ICCAT ban on driftnets for large pelagics in the Mediterranean (Rec. 2003–04), and General Fisheries Commission of the Mediterranean (GFCM) ban on use of driftnets in the Mediterranean), recent investigations show common thresher sharks are being increasingly targeted in the Alboran Sea by an illegal large-scale swordfish driftnet fleet based primarily in Morocco. For example, Tudela *et al.* (2005) monitored 369 fishing operations made by the driftnet fleet between December 2002 and September 2003 and estimated a total of 4,791 common threshers caught over the 8-month sampling period. When extrapolated to 12-months, catches of common thresher sharks are estimated at about 7000–8000 individuals in the Alboran Sea alone. This suggests that regulatory mechanisms are not adequate in this region to control for overutilization as a result of intensive fishing pressure. However, some recent regulations may help to curb fishing pressure in the region. For example, in 2013, the European Parliament passed a regulation prohibiting the removal of shark fins by all vessels in EU waters and by all EU-registered vessels operating anywhere in the world. Many individual European countries have also implemented measures to stop the practice of finning and conserve shark populations. For example, in 2009, Spain enacted national legislation (Orden ARM/2689/2009) that includes specific measures prohibiting Spanish fishing vessels from catching, transshipping, landing and marketing of sharks of the Family Alopiidae (all three *Alopias* spp.) in all fisheries. This includes territorial waters of Spain and in other EU countries with which there is a fisheries agreement, and in areas that can be accessed by private agreement or contract lease of fishing vessels. This regulation went into effect in 2010. Given that Spain accounts for approximately 7.3 percent of the global shark catch (Lack and Sant, 2011) and was the largest exporter of fins in 2008, this prohibition has likely decreased total fishing mortality on the Atlantic population of thresher sharks. This is potentially evidenced by the fact that total EU catches of common threshers dropped precipitously by approximately 65 percent from 2009 to 2010, and have continued to decline since. Thus, this prohibition may be responsible for the significant decline in thresher landings by the EU reported to ICCAT since 2010, and may significantly reduce fishing pressure on common thresher sharks. In addition, the ERA team agreed that overutilization of the species in the Mediterranean, which is a small portion of the species' global range, does not necessarily constitute a high risk of extinction for the global population, now or in the foreseeable future.

In Indian Ocean waters, the main regulatory body is the IOTC, which has management measures in place specifically for thresher sharks that prohibit the landing of all *Alopias* species. Specifically, in 2010, the IOTC passed recommendation 10–05 to prohibit the retention, transshipment, landing, storing, or offering for sale any part of carcass of thresher sharks of the family Alopiidae. The IOTC also requires contracting parties (CPCs) to annually report shark catch data and provide statistics by species for a select number of sharks, including thresher sharks (Resolutions 05/05, 11/04, 08/04, 10/03, 10/02). The IOTC also developed additional shark conservation and management measures that aim to further reduce shark waste and encourage the live release of sharks, especially juveniles or pregnant females, caught incidentally (and not used for food or other purposes) in fisheries for tunas and tuna-like species. However, it is unclear how effective these measures have been. For example, in a recent status report, the IOTC's Working Party on Ecosystems and Bycatch noted that the International Plan of Action for sharks was adopted in 2000, which requires each CPC to develop a National Plan of Action (NPOA) for sharks; however, despite the time that has elapsed since then, very few CPCs have developed NPOAs for sharks, or even carried out assessments to determine whether the development of a plan is prudent. Currently, only 12 of the 35 CPCs have developed NPOAs for sharks (IOTC, 2014). Additionally, although the IOTC is the only RFMO that has specific regulations for all thresher species, the IOTC itself acknowledges that species retention bans may not be adequate for species that have high bycatch-related mortality rates. Overall, however, common threshers in particular do not appear to be caught in large numbers by fisheries in the Indian Ocean, likely a result of the species' more coastal, temperate distribution in areas where high seas longline fisheries operations are not as concentrated. In fact, it is quite possible that common thresher sharks do not occur in equatorial or tropical waters of the Indian Ocean at all (Romanov, 2015). Thus, while regulatory mechanisms to control overutilization may be problematic for more prevalent bycatch species in this region, inadequate regulations in the Indian Ocean are potentially less problematic for the common thresher shark.

On the U.S. West Coast, recreational fisheries primarily occur in non-federal waters (0–3 nmi off the coast) and are managed by the states of Washington, Oregon, and California, with inter-state coordination facilitated through the Pacific States Marine Fisheries Commission. Common thresher sharks may be retained recreationally, except in Washington State, where any fishing for *Alopias* spp. is prohibited. California recreational regulations impose a two-fish bag limit on thresher sharks. This is cumulative for multi-day trips and most anglers seldom fill bag limits. Upon a thorough review of recent California Recreational Fishery Survey data, estimates of recreational thresher shark catches were not causing cumulative landings to exceed the precautionary harvest guideline of 340 t. Further, an analysis of bag limits showed that few anglers actually caught and filled their legal limits. Finally, and as previously described, a recent stock assessment (Teo *et al.,* in prep) confirmed that removal levels of common thresher as a result of recreational fisheries are presently sustainable and not contributing to the overutilization of the species. Thus, it appears that recreational fisheries management of the U.S. West Coast population of thresher shark is precautionary, and ensures that cumulative catches (recreational + commercial) do not exceed the harvest guideline (*i.e.,* 340 mt) nor the maximum sustainable yield (MSY) (*i.e.,* 806 mt) for the species.

In the U.S. Atlantic, an HMS permit (either Angling or Charter/Headboat) is required for recreational fishing for sharks in Federal waters. Common thresher sharks may be retained recreationally using authorized fishing gear, including rod and reel and handline. There are no restrictions on the types of hooks that may be used to catch Atlantic sharks on these gear types. Common thresher sharks that are kept must have a minimum size of 54 inches (4.5 feet; 137 cm) FL. Sharks that are under the minimum size must be released, and only one shark, which could be a common thresher shark, may be kept per vessel per trip (note, there are exceptions to the retention limit and size limit for Atlantic sharpnose, bonnethead, and smoothhound sharks). Since 2008, recreational fishermen have been required to land all sharks with their head, fins, and tail naturally attached. Thus, there are some management measures in place to regulate recreational catches of common thresher sharks, including bag and size limits. As described previously, an estimated 17,834 common thresher sharks were caught in the rod and reef fishery in the U.S. Northwest Atlantic from 2004–2013, with approximately 70 percent retained. Additionally, size limits for common thresher sharks imposed by the various states under the ASMFC may not be helpful for reducing recreational fishing pressure because the size limit (137 cm FL) is significantly lower than the reported size of maturity in the Northwest Atlantic, and thus, allows for sexually immature juveniles to be caught and landed. However, recreational fisheries, and in particular tournaments, may have their own size limits that are larger than 137 cm FL because they typically tend to target the largest sharks. Despite the increases in popularity and targeting of common thresher sharks in recreational fisheries in the Northeast United States, standardized tournament data that account for changes in effort show increasing relative abundance of common thresher sharks in recent years. This information, combined with a stable CPUE trend from commercial fisheries, indicates that the population is stable and removals via recreational fisheries are likely sustainable.

In addition to commercial and recreational fishing regulations, 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, 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.

After the passage of the Shark Finning Prohibition Act, U.S. exports of dried shark fins significantly dropped, which was expected. 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, 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. 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). As described previously, landings of thresher sharks declined since 2000 in both American Samoa and Hawaii, presumably due to the implementation of shark finning regulations. Thus, these regulations are likely conferring a conservation benefit for thresher sharks.

Internationally, the RFMOs that cover the Atlantic, Indian and Pacific Oceans, including ICCAT, IOTC, the Western and Central Pacific Fisheries Commission (WCPFC), and the Inter-American Tropical Tuna Commission (IATTC), require the full utilization of any retained catches of sharks, with a regulation that onboard fins cannot weigh more than five percent of the weight of the sharks (*i.e.,* the five percent fin to carcass ratio). These regulations are aimed at curbing the practice of shark finning, but do not prohibit the fishing of sharks. In addition, these regulations may not be as effective in stopping finning of sharks compared to those that require fins to be naturally attached, as a recent study found many shark species, including the common thresher shark, to have an average wet-fin-to-round-mass ratio of less than five percent (Biery and Pauly, 2012). In other words, fishing vessels operating in these RFMO convention areas may be able to land more shark fins than bodies and still pass inspection. However, these RFMOs do encourage the release of live sharks, especially juveniles and pregnant females that are caught incidentally and are not used for food and/or subsistence in fisheries, and request the submission of data related to catches of sharks, down to the species level where possible.

While the ERA team initially expressed some concern regarding finning of common thresher sharks for the international shark fin trade, they noted that the situation 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 may not be as severe a threat to common thresher sharks compared to other species, as some evidence suggests that thresher shark fins are not preferred or ''first choice'' among some traders (Rose, 1996; FAO, 2002; Gilman *et al.,* 2007; Clarke pers. comm. 2015). Additionally, unlike bigeye and pelagic thresher shark fins, common thresher shark fins have been rarely identified as present in several genetic tests of fins throughout various portions of the species' range. Also, as discussed above (with further details in Young *et al.,* 2015), finning bans have been implemented by a number of countries, as well as by nine RFMOs. These finning bans range from requiring fins remain attached to the body to allowing fishermen to remove shark fins provided that the weight of the fins does not exceed five percent of the total weight of shark carcasses landed or found onboard. These regulations are aimed at stopping the practice of killing and disposing of shark carcasses at sea and only retaining the fins. Although they do not prohibit shark fishing, they work to decrease the number of sharks killed solely for the international shark fin trade, with some more effective than others.

In addition to these finning bans, there has been a recent push to decrease the demand of shark fins, especially for shark fin soup. 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 fin 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. Thus, given that thresher fins are not among the most prized in the international shark fin trade (and, in fact, are considered of low value to some traders), combined with a lack of evidence of common thresher fins in several prominent markets, the extent of utilization on common thresher sharks for this trade was not viewed as significant enough to decrease the species' abundance to the point where it may be at risk of extinction due to environmental variation, anthropogenic perturbations, or depensatory processes. Additionally, as the supply of shark fins continues to decline (as demonstrated by the increase in finning bans and other regulations) and demand for shark fins also continues to decline (as demonstrated by decreases in prices of shark fin food products), so should the threat of finning and illegal harvest. Finally, and as previously discussed (refer back to the *Overutilization for commercial, recreational, scientific, or educational purposes* section), although there has been a recent shift in demand from shark fins to shark meat, we have no evidence to suggest that the species is experiencing increased mortality in fisheries as a result of this shift in the international market.

Based on the above review of regulatory measures (in addition to the regulations described in Young *et al.,* 2015), the ERA team concluded that these existing regulations are not inadequate such that they contribute significantly to the species' risk of extinction throughout its global range. In fact, the team noted that some areas of the species' range do have adequate measures in place to prevent overutilization, such as in the Northeast Pacific and Northwest Atlantic, where U.S. fishery management measures are helping to monitor the catch of common thresher and prevent any further population declines. Thus, these U.S. conservation and management measures (as previously summarized with additional details in Young *et al.,* 2015) are adequate and do not contribute to the extinction risk of the common thresher 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. Although regulations specific to common thresher sharks are lacking in other parts of its range, fishery interactions are rare (with the exception of the Mediterranean) and thus the effects of the current regulatory measures do not appear to be significantly increasing the species' risk of extinction. This species appears to be naturally rare in many fisheries throughout its global range, and overutilization of the species is not considered a significant threat (see *Overutilization for Commercial, Recreational, Scientific or Educational Purpose* section discussed earlier in this notice). Therefore, based on the best available information, we find that the threat of inadequate regulatory mechanisms is not likely contributing to the species' risk of extinction throughout its global range; however, we recognize that improvements are needed in the monitoring and reporting of fishery interactions of this species.

Other Natural or Manmade Factors Affecting Its Continued Existence

As previously described, the ERA team assessed the effects of climate change as a potential threat to common thresher sharks; however, since most of the studied impacts from climate change are habitat-focused, the threat of climate change is addressed in the *Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range* section of this finding. Other threats that fall under Factor E (ESA section 4(a)(1)(E)), including pollution and potential threats to important prey species, are addressed in the status review report (Young *et al.,* 2015), but were not identified as threats that rose to the level of increasing the species' risk of extinction.

Overall Risk Summary

Guided by the results 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 common thresher shark now and in the foreseeable future. The ERA team concluded that the common thresher shark currently has a low risk of extinction. However, due to the lack of abundance trends and catch data for a large portion of the species' range (*e.g.,* Western and Central Pacific and Indian Oceans), as well as potentially significant declines observed in a small portion of the range (*e.g.,* Mediterranean), the ERA team expressed some uncertainty by placing some likelihood points in the ''moderate risk'' and ''high risk'' categories as well. Likelihood points attributed to the overall level of extinction risk categories were as follows: Low Risk (52.5/70), Moderate Risk (14.5/70), High Risk (3/70). The ERA team reiterated that in most areas (with the exception of the Mediterranean), common thresher abundance trends are stable, increasing, or not discernable. There is also no evidence to suggest depensatory processes are currently at work. The species is found globally, throughout its historical range, appears to be well-adapted, and is not limited by habitat. The team noted that the only available stock assessment of common thresher is from the eastern North Pacific. The stock assessment (Teo *et al.,* in prep) shows that although common threshers experienced a significant historical decline in the 1980s, the species has recovered to more than 90 percent of virgin, pre-fished levels. As discussed previously, there were flaws in the other studies cited within the status review report, including the fact that most of these studies are not species-specific, as well as questionable species identification within the datasets (as only recently has more attention been paid to accurately identifying thresher sharks down to species). Some of these studies have also been criticized for a number of other issues, including relying on fisheries logbook data, variation in locations between surveys and differences in data sources (*e.g.,* fishery-independent data vs. fishery-dependent data), and not accounting for other various factors that may have affected the outcomes. After considering the flaws within the datasets, as well as conducting separate analyses of available and arguably more reliable observer data, the ERA team found the results do not demonstrate that the common thresher shark is at risk of extinction due to its current abundance. Throughout the species' range, observations of its abundance are variable, with reports of increasing, decreasing, and stable or no trends. The species is also rare in fisheries data in a large portion of its range (Western and Central Pacific, Indian, and South Atlantic Oceans), either due to lack of reporting or because the species is simply not present in common fishing grounds (or not susceptible to fishing gear, see Ecological Risk Assessment results). As the main threat that the ERA team identified was overutilization due to fisheries (with references to historical overutilization), the absence of the species in fisheries data in a large portion of its range suggests that this threat is either being minimized by existing regulations or is not significantly contributing to the extinction risk of the species at this time (as the abundance data do not indicate that the species has been fished to near extinction).

The available information indicates that most of the observed declines occurred in the 1980s, before any significant management regulations. Since then, current regulatory measures in some parts of the common thresher shark's range are minimizing the threat of overutilization. For example, the recovery of the common thresher population on the U.S. West Coast is largely attributed to the conservative management regulations implemented for the California swordfish/shark gillnet fishery. Additionally, the comprehensive science-based management and enforceable and effective regulatory structure within the U.S. Northwest Atlantic will help monitor and prevent further declines of common thresher sharks while in these waters, and the implementation of Spain's regulation on the prohibition of landing or selling all *Alopias* spp. will provide increased protection for common thresher sharks throughout the entire Atlantic Ocean into the foreseeable future. In the rest of the species' range, rare fisheries interactions seem to imply that the species' more coastal and temperate distribution may buffer the species from exposure to intensive fishing pressure by industrial high seas fisheries, which concentrate the majority of fishing effort in more tropical waters. In addition, existing management measures (such as RFMO recommendations, national shark fishing measures, and shark fin bans) may be effective at minimizing overutilization of the species, with trends that are moving toward more restrictive trade and decreased demand in shark fin products, which indicate a decreased likelihood of extinction of the global population in the foreseeable future. Thus, given the best available information, the ERA concluded that over the next 30 years, it is unlikely that the common thresher shark will have a high risk of extinction throughout its global range, due to trends in its abundance, productivity, spatial structure, or diversity or influenced by stochastic or depensatory processes.

Significant Portion of Its Range

If we find that the common thresher shark is not in danger of extinction now or in the foreseeable future throughout its range, under the Significant Portion of its Range (SPR) Policy, we must go on to evaluate whether the species is in danger of extinction, or likely to become so in the foreseeable future, in a ''significant portion of its range'' (79 FR 37578; July 1, 2014).

The SPR Policy explains that it is necessary to fully evaluate a particular portion for potential listing under the ''significant portion of its range'' authority only if substantial information indicates that the members of the species in a particular area are likely *both* to meet the test for biological significance *and* to be currently endangered or threatened in that area. Making this preliminary determination triggers a need for further review, but does not prejudge whether the portion actually meets these standards such that the species should be listed. To identify only those portions that warrant further consideration, we will determine whether there is substantial information indicating that (1) the portions may be significant and (2) the species may be in danger of extinction in those portions or likely to become so within the foreseeable future. We emphasize that answering these questions in the affirmative is not a determination that the species is endangered or threatened throughout a significant portion of its range—rather, it is a step in determining whether a more detailed analysis of the issue is required (79 FR 37578, at 37586; July 1, 2014).

Thus, the preliminary determination that a portion may be both significant and endangered or threatened merely requires NMFS to engage in a more detailed analysis to determine whether the standards are actually met (79 FR 37578, at 37587). Unless both standards are met, listing is not warranted. The SPR policy further explains that, depending on the particular facts of each situation, NMFS may find it is more efficient to address the significance issue first, but in other cases it will make more sense to examine the status of the species in the potentially significant portions first. Whichever question is asked first, an affirmative answer is required to proceed to the second question. *Id.* ''[I]f we determine that a portion of the range is not 'significant,' we will not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in a portion of its range, we will not need to determine if that portion is 'significant' '' *Id.* Thus, if the answer to the first question is negative—whether that regards the significance question or the status question—then the analysis concludes and listing is not warranted.

As defined in the SPR Policy, a portion of a species' range is ''significant'' ''if the species is not currently endangered or threatened throughout its range, but the portion's contribution to the viability of the species is so important that, without the members in that portion, the species would be in danger of extinction, or likely to become so in the foreseeable future, throughout all of its range'' (79 FR 37578, at 37609). For purposes of the SPR Policy, ''[t]he range of a species is considered to be the general geographical area within which that species can be found at the time FWS or NMFS makes any particular status determination. This range includes those areas used throughout all or part of the species' life cycle, even if they are not used regularly (*e.g.,* seasonal habitats). Lost historical range is relevant to the analysis of the status of the species, but it cannot constitute a significant portion of a species' range'' *Id.*

Applying the SPR policy to the common thresher shark, we first evaluated whether there is substantial information indicating that the species may be threatened or endangered in any portion of its range. After a review of the best available information, the ERA team concluded, and we agree, that the Mediterranean region likely has more concentrated threats than other regions of the common thresher's range, placing the species at an increased risk of extinction within this portion. However, in determining whether this portion of the species' range also meets the ''significance'' test under the SPR Policy, the ERA team concluded that the Mediterranean represents a small portion of the global range of the common thresher shark, and the loss of that portion would not result in the remainder of the species being endangered or threatened, particularly given the fact that there is no evidence to suggest the species makes trans-Atlantic migrations, and thus that other portions of the species' global population would be at risk from threats in the Mediterranean region. In particular, we did not find substantial evidence to indicate that the loss of this portion would result in a level of abundance for the remainder of the species to be so low or variable, that it would cause the species to be at a moderate or high risk of extinction due to environmental variation, anthropogenic perturbations, or depensatory processes. We also could not find any substantial evidence to suggest that the loss of the Mediterranean portion of its range would isolate the species to the point where the remaining populations would be at risk of extinction from demographic processes. We also found no evidence to suggest that the loss of genetic diversity from this portion would result in the remaining population lacking enough genetic diversity to allow for adaptations to changing environmental conditions. Although there is preliminary evidence of possible genetic partitioning between ocean basins, this was based on one study with a limited sample size (see Trejo, 2005_ENREF_224). Since common thresher sharks are globally distributed and highly mobile, we did not find that the loss of the Mediterranean portion would severely fragment and isolate the common thresher population to the point where individuals would be precluded from moving to suitable habitats or have an increased vulnerability to threats. Areas exhibiting source-sink dynamics, which could affect the survival of the species, were not evident in any part of the common thresher shark range. There is also no evidence that the Mediterranean portion of the range encompasses aspects that are important to specific life history events that other portions do not, where loss of the former portion would severely impact the growth, reproduction, or survival of the entire species. There is also little to no information regarding nursery grounds or other important habitats utilized by the species that could be considered limiting factors for the species' survival. In fact, we found evidence that there are likely reproductive grounds and nursery areas in all three major ocean basins. In other words, the viability of the species does not appear to depend on the productivity of the population or the environmental characteristics in the Mediterranean portion of the range. Overall, we did not find any evidence to suggest that this specific portion of the species' range has increased importance over any other with respect to the species' survival. As such, the Mediterranean region does not meet the significance criteria under the SPR policy. We could not identify any other portions of the common thresher shark range in which the species is in danger of extinction, or likely to become so in the foreseeable future, and thus our SPR analysis ends.

Final 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 (80 FR 11379; March 3, 2015), the status review report (Young *et al.,* 2015), and other published and unpublished information, and we have consulted with species experts and individuals familiar with common thresher sharks. 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. As previously explained, we could not identify any portion of the species' range that met both criteria of the SPR policy. Although the Mediterranean region was identified as a portion of the range in which the common thresher has a higher risk of extinction due to concentrated threats, we could not identify this portion as ''significant.'' Additionally, we could not identify any other portion of the species' range in which the species is currently in danger of extinction or likely to become so in the foreseeable future. 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 entire range.

We conclude that the common thresher shark is not presently in danger of extinction, nor is it likely to become so in the foreseeable future, throughout all of its range. We summarize the factors supporting this conclusion as follows: (1) The species is broadly distributed over a large geographic range, with no barrier to dispersal; (2) there is no evidence of a range contraction and there is no evidence of habitat loss or destruction; (3) while the species possesses life history characteristics that increase its vulnerability to harvest, it has been found to be less susceptible to pelagic longline fisheries compared to other shark species (based on results from Ecological Risk Assessments), decreasing the chance of substantial fishing mortality from this fishery that operates throughout its range; (4) the best available information indicates that abundance is variable across the species' range, with reports of localized population declines but also evidence of stable and/or increasing abundance estimates; (5) based on the ERA team's assessment, while the current population size has likely declined from historical numbers, it is sufficient to maintain population viability into the foreseeable future; (6) the main threat to the species is fishery-related mortality from global fisheries; however, information on harvest rates is inconclusive due to poor species discrimination and significant uncertainties in the data, with the best available information indicating low utilization of the species (rare in tropical fisheries records in both the Western and Central Pacific and Indian Oceans as well as the South Atlantic, and rarely identified as present in several genetic tests of shark fins from markets throughout its range); (7) there is no evidence that disease or predation is contributing to increasing the risk of extinction of the species; (8) existing regulatory mechanisms throughout a large portion of the species' range appear effective in addressing the most important threats to the species (harvest); (9) there is no evidence that other natural or manmade factors are contributing to increasing the risk of extinction of the species; and, (10) while the global population has likely declined from historical numbers, there is no evidence that the species is currently suffering from depensatory processes (such as reduced likelihood of finding a mate or mate choice or diminished fertilization and recruitment success) or is at risk of extinction due to environmental variation or anthropogenic perturbations. Finally, and as previously described in the SPR analysis above, we determined that the species is not threatened or endangered in a significant portion of its range.

Based on these findings, we conclude that the common thresher shark is not currently in danger of extinction throughout all or a significant portion of its range, nor is it likely to become so within the foreseeable future. Accordingly, the common thresher shark does not meet the definition of a threatened or endangered species, and thus, the common thresher shark does not warrant listing as threatened or endangered at this time.

Bigeye Thresher Shark (*Alopias superciliosus*)

Species Description

The bigeye thresher shark (*Alopias superciliosus*) has a broad head, moderately long and bulbous snout, curved yet broad-tipped pectoral fins, distinctive grooves on the head above the gills, and large teeth. The first dorsal-fin midbase is closer to the pelvic-fin bases than to the pectoral-fin bases. The caudal tip is broad with a wide terminal lobe. While some of the above characteristics may be shared by other thresher shark species, diagnostic features separating this species from the other two thresher shark species (common and pelagic thresher) are their extremely large eyes, which extend onto the dorsal surface of the head, and the prominent notches that run dorso-lateral from behind the eyes to behind the gills. The body can be purplish grey or grey-brown on the upper surface and sides, with grey to white coloring on its underside; however, unlike the common thresher, the light color of the abdomen does not extend over the pectoral fins and there is no white dot on the upper pectoral fin tips like those often seen in common threshers (Compagno, 2001).

Current Distribution

The bigeye thresher shark is a large, highly migratory oceanic and coastal species of shark found throughout the world in tropical and temperate seas. In the western Atlantic (including the Gulf of Mexico), bigeye threshers can be found off the Atlantic coast of the United States (from New York to Florida), and in the Gulf of Mexico off Florida, Mississippi and Texas. They can also be found in Mexico (from Veracruz to Yucatan), Bahamas, Cuba, Venezuela, as well as central and southern Brazil. In the eastern Atlantic, bigeye threshers are found from Portugal to the Western Cape of South Africa, including the western and central Mediterranean Sea. In the Indian Ocean, bigeye threshers are found in South Africa (Eastern Cape and KwaZulu-Natal), Madagascar, Arabian Sea (Somalia), Gulf of Aden, Maldives, and Sri Lanka. In the Pacific Ocean, from west to east, bigeye threshers are known from southern Japan (including Okinawa), Taiwan (Province of China), Vietnam, between the Northern Mariana Islands and Wake Island, down to the northwestern coast of Australia and New Zealand, as well as American Samoa. Moving to the Central Pacific, bigeye threshers are known from the waters surrounding Wake, Marshall, Howland and Baker, Palmyra, Johnston, Hawaiian Islands, Line Islands, and between Marquesas and Galapagos Islands. Finally, in the Eastern Pacific, bigeye threshers occur from Canada to Mexico (Gulf of California) and west of Galapagos Islands (Ecuador). They are also possibly found off Peru and northern Chile (Compagno, 2001; Ebert *et al.,* 2014).

Habitat Use and Movement

Bigeye thresher sharks are found in a diverse spectrum of locations, including in coastal waters over continental shelves, on the high seas in the epipelagic zone far from land, in deep waters near the bottom on continental slopes, and sometimes in shallow inshore waters. They are an epipelagic, neritic, and epibenthic shark, ranging from the surface and in the intertidal to at least 500 m deep, and have even been recorded as deep as 723 m (Nakano *et al.,* 2003), but mostly occur in depths below 100 m (Compagno, 2001). Bigeye threshers are known to endure colder water and remain longer in deeper waters than many other pelagic sharks (Gruber and Compagno, 1981; Fernandez-Carvalho *et al.,* 2015). Like common threshers, bigeye thresher sharks are also known to make daily diel vertical migrations, spending most of their day below the thermocline, and most of the night in the mixed layer and upper thermocline (Nakano *et al.,* 2003; Weng and Block, 2004; Kohin *et al.,* 2006; Stevens *et al.,* 2009; Musyl *et al.,* 2011). In the Marshall Islands, Cao *et al.* (2011) identified a preferred optimum swimming depth of 240–360 m, water temperature of 10–16 °C, salinity of 34.5–34.7 ppt and dissolved oxygen range of 3.0–4.0 ml/l for bigeye threshers. Nakano *et al.* (2003) recorded the deepest dive to date in the Eastern Tropical Pacific, extending the known depth distribution for bigeye thresher to 723 m.

In the Atlantic, mark/recapture data (number tagged = 400 and number recaptured = 12) from the NMFS CSTP between 1963 and 2013 showed that the range of movement for the bigeye thresher was much larger than for the common thresher (Kohler, 1998; Kohler and Turner, 2001; NMFS, unpublished data), with a maximum straight-line distance travelled of 2,067 nmi (3,828 km; NMFS, unpublished data). This transatlantic movement was from a shark tagged in 1984 by a NMFS shark biologist 565 nmi (1046 km) southwest of the Cape Verde Islands off the west coast of Africa and recaptured in 1994 by a commercial longliner 19 nmi (35 km) off the Venezuelan coast (NMFS, unpublished data), confirming that this species is highly migratory.

Diet

Bigeye threshers have larger teeth than common threshers and feed on a wider variety of prey, including small to medium sized pelagic fishes (*e.g.,* lancetfishes, herring, mackerel and small billfishes), bottom fishes (*e.g.,* hake) and cephalopods (*e.g.,* squids). Thus, the bigeye thresher appears to be an opportunistic feeder, foraging on diverse species covering a broad range of habitats, whereas niche separation is more apparent for common threshers (Preti *et al.* 2008). The arrangement of the eyes, with keyhole-shaped orbits extending onto the dorsal surface of the head, suggest that this species has a dorsal/vertical binocular field of vision (unlike other threshers), which may be related to fixating on prey and striking them with its tail from below (FAO, 2015). Based on a study at the NMFS SWFSC, the top five prey species, in order, are barracudinas, Pacific hake, Pacific saury, Pacific mackerel, and northern anchovy. At least eight cephalopod species were also observed, although most species were found in only a few stomachs (Preti *et al.,* 2008).

Reproduction

The bigeye thresher has the slowest growth rate and is the least productive compared to the other *Alopias* species. It reaches maturity at a later age than the common thresher, about 10 years for males and 13 years for females. In terms of size, females attain maturity generally around 332–355 cm TL while males reach maturity at smaller sizes (generally around 270–288 cm TL) (see Table 2 in Young *et al.,* 2015). Like other thresher species, the reproductive mode of bigeye thresher is aplacental viviparity with oophagy; however, bigeye threshers usually bear only two pups per litter—one per uterus (although cases of up to four embryos may occur), resulting in an extremely low fecundity. The gestation period may be 12 months long, but remains uncertain due to a lack of birthing seasonality data (Liu *et al.,* 1998). However, there have been some observations and hypotheses regarding potential birthing seasons and nursery areas of bigeye thresher sharks from various parts of its range, including summer, fall, and winter in the Florida Straits. Another nursery for this species may exist in nearshore Cuban waters, as many small juveniles and females with full-term litters have been observed there (Guitart, 1975 cited in Camhi *et al.,* 2008). Moreno and Morón (1992) concluded that birth occurs over a protracted period from autumn to winter in the Strait of Gibraltar. More recently, Fernandez-Carvalho *et al.* (2015) observed the presence of large embryos (closer to the size at birth) in October/November in the northeast Atlantic and in March in the Southwest Atlantic, which seems to suggest that birth may be taking place during late summer and autumn in both hemispheres. This corroborates what has been previously suggested for both regions, particularly by Moreno and Morón (1992) for the Northeast, that a nursery area for this species exists off the southwestern Iberian Peninsula based on the records of several pregnant females. In fact, Fernandez-Carvalho *et al.* (2015) hypothesize that such an area not only exists, but possibly extends farther south, into the tropical Northeast Atlantic and equatorial waters closer to the African continent. This may be validated by the fact that smaller and mainly juvenile specimens tended to be captured in the tropical Northeast and equatorial waters, as well as pregnant females both in mid- and late-term stages. Another cluster of pregnant females was recorded in the Southwest Atlantic, some close to the Rio Grande Rise and a few inside the Uruguayan EEZ, suggesting these areas may also be nurseries for this species in the South Atlantic. This was previously suggested in a study by Amorim *et al.* (1998), who also reported the presence of pregnant females in this area. In contrast, a different reproduction and birth seasonality may exist in the Pacific Ocean, where Matsunaga and Yokawa (2013) reported that neonates (<80 cm pre-caudal length) were caught mainly during winter and spring in an area between 10 and 15 °N.

Size and Growth

Bigeye threshers have a maximum estimated age of about 20 years, and can grow to a maximum total length of 504 cm (TL) depending on sex and geographic location. Growth rates are also different depending on geographic location. Male bigeye thresher sharks are thought to grow slightly faster than females (with a growth coefficient, k, of 0.088/year for males and 0.092/year for females in the Northwest Pacific and 0.18/year for males and 0.06/year for females in the eastern Atlantic) but reach a smaller asymptotic size (206 cm FL for males versus 293 cm FL for females) (Liu *et al.,* 1998; Fernandez-Carvalho *et al.,* 2011). Using life history parameters from the eastern central Atlantic, Cortés *et al.* (2012) estimated productivity of the bigeye thresher shark, determined as intrinsic rate of population increase (*r*), to be 0.009 per year (median). Overall, the best available data indicate that the bigeye thresher shark is a long-lived species (at least 20 years) and can be characterized as having 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.

Current Status

Bigeye thresher sharks can be found worldwide, with no present indication of a range contraction. Although they are generally not targeted, they are caught as bycatch in many global fisheries, including bottom and pelagic longline tuna and swordfish fisheries, purse seine fisheries, coastal gillnet fisheries, and artisanal fisheries. Bigeye thresher sharks are more commonly utilized for their meat than fins, as they are a preferred species for human consumption (although not as preferred as the common thresher); however, they are also valuable as incidental catch for the international shark fin trade.

In 2009, the IUCN considered the bigeye thresher shark to be Vulnerable globally, based on an assessment by Amorim *et al.* (2009) and its own criteria (A2bd), and placed the species on its ''Red List.'' As noted previously, under criteria A2bd, 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, or over a 3-generation period, whichever is the longer, and where the causes of the reduction may not have ceased or may not be understood or may not be reversible, based on an index of abundance appropriate to the taxon and/or the actual or potential levels of exploitation. The IUCN justification for the categorization is based on the bigeye thresher's suspected declining populations as result of a combination of 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. As a note, the IUCN classification for the bigeye thresher 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 Segment Analysis

The petition to list the bigeye thresher shark requested NMFS to list it throughout its range, or alternatively, as DPSs should NMFS find they exist. The ERA team was asked to examine the best available data to determine whether DPSs may exist for this species. The petition, itself, did not provide any information regarding potential DPSs of bigeye thresher shark, aside from requesting that NMFS consider using the regions/populations as outlined and delimited in the petition (*i.e.,* Northwest and Western Central Atlantic, Southwest Atlantic, Mediterranean Sea and Eastern Atlantic, Indo-West Pacific, and Eastern Central Pacific). The petition did not otherwise provide support to identify any DPSs of bigeye thresher shark. As previously noted, to meet the definition of a DPS, a population must be both discrete from other populations of the species and significant to the species as a whole (61 FR 4722; February 7, 1996). The petition did not provide biological evidence to support the existence of any ''subpopulations'' nor did the petition propose any boundaries for DPSs. Additionally, the petition did not describe in any detail the ways in which different management relating to international governmental boundaries may delineate the species into boundaries aligning with the suggested regions/populations. Specific gaps in management or intergovernmental boundaries were not described as they relate to any of the suggested regions/populations. In our review of the best available data, we were also unable to find information to define any DPSs as discrete on biological grounds. We found only two preliminary studies to suggest population structure of the bigeye thresher shark. Trejo (2005) examined mitochondrial control region DNA, which demonstrated significant population structure between most pairwise comparisons, but the sample sizes were extremely low, and thus the results could not be interpreted with confidence. The data results support shallow population structure between Indo-Pacific and Atlantic populations, but not among populations spanning the entire Indo-Pacific Ocean (Trejo, 2005). In a genetic analysis by Naylor *et al.* (2012), little difference was seen among nine specimens spanning much of the global distribution of the species. Based on the preliminary nature of these data, and low sample size throughout the studies, these results cannot be relied upon to divide the bigeye thresher shark into any discrete populations. In our review of the best available data, we were also unable to find information to define any DPSs as discrete based on any other physical, physiological, ecological, or behavioral factors or based on differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms across any international governmental boundaries that would be significant in light of potential threats to the species. Thus, we concluded that the best available information does not indicate that any population segment of the bigeye thresher shark would qualify as a DPS under the DPS policy. As such, we conducted the extinction risk analysis on the global bigeye thresher shark population.

Assessment of Extinction Risk

Please refer back to the *Assessment of Extinction Risk* section for the common thresher for statutory definitions and methods of the extinction risk assessment. In terms of determining a reasonable foreseeable future timeframe for the bigeye thresher, the ERA team first considered the life history of the species. Longevity of the bigeye thresher is estimated to be about 25 years. Generation time, which is defined as the time it takes, on average, for a sexually mature female bigeye thresher shark to be replaced by offspring with the same spawning capacity, is estimated to be approximately 17.8 years. As a late-maturing species (like the common thresher), with relatively slow growth rates and 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. As previously described, this is supported by the fact that we have a well-documented example of how these species respond to intense fishing pressure, and the time required for the initial implementation of regulatory measures to be reflected in population abundance indices (refer back to the common thresher *Assessment of Extinction Risk* section for more details). Thus, given that the bigeye thresher has lower productivity than the common thresher, the ERA team assumed that the time required to observe changes in abundance indices would be longer, and would also similarly comport with 3 generation times (*i.e.,* 50 years). The ERA team then discussed whether they could confidently predict the impact of threats on the species out to 50 years and agreed that since the main threats to the species were likely fisheries and the regulatory measures that manage these fisheries, they had the background knowledge and expertise to confidently predict the impact of these threats on the biological status of the species within this timeframe. For the foregoing reasons, the ERA team concluded, and we agree, that a biologically reasonable foreseeable future timeframe would be 50 years for the bigeye thresher.

Evaluation of Demographic Risks

Abundance

Currently, there is a lack of reliable species-specific global population size estimates, population assessments, and trends in abundance for the bigeye thresher shark. As previously noted, using a thresher complex or other thresher species as a proxy for bigeye thresher abundance could be erroneous because of the differences in the species' distributions as well as the proportions they make up in commercial catches. In most areas showing overall declines in Alopiids, it is uncertain which thresher species the declines are more likely attributable to, although most declines are likely attributable to either the bigeye or pelagic thresher rather than common threshers, with the exception of the Mediterranean. Additionally, there are also long-term misidentification issues between thresher sharks, which means historical data regarding thresher catch is likely not entirely accurate. The ERA team expressed some concern regarding the bigeye thresher shark's global abundance, particularly given that the species likely experienced localized population declines over the past few decades. Given the lack of data, and the fact that most of the available information is not specific to bigeye thresher, the extent of the declines and current status of the global population are unclear. However, some information, including species-specific analyses of standardized observer data from the Northwest Atlantic and Hawaii, provide some insight into the current abundance levels of the species.

Bigeye thresher shark populations have likely exhibited historical declines in abundance relative to virgin biomass levels, but information regarding the magnitude of these declines is poor. In areas where more recent indicators of abundance for bigeye thresher are available (*i.e.,* standardized CPUE trends), abundance trends are highly variable. In the Northwest Atlantic, it is likely that the bigeye thresher population suffered a significant historical decline (refer back to the discussion of Baum *et al.* (2003) and Cortés (2007) in the common thresher *Demographic Risk Assessment—Abundance* section); however, the ERA team questioned the magnitude of these declines, noting several issues with the available information, including the following: The data used were not species-specific, the time series ended in 2006, and the data were based on fisheries logbooks rather than observer data. The ERA team determined that observer data is likely more representative for bycatch species; thus, in order to determine species-specific abundance trends of bigeye thresher in the Northwest Atlantic, the ERA team analyzed the available species-specific observer data from the U.S. Northwest Atlantic Pelagic Longline Fishery from 1992–2013. From this analysis, the ERA team determined that although the population of bigeye thresher shark in this area suffered a historical decline, the population has likely stabilized since 1990.

In the Western and Central Pacific, where bigeye threshers are most commonly observed and likely most abundant, trends in abundance are variable. As described earlier in the common thresher *Abundance* section, much of the fisheries data from this region are for the thresher complex (all three *Alopias* spp.), thus making it difficult to discern abundance trends for any one species in particular. In order to glean species-specific abundance trends for bigeye thresher, the ERA team conducted an analysis of species-specific observer data from the Hawaii-based pelagic longline fishery, which indicates that abundance of bigeye thresher has been relatively stable since 1994, and even potentially increasing in recent years. In contrast, fisheries data from the rest of the Western and Central Pacific region suggest thresher abundance may be on a decline, particularly in the last few years (Rice *et al.,* 2015). However, the latter data from the rest of the Western and Central Pacific is not specific to bigeye thresher, and rather analyzes the thresher complex (all three *Alopias* spp.). As such, interpreting these data is difficult, particularly since the second most common species reported is the general ''thresher shark'' category. Given that the bigeye thresher is typically the dominant thresher species in catch records from this region combined with its more tropical distribution, the ERA team made the assumption that the trends from the Western and Central Pacific are likely reflective of bigeye thresher. However, even given this assumption, the ERA team determined, and we agree, that the potential population decline in this region in the last few years, combined with a stable and potentially increasing abundance trend of bigeye thresher in the Central Pacific since 1994, indicates that the potential population decline of bigeye thresher is not Pacific-wide. Thus, the best available information indicates that the species' current level of abundance in the Western and Central Pacific is spatially variable, but not likely so low such that it places the species at a high risk of extinction throughout its global range, now or in the foreseeable future.

Abundance information from other portions of the species' range is relatively poor and unreliable or lacking altogether. In areas where data are lacking (*e.g.,* South Atlantic, Indian Ocean) it was difficult to discern if the population is stable or in decline. In a recent proposal developed by Sri Lanka to list all three thresher species under CITES Appendix II, a population decline of 83 percent was inferred for the Indian Ocean based on a study conducted in the Eastern and Central Pacific (Ward and Myers, 2005), because there is currently no confirmed stock separation between the Indian and Pacific Ocean stocks of the species. However, as previously described in this finding, the ERA team identified several caveats regarding the Ward and Myers (2005) study, including differences in survey locations as well as data types used (*e.g.,* fishery-independent vs. fishery-dependent) and seriously questioned the conclusions regarding the magnitude of decline for the thresher complex in this region. However, given the high fishing pressure in the Indian Ocean, coupled with the species' high bycatch-related mortality rates and low productivity (IOTC, 2014), the ERA team concluded that it is likely the species is experiencing some level of population decline in this region that may be similar to declines in other portions of the species' range; nevertheless, we do not have enough information to determine the magnitude of this decline and whether this decline is significantly contributing to the extinction risk of the global population.

In the South Atlantic, standardized CPUE data indicate that bigeye thresher abundance may have declined only slightly from 1978 to 2006 (Mourato *et al.,* 2008); however, the available CPUE time series ended in 2006 and best available information indicates that the main fishery catching bigeye threshers (the Brazilian Santos longline fishery) underwent several operational changes, including a shift in effort to more temperate waters, which may have reduced fishing pressure on bigeye thresher in this portion of its range. We could not find any other reliable abundance indices that indicate bigeye thresher has experienced a significant population decline in the Southwest Atlantic region.

Overall, there is no evidence to suggest that present abundance levels are so low, such that depensatory processes are at work. As previously noted, although it is likely that the bigeye thresher shark has experienced declines of varying magnitudes throughout its range due to fishing mortality, recent relative abundance data included in the status review report (Young *et al.,* 2015) suggest that abundance trends are highly variable throughout the species' global range, with populations increasing, stable, slightly declining, or showing no clear trend. We noted that bigeye threshers are still captured regularly throughout their range and the range does not appear to have contracted. Thus, based on the best available information, we conclude that the current abundance of bigeye thresher throughout its range is not contributing significantly to the species' risk of extinction, such that the species has a high risk of extinction throughout its global range, now or in the foreseeable future.

Growth Rate/Productivity

Similar to abundance, the ERA team expressed some concern regarding the effect of the bigeye thresher shark's growth rate and productivity on its risk of extinction. Bigeye thresher sharks exhibit life-history traits and population parameters that are on the low end of the spectrum among other shark species. The estimated growth coefficients confirm that the bigeye thresher is generally a slow-growing species. Relative to other thresher species, the bigeye thresher shark is the least fecund and productive, with a low intrinsic rate of population increase ($r = 0.009\ year^{-1}$; Cortés *et al.,* 2012). These demographic parameters place bigeye thresher shark towards the slower growing sharks along the ''fast-slow'' continuum of population parameters calculated for 38 species of sharks (see Appendix 2 of Cortés (2002)), which means this species generally has a low potential to recover from exploitation. In addition, based on several Ecological Risk Assessments, bigeye threshers have been found to be the most susceptible to pelagic longline fisheries in the Atlantic and Indian Oceans when compared to other shark species. Based on the best available information, including the fact that most species of elasmobranchs require many years to mature and have relatively low fecundity compared to teleosts, these life history characteristics could pose a risk to this species in combination with threats that reduce its abundance, such as overutilization.

Spatial Structure/Connectivity

Like the common thresher, habitat characteristics that are important to the bigeye thresher are unknown, as are nursery areas. There is currently no evidence of female philopatry, 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. Thus, based on the best available information, there is insufficient information to support the conclusion that spatial structure and connectivity pose significant risks to this species.

Diversity

Similar to the common thresher, the ERA team concluded, and we agree, that the current level of information regarding the bigeye thresher shark's diversity is either unavailable or unknown, such that the contribution of this factor to the extinction risk of the species cannot be determined at this time. Currently, there is no evidence to suggest the species is at risk due to a substantial change or loss of variation in genetic characteristics or gene flow among populations.

Summary of Factors Affecting the Bigeye Thresher Shark

As described previously, 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 bigeye thresher shark population. This section briefly summarizes the ERA team's findings and our conclusions regarding threats to the common thresher shark. More details can be found in the status review report (Young *et al.,* 2015).

The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The ERA team did not identify habitat destruction as a potential threat to the bigeye thresher shark. As described earlier (see *Species Description—Movement and Habitat Use section*) the bigeye thresher shark is a large, highly migratory oceanic and coastal species of shark found throughout the world in tropical and temperate seas (Compagno, 1984). Bigeye thresher sharks are found in a diverse spectrum of locations, including in coastal waters over continental shelves, on the high seas in the epipelagic zone far from land, in deep waters near the bottom on continental slopes, and sometimes in shallow inshore waters. They range from the surface and in the intertidal to at least 500 m deep, and have even been recorded as deep as 723 m (Nakano *et al.,* 2003), but mostly occur in depths below 100 m (Compagno, 2001); however, little else is known regarding specific habitat preferences or characteristics.

As previously described, the MSA requires NMFS to identify and describe EFH in FMPs, minimize the adverse effects of fishing on EFH, and identify actions to encourage the conservation and enhancement of EFH in the U.S. EEZ. Results from the two previously described NMFS-funded cooperative survey programs indicate the importance of coastal waters off the Atlantic east coast, from Maine to the Florida Keys, central Gulf of Mexico and localized areas off of Puerto Rico and the U.S. Virgin Islands (NMFS, 2009). As a side note, insufficient data are available to differentiate EFH by size classes in the Atlantic for the bigeye thresher shark; therefore, EFH is the same for all life stages. Since bigeye thresher shark EFH is defined as the water column or attributes of the water column, NMFS determined that there are minimal or no cumulative anticipated impacts to the EFH from gear used in U.S. HMS and non-HMS fisheries, basing its finding on an examination of published literature and anecdotal evidence (NMFS, 2006).

The bigeye thresher population off California and Oregon appears to be predominantly adult males (71 percent of observed catches are mature males), which range north to Oregon, and immature females, which primarily occur south of Monterey Bay and in the Southern California Bight. Essential Fish Habitat is described for two age classes: Late juveniles/subadults and adults. Neonates/early juveniles (~90 to 115 cm FL, 0 to 2 and 3 year olds) are not known to occur in the U.S. West Coast EEZ, thus EFH is not defined for this size class. For late juveniles/subadults (>115 cm FL and <155 cm FL males and <189 cm FL females), EFH is described as coastal and oceanic waters in epi- and mesopelagic zones from the U.S.-Mexico border north to 37° N. latitude off Davenport, California, South of 34° N. latitude from the 100 fm (183 m) isobath to the 2,000 fm (3,568 m) isobaths and north of 34° N. from the 800 fm (1,463 m) isobath out to the 2,200 fm (4,023 m) isobath. For adults (>154 cm FL males and >188 cm FL females) EFH is described as coastal and oceanic waters in epi-and mesopelagic zones from the U.S.-Mexico border north to 45° N. latitude off Cascade Head, Oregon. In southern California EFH is south of 34° N. latitude from the 100 fm (183 m) isobath out to the 2,000 fm (3,568 m) isobath and North of 34° N. latitude from the 800 fm (1,463 m) isobath out to the outer EEZ boundary.

In the U.S. Western Pacific, including Hawaii, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands, EFH for bigeye thresher is described identically to common thresher (refer back to the common thresher *The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* section of this finding).

Likewise, bigeye thresher shark habitat in other parts of its range is assumed to be similar to that in the Northwest Atlantic and Gulf of Mexico, comprised of open ocean environments occurring over broad geographic ranges and characterized primarily by the water column attributes. As such, large-scale impacts, such as global climate change, that affect ocean temperatures, currents, and potentially food chain dynamics, may pose a threat to this species. Studies on the impacts of climate change specific to thresher sharks have not been conducted; however, there are a couple of studies on other pelagic shark species that occur in the range of the bigeye thresher shark (refer back to the common thresher *The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* section for a summary of relevant climate change studies in which pelagic sharks have variable vulnerability to the effects of climate change). However, like the common thresher, the bigeye thresher shark is highly mobile throughout its range; and, although there is very little information on habitat use and pupping and nursery areas, there is no evidence to suggest its access to suitable habitat is restricted. Additionally, bigeye threshers are likely more confined by temperature and prey distributions than a particular habitat type. The highly migratory nature of bigeye threshers gives them the ability to shift their range or distribution to remain in an environment conducive to their physiological and ecological needs. Thus, it is very unlikely that the loss or degradation of any particular habitat type would have a substantial effect on the global bigeye thresher population. Further, there is currently no evidence to suggest a range contraction based on habitat degradation for the bigeye thresher shark. As a result, the ERA team concluded, and we agree, that the effect that habitat destruction, modification, or curtailment is having on the species' extinction risk is low. Therefore, based on the best available information, we conclude that current evidence does not indicate that there exists a present or threatened destruction, modification, or curtailment of the bigeye thresher shark's habitat or range.

Overutilization for Commercial, Recreational, Scientific or Educational Purposes

Like the common thresher, the bigeye thresher is also considered a valuable bycatch species, which, when combined with its high at-vessel mortality rates and low productivity, makes this species more susceptible to overutilization. The ERA team assessed three different factors that may contribute to the overutilization of the bigeye thresher shark: Bycatch in commercial fisheries (including at-vessel and post-release mortality rates), recreational fisheries, and the global shark trade (including the trade of both bigeye thresher fins and meat). Similar to common thresher sharks, bigeye thresher sharks are caught as bycatch in many global fisheries, including bottom and pelagic longline fisheries, purse seine fisheries, coastal gillnet fisheries, and artisanal fisheries; however, as a primarily pelagic and tropical species (in contrast to the common thresher's more coastal and temperate distribution), the bigeye thresher shark is relatively common in the catches of tropical fisheries, particularly in the Western and Central Pacific and Indian Oceans. It is also relatively common in catches of fisheries operating in the Northwest and South Atlantic. Though it is generally not a target species in commercial fisheries, the bigeye thresher shark is valued for both its meat and fins, and is therefore valued as incidental catch for the international shark trade (Clarke *et al.,* 2006a; Dent and Clarke, 2015).

As noted previously in the *Evaluation of Demographic Risks—Abundance* section, there is very little information on the historical abundance, catch, and trends of bigeye thresher sharks, with the exception of U.S. data from the Northwest Atlantic and Central Pacific (*i.e.,* Hawaii). As described previously, although more countries and RFMOs are working towards better reporting of fish catches down to species level, catches of bigeye threshers have gone and continue to go unrecorded in many countries. Additionally, many catch records that do include thresher sharks do not differentiate between the *Alopias* species or shark species in general, and if they do, they are often plagued by species misidentifications. These numbers are also likely under-reported in catch records, as many records do not account for discards or they reflect dressed weights instead of live weights. Thus, the lack of catch data for bigeye thresher sharks makes it difficult to estimate rates of fishing mortality or conduct detailed quantitative analyses of the effects of fishing on bigeye thresher populations.

On the U.S. West Coast, utilization of bigeye thresher shark is likely minimal. Bigeye threshers sometimes co-occur with common threshers as incidental catch, but they are generally more prevalent offshore, especially north of Point Conception. The first reported catch within the U.S. West Coast EEZ occurred in 1963 when a bigeye thresher was taken in a set gillnet in southern California. Although it is now a regular incidental species in the drift net fishery (NMFS, 2009), it is estimated that bigeye threshers comprise approximately only nine percent of the total thresher catch. Overall, bigeye thresher represents a minor component of U.S. West Coast fisheries; individuals taken within the management area are thought to be on the edges of their habitat ranges, and they are presumably not overexploited, at least locally (PFMC, 2003). Additionally, regulations to control for overutilization of common threshers in this region (described previously) would also confer benefits to the bigeye thresher shark, which is evidenced by the similar trajectories of West Coast commercial landings of both species.

Farther south in the Eastern Pacific, the level of utilization of bigeye thresher is unclear, as there is currently very little information regarding the status of bigeye thresher in the Eastern Pacific. Bigeye threshers are known bycatch in purse-seine and longline fisheries operating in this region. In 2005, bigeye thresher represented the most incidentally caught shark species in the Korean longline fishery operating in the Eastern Pacific (between 1°48′ S. ~7°00′ S. and 142°00′ ~149°13′ W.), comprising 12.8 percent of the total shark catch (Kim *et al.,* 2006). The bigeye thresher is also the most prevalent thresher species caught as bycatch in purse-seine fisheries operating in the Eastern Pacific. As previously described, thresher sharks (*Alopias* spp.) collectively represented approximately three percent of the species observed during the Shark Characteristics Sampling Program, with bigeye threshers comprising one percent of the catch, and unidentified threshers representing 0.7 percent. Thresher bycatch in this fishery increased from 9 mt in 2010 to 17 mt in 2011, and has remained stable between 10–11 mt since.

Bigeye threshers are also reported in fisheries records from the principal port of Manta, Ecuador; however, they comprise a minor portion of the total shark catch and even the total thresher catch. In fact, the pelagic thresher is the dominant thresher species landed in Ecuador, comprising up to 92 percent of thresher shark landings (Reardon *et al.,* 2009), and representing 36 percent of the total shark catch. In contrast, the bigeye thresher comprises approximately 3 percent of the total shark catch in Ecuador (Amorim *et al.,* 2009). Thus, while Carr *et al.* (2013) reported that bigeye threshers and blue sharks comprised 87 percent of shark fins in a seizure of illegal fins from the Galapagos Marine Reserve, given that 64 percent of the thresher sharks from this catch had their heads removed, and genetic testing was not conducted to identify to species, there is some uncertainty as to whether all of the sharks were actually bigeye thresher. It is possible that some of the thresher sharks illegally taken were misidentified pelagic threshers. Thus, while bigeye thresher sharks are somewhat prevalent as bycatch in various fisheries in the Eastern Pacific Ocean, they seemingly comprise a relatively small portion of the total shark catch in several areas. Therefore, we conclude that overutilization is not likely occurring in this portion of the species' range, such that the species is experiencing an increased risk of extinction throughout its global range.

In the Western and Central Pacific, bigeye threshers are regularly caught as bycatch in longline fisheries throughout the region. Longline fishing effort in this region has steadily increased since 1995 primarily in the South Pacific, and nearly half the effort occurs in tropical and equatorial waters where bigeye threshers have shown the highest CPUEs (Matsunaga & Yokawa, 2013; Rice *et al.,* 2015). Several analyses of fisheries data are available from the Western and Central Pacific; however, as previously mentioned, most of the information available is for the thresher complex, with the exception of observer data from the Hawaii-based pelagic longline fishery. Bigeye thresher sharks are the third most frequently caught elasmobranch in Hawaii tuna fisheries and the most commonly encountered thresher species in the observer data. The Hawaii-based longline fishery has observed an increase in the number of bigeye threshers caught as bycatch on tuna targeted trips. While participation, number of hooks, and number of tuna targeted trips have been slowly increasing since 2010 (PIFSC, 2014), standardized CPUE derived from observer data indicates that abundance of bigeye thresher has been relatively stable since 1994, with a potentially substantial increase in recent years. Based on this information, the ERA team concluded, and we agree, that the bigeye thresher shark population appears relatively stable in this region of the Central Pacific Ocean.

The bigeye thresher shark appears to be an important species in other longline fisheries of the Western and Central Pacific as well. Some reliable fisheries data from Japanese longline observer data indicate that bigeye thresher was the second most commonly caught shark species from 1992–2006, comprising 10.9 percent of the total shark catch (Matsunaga and Yokawa, 2013). Catch estimates indicate that removals have been stable over the last decade, and some analyses indicate slight increases in catch rates of thresher sharks in certain areas, although no clear temporal trend was detected (Clarke, 2011; Lawson, 2011). The bigeye thresher is also an important species in Taiwanese longline fisheries targeting tuna, comprising approximately five percent of the total shark catch (Liu and Tsai, 2011). Although catches of bigeye threshers have increased over time in Taiwanese longline fisheries, information regarding corresponding effort is not available to discern abundance trends. As previously discussed, bigeye thresher appears to be a common bycatch species in RMI longline fisheries, with 1,636 bigeye thresher sharks caught from 2005–2009 (Bromhead *et al.* 2012); however, we could not discern any abundance trends from these data.

As described previously in the common thresher *Overutilization for Commercial, Recreational, Scientific or Educational Purposes* section, the most recent standardized CPUE data from 2002–2014 for the Western and Central Pacific based on data holdings of the SPC, show a decreasing trend for the thresher complex from 2011–2013 (Rice *et al.,* 2015). While the last 3 years of both the standardized and nominal thresher CPUEs show a decline, the standardized CPUE from the thresher complex is difficult to interpret, as the second most commonly reported thresher species is the general ''thresher shark'' category. Additionally, while it appears the thresher shark complex is declining sharply at the last data point, this is based on relatively few data, which may not be robust and likely exaggerates the trend in the last year. In terms of biological indicators, the majority of observed thresher sharks occurred in a region of the Central Pacific just south of Hawaii, where the lengths of both male and female sharks were relatively stable throughout the time period. Overall, despite increasing fishing pressure over the past 20 years, focused predominantly in tropical areas where all life stages of bigeye thresher would likely occur (including potential nursery areas), recent available abundance indices have not shown any significant or ongoing population decline that would be cause for concern. Based on this information, the ERA team did not deem the declining trend in the last 3 years to be so significant to conclude that overutilization is occurring throughout the entirety of the Western and Central Pacific. The ERA team emphasized, and we agree, that the present level of fishing pressure on bigeye thresher in this region is highly variable, both spatially and temporally, as evidenced by increasing trends in Hawaiian fisheries compared to slightly declining trends for the rest of the Western and Central Pacific. Thus, based on the best available information, current levels of bigeye thresher mortality in commercial fisheries are not likely contributing to overutilization of the species throughout the entirety of the Western and Central Pacific, such that the species has a high risk of extinction throughout its global range, now or in the foreseeable future.

In the Northwest Atlantic, the bigeye thresher is a common bycatch species in the U.S. pelagic longline fishery, with relatively high post-capture mortality rates. As previously discussed (see the common thresher *Overutilization* section), fisheries data from the Northwest Atlantic show a significant historical decline in the thresher population (common and bigeye threshers combined), likely due to exploitation of the species. While these data are not species-specific, the bigeye thresher is thought to be the more common of the two species. For example, observer data from 1992–2005 recorded 627 bigeye threshers, representing 81 percent of the identified thresher catch (in contrast to only 148 common thresher sharks recorded over the same time period, representing 19 percent of the identified thresher catch). This does not include the 1,067 thresher sharks that were not identified to species level (Baum and Blanchard, 2010). Nonetheless, despite the historical decline of thresher sharks in the Northwest Atlantic, the ERA team conducted a species-specific analysis using observer data from 1992–2013 and found no obvious change in the population trend over time for the bigeye thresher shark. This analysis indicates that the population in this region has likely stabilized since 1990. While we acknowledge that fishing pressure on thresher sharks began over two decades prior to the start of this time series (*i.e.,* estimated historical declines are not from virgin biomass and the stabilization of the bigeye thresher population is therefore at a diminished abundance), existing regulations in this portion of the species' range appear to be minimizing this threat (see *Inadequacy of Existing Regulatory Mechanisms* section below for more details). Therefore, the ERA team concluded, and we agree, that overutilization in this portion of the species' range is not likely significantly contributing to a high risk of extinction for the species throughout its global range, now or in the foreseeable future.

As previously noted, fisheries data for thresher sharks in the Northeast Atlantic and Mediterranean are scarce and unreliable due to the mixing of both thresher species in the records. The bigeye thresher has been poorly documented in the Mediterranean and is considered scarce or rare (Amorim *et al.,* 2009); most of the available information from this region is for the common thresher. In fact, the bigeye thresher is often referred to as ''False Thresher'' in this region as a result of a perceived low local value (Cavanagh and Gibson, 2007). Although available data on catch trends for this species are lacking in the region, an increasing number of new records in recent years from the eastern Mediterranean (sometimes multiple captures) demonstrate that this species is widely distributed to the east of Malta, occurring in the waters off Israel (Levantine basin), in the Aegean Sea off Turkey and southern Greece, and off southern Crete. Evidence from offshore pelagic fisheries in southern Sicily and Malta indicate that bigeye thresher is caught in unknown numbers each year, but routinely discarded at sea (Cavanagh and Gibson, 2007). However, due to the lack of information regarding bigeye thresher catch trends, it is difficult to determine the status of bigeye thresher in the Mediterranean, and whether the species' scarce abundance in this region is a result of population declines due to fishing pressure or its natural rarity, or both.

In the South Atlantic, bigeye thresher sharks are caught as bycatch in various longline fisheries, including those of Brazil, Uruguay, Taiwan, Japan, Venezuela, and Portugal, where they have shown to have high bycatch-related mortality rates. However, as previously noted, there is little information on the catch rates or trends in abundance of thresher sharks in the South Atlantic, with some countries still failing to collect or report shark data. Based on observer data from 1994–2000, bigeye thresher represented only 2.2 percent of the total shark catch in the Venezuelan pelagic longline fishery; however, without corresponding effort data, discernable temporal trends are unavailable. Similarly, low CPUE rates were observed in Uruguayan longline fisheries despite high fishing pressure from 2001 to 2005; however, with such a short time series, temporal trends were also not discernable from this fishery. The only fishery for which a temporal trend is available is from the prominent Brazilian Santos and Guaruja tuna longline fishery that operates in the Southwest Atlantic. Standardized CPUE of bigeye thresher from this fishery showed a slight decline from 1978 to 2006, with bigeye threshers disappearing from the catch altogether in 2006. However, a shift in the distribution of fishing effort also occurred in 2006, moving from the equatorial Atlantic between 7° N. and 5° S. to around 20° S. Thus, the disappearance of bigeye threshers from Brazilian longline catch can likely be attributed to the shift of fishing effort into more temperate waters, where the species is less prevalent. Given the high fishing pressure in this portion of the range, with evidence of high bycatch-related mortality and slight declines in CPUE, overutilization is potentially negatively affecting the species in this part of its range. However, with only a slight decline in CPUE over the past several decades, and a geographical shift in effort of the Brazilian longline fleet to more temperate latitudes, fishing pressure on bigeye thresher may be on a decline in this part of its range and is likely not contributing to overutilization of the species such that it places the species at a high risk of extinction throughout its global range, now or in the foreseeable future.

Overall, according to an ERA conducted in 2008 by the ICCAT Standing Committee on Research and Statistics for shark and ray species typically taken in Atlantic pelagic longline fisheries, Atlantic bigeye thresher sharks were identified as one of the least productive and most vulnerable sharks of the species examined. In addition, other more recent ERAs also found that the bigeye thresher's combination of low productivity and high susceptibility to pelagic longline gear places the species at a high risk of overexploitation (Cortés *et al.* 2010; Cortés *et al.,* 2012). The bigeye thresher's vulnerability to Atlantic fisheries is further confirmed by Gallagher *et al.* (2014) who found bigeye thresher emerged as one of the most vulnerable to longline bycatch mortality, as a result of the species' combined low fecundity and productivity, moderate age of maturity ranking, and low mean survival rate when caught (around 48 percent). However, despite the species' vulnerability to pelagic longline fisheries in the Atlantic, there is no evidence to suggest that the Atlantic bigeye thresher population has declined so significantly such that the species' global persistence is presently in question.

The bigeye thresher shark has been reported in the catches of several fisheries operating in the Indian Ocean. While there are no abundance trends for bigeye thresher in the Indian Ocean, the IOTC acknowledges, and the ERA team agreed, that bycatch rates and associated mortality of bigeye thresher shark are likely high in Indian Ocean longline fisheries. Landings data reported to the IOTC are reported for the thresher complex and not identified to species, thus it is difficult to interpret this information with respect to bigeye thresher. However, given the bigeye thresher's high hooking mortality rate, the intensive fishing pressure in this region may be contributing to the overutilization of the species in the Indian Ocean. We note that this threat may also be exacerbated by the species' relatively high vulnerability to fisheries due to its slow growth and low productivity. Thus, in the absence of any trend data, we concluded conservatively that overutilization in the form of bycatch-related fishing mortality is likely contributing to population declines and increasing this species' risk of extinction in the Indian Ocean in the foreseeable future, although there are significant uncertainties. However, it should also be noted that longline fishing effort in the Indian Ocean appears to be declining as well as shifting to more temperate waters (Ardill *et al.,* 2011) where bigeye threshers are less prevalent, which could potentially reduce fishing pressure on the species. Overall, based on the best available information, the ERA team agreed that overutilization of bigeye thresher in the form of indirect and direct fishing pressure is likely occurring in the Indian Ocean, but also noted that overutilization of the species in one particular region does not necessarily equate to a high risk of extinction to the global population, now or in the foreseeable future.

The ERA team did not identify recreational fisheries as a threat to the bigeye thresher shark throughout its range. Although common threshers comprise an important aspect of the recreational fishery in southern

California, it is not known whether bigeye threshers enter the California recreational fishery on any regular basis, but presumably only few are taken. Further, there are no records of bigeye threshers from the recreational fishery off Oregon or Washington (NMFS, 2007), and in fact, a strict prohibition on recreational fishing of all thresher species was implemented in Washington State in 2013. Farther west in Hawaii, there were no catch records of bigeye thresher in the Hawaii recreational survey from 2003–2014 (Pers. comm. with NMFS Fisheries Statistics Division, October 14, 2015). In the Northwest Atlantic, data are generally extremely sparse for this species in U.S. recreational fisheries. Since prohibition of this species was implemented in 1999, there has been no observed recreational harvest of this species, with the exception of years 2002 and 2006, in which expanded survey estimates (which are highly unreliable due to large associated variances) estimated that 65 and 42 bigeye thresher sharks were caught and harvested, respectively (NMFS 2012; 2014). In fact, in most years of recreational data, dating back to 1981 and combining information from the Large Pelagics Survey and general Marine Recreational Information Program survey, bigeye threshers are typically not observed, with only 5 years showing bigeye threshers either landed or released alive throughout the Northwest Atlantic and Gulf of Mexico (Pers. comm. from NMFS, Fisheries Statistics Division, October 14, 2015). We could not find any additional information on bigeye thresher in recreational fisheries outside of the United States. Thus, based on the best available information, we conclude that recreational fisheries are not currently a threat to the bigeye thresher shark, such that it places the species at an increased risk of extinction throughout its global range.

Finally, the ERA team assessed the threat of the shark trade to the global extinction risk of the bigeye thresher. As previously described, the thresher complex has been reported as comprising approximately 2.3 percent of the shark fin trade; however, the proportion of bigeye thresher in the fin trade is unknown. As discussed previously in the common thresher assessment, based on genetic analyses of fins in markets of major shark fin exporting countries throughout the range of the species, including Taiwan, Indonesia, and UAE, bigeye thresher fins have commonly been identified as present. In fact, bigeye thresher fins comprised approximately 7 percent of fins in numerous markets across Indonesia, which is one of the largest shark catching nations in the world. However, overall, the ERA team concluded that thresher sharks as a whole represent a relatively small portion of the fin trade, and the situation regarding the fin trade may be improving, as evidenced by a decline in both price and demand for fins. In fact, landings of thresher sharks in particular have declined in both Hawaii and American Samoa, which has been attributed to regulations prohibiting shark finning in the United States. Additionally, and as previously noted, thresher sharks were not historically identified as ''preferred'' or ''first choice'' species for fins, with some traders considering thresher fins to be of low quality and value (Rose, 1996; FAO, 2002; Clarke, pers. comm. 2015). Furthermore, recent studies suggest that due to a waning interest in fins, the shark fin market is declining, and a surge in the trade of shark meat has occurred in recent years (Dent and Clarke, 2015; Eriksson and Clarke, 2015). However, as previously discussed in the common thresher *Overutilization for Commercial, Recreational, Scientific or Educational Purposes* section, it is unlikely that this shift in the shark trade would create new markets or increased demand for thresher species. This is particularly true for the bigeye thresher because it is not as highly regarded for human consumption due to the lower quality of the meat (Vannuccini, 1999). Therefore, based on the best available information, the ERA team concluded, and we agree, that although the bigeye thresher shark is likely more prevalent in the shark fin trade relative to the common thresher, finning for the shark fin trade is not a threat contributing to the overutilization of the species to the point that it significantly increases the species' risk of extinction throughout its global range, now or in the foreseeable future.

Disease or Predation

The ERA team did not identify disease or predation as potential threats to the bigeye thresher shark, as they did not find evidence to suggest that either is presently contributing significantly to the species' risk of extinction. Like common thresher sharks, bigeye thresher sharks likely carry a range of parasites, including external copepods and cestodes. As previously described, nine species of copepods, genus *Nemesis,* parasitize thresher sharks. These parasites attach themselves to gill filaments, and can cause tissue damage which can then impair respiration in the segments of the gills (Benz and Adamson, 1999). The known parasite fauna of the bigeye thresher and associated references are reviewed in Gruber and Compagno (1981) and detailed in the status review report (see Young *et al.,* 2015); however, the magnitude of impact these parasites may have on the health of bigeye thresher shark is unknown, but likely minimal.

Predation is also not thought to be a factor influencing bigeye thresher numbers, as the bigeye thresher is a large shark with limited numbers of predators during all life stages. While they may be preyed upon by mako sharks, white sharks, killer whales, and even large sea lions, there is no information to suggest that this level of opportunistic predation is affecting bigeye thresher populations. Therefore, based on the best available information, the ERA team concluded, and we agree, that neither disease nor predation is currently placing the species in danger of extinction throughout its global range, now or in the foreseeable future.

Inadequacy of Existing Regulatory Mechanisms

The ERA team evaluated existing regulatory mechanisms to determine whether they may be inadequate to address threats to the bigeye thresher shark. Existing regulatory mechanisms may include Federal, state, and international regulations for commercial and recreational fisheries, as well as the international shark trade. Below is a brief description and evaluation of current and relevant domestic and international management measures that may affect the bigeye thresher shark. Since many of the broader regulatory mechanisms that may affect sharks in general were already discussed in the common thresher *Inadequacy of Existing Regulatory Mechanisms* section of this finding (*e.g.,* U.S. regulations to conserve and manage shark species), the following will only cover the existing regulatory mechanisms specific to bigeye thresher, and in the regions where overutilization was deemed a potential threat to the species or in regions that were not addressed in the common thresher assessment (*e.g.,* Caribbean). More information on these domestic and international management measures can be found in the status review report (Young *et al.,* 2015) and other recent status reviews of other shark species (Miller *et al.,* 2013; 2014).

In the Northwest Atlantic, in addition to all of the previously described regulatory mechanisms regarding U.S. HMS fisheries for pelagic sharks, the U.S. FMP for Atlantic Tunas, Swordfish, and Sharks implemented a specific measure in 1999 that effectively prohibited retention of bigeye thresher sharks, among several other pelagic shark species. The designation of bigeye thresher shark as a prohibited species was a precautionary measure to ensure that directed fisheries and/or markets did not develop. However, we recognize that bigeye threshers are still incidentally caught as bycatch on pelagic longlines and in gillnets in the Northwest Atlantic, and have relatively high bycatch-related mortality rates. For example, since the prohibition on bigeye threshers came into effect in 2000, approximately 1,493 lb, dressed weight (677 kg) of bigeye thresher were landed in the Atlantic (NMFS, 2012; 2014) despite its prohibited status, although this equates to few sharks based on average weight. Further, the United States reported that bigeye thresher represented one of the largest amounts of dead discards in the Atlantic commercial fleet, reporting a total of 46 mt in 2009 and 27 mt in 2010 (NOAA, 2010 and 2011 Reports to ICCAT). However, in the most recent available report to ICCAT, bigeye thresher sharks were not listed among the largest amounts of dead discards. In fact, in 2012 and 2013, NMFS reported prohibited shark interactions of bigeye thresher to ICCAT, with a total of 38 and 33 mt of bigeye threshers caught as bycatch, respectively, with more than half released alive (NMFS, 2013; 2014). Therefore, these bycatch numbers are down significantly from earlier reports of hundreds of thresher sharks caught as bycatch in the late 1980s and early 1990s (NMFS 2009 Report to ICCAT), which was prior to management regulations. Although we recognize that bigeye threshers are still caught and discarded in these fisheries, the ERA team determined that current levels may be sustainable, as evidenced by a continuing stable CPUE trend based on observer data, which accounts for bycatch-related mortality. In fact, as previously discussed, recent standardized CPUE data for the bigeye thresher shark suggest the population has stabilized since the 1990s, which corresponds to the advent of pelagic shark species management as well as species-specific management measures for the bigeye thresher.

In addition, the HMS Management Division recently published an amendment to the Consolidated HMS FMP that specifically addresses Atlantic HMS fishery management measures in the U.S. Caribbean territories (77 FR 59842; Oct. 1, 2012). Due to substantial differences between some segments of the U.S. Caribbean HMS fisheries and the HMS fisheries that occur off the mainland of the United States (including permit possession, vessel size, availability of processing and cold storage facilities, trip lengths, profit margins, and local consumption of catches), the HMS Management Division implemented measures to better manage the traditional small-scale commercial HMS fishing fleet in the U.S. Caribbean Region. Among other things, this rule created an HMS Commercial Caribbean Small Boat (CCSB) permit, which: Allows fishing for and sales of big-eye, albacore, yellowfin, and skipjack tunas, Atlantic swordfish, and Atlantic sharks within local U.S. Caribbean market; collects HMS landings data through cooperation with NMFS and existing territorial government programs; authorizes specific gears; is restricted to vessels less than or equal to 45 feet (13.7 m) length overall; and may not be held in combination with any other Atlantic HMS vessel permits. However, at this time, fishermen who hold the CCSB permit are prohibited from retaining Atlantic sharks, and are restricted to fishing with only rod and reel, handline, and bandit gear under the permit. Both the CCSB and Atlantic HMS regulations will help protect bigeye thresher sharks while in the Northwest Atlantic Ocean, Gulf of Mexico, and Caribbean Sea.

In addition to U.S. regulatory mechanisms, there are also international regulatory mechanisms specific to bigeye thresher in the Atlantic Ocean. In 2009, ICCAT adopted Recommendation 09–07, which prohibits the retention of bigeye threshers caught in association with ICCAT-managed fisheries. Each Contracting Party to ICCAT is responsible for implementing this recommendation, and currently there are approximately 47 contracting parties (including the United States, the EU, Brazil, Venezuela, Senegal, Mauritania, and many other Central American and West African countries). The ICCAT Recommendation 09–07 includes a special exception for a Mexican small-scale coastal fishery with a catch of less than 110 fish. Based on the nominal catch data from ICCAT, it appears that catches of bigeye thresher sharks by ICCAT vessels have been on a decline since the implementation of this measure. Prior to Recommendation 09–07, average reported bigeye thresher catch was approximately 82 mt per year (range: 0 to 185 mt; 1993–2009). In 2014, only fleets operating under U.S., Brazil, and Trinidad and Tobago flags reported catches of bigeye thresher sharks (total = 25 mt). These declining numbers reported by ICCAT vessels may be a reflection of the efficacy of Recommendation 09–07 for reducing the number of landed bigeye thresher sharks, as well as the previously described regulation implemented by Spain, a main thresher catching country in the Atlantic, that prohibits the landing and sale of any thresher species. Although these retention bans do not address bycatch-related mortality, they likely provide some benefit to the bigeye thresher shark, particularly given that the species was historically retained as bycatch in ICCAT fisheries. Therefore, although the bigeye thresher has relatively high vulnerability (susceptibility and productivity) to ICCAT fisheries, regulations prohibiting the retention of bigeye thresher sharks help to minimize the threat of overutilization of this species within the Atlantic Ocean.

In the Western and Central Pacific, the Western and Central Pacific Fisheries Commission (WCPFC) is the main regulatory body for the management of sharks. Unlike ICCAT and IOTC, the WCPFC has no regulatory measures specific for the conservation of thresher sharks. However, thresher sharks are designated as ''key shark species'' in the WCPFC area, which means they are nominated for the purposes of either data provision and/or assessment. Thresher sharks were nominated for assessment and are thus included in the WCPFC's Shark Research Plan. Additionally, the WCPFC has implemented a number of conservation management measures (CMMs), that, although have variable implementation rates by the WCPFC members (CCMs), likely confer some conservation benefits for bigeye thresher, including reporting requirements and a five percent fin to carcass ratio (CMM 2010–07). As previously discussed in the common thresher *Inadequacy of Existing Regulatory Mechanisms* section of this finding, we note a number of issues regarding the five percent fin to carcass ratio. However, in a recent study of longline fisheries (Rice *et al.* 2015), the percentage of key shark species that were finned reduced from 2010 to 2013, with the last year of the study showing an increase in finning and a decrease in the number of sharks retained. The decrease in finning from 2010 to 2013 corresponded with an increase in retention, which would be the expectation if fishers were beginning to retain the carcass to adhere to CMM 2010–07 (the five percent fin to carcass rule) (Rice *et al.* 2015). However, this could also be due to the growing demand for shark meat and a waning interest in shark fins, as discussed earlier (see Dent and Clarke (2015) and Eriksson and Clarke (2015) for more details). Despite the increase in finning of key shark species in the last year of the Rice *et al.* (2015) study, the fate of thresher sharks in longline gear shows a declining trend in the number of threshers finned since 2007 in the Western and Central Pacific Ocean. This may be indicative of the efficacy of conservation measures in this region, although this remains uncertain. More recently, however, the WCPFC also adopted CMM 2014–05 (effective July 2015) that requires each national fleet to ban the use of wire trace as branch lines or leaders and shark lines, which has been shown to significantly reduce shark bycatch in the first place.

As previously noted, inadequate regulatory mechanisms to control for overutilization of thresher species were noted as problematic throughout the Indian Ocean. The IOTC is the only RFMO that has specific regulations for all three thresher species. In 2010, the IOTC implemented Resolution 12/09 on the conservation of thresher species, which prohibits retaining on board, transhipping, landing, storing, selling or offering for sale any part or whole carcass of thresher sharks of all the species of the family Alopiidae. However, despite the prohibition on landings of *Alopias* spp., reported landings of unidentified thresher species have continued through 2012, indicating that regulations in the Indian Ocean may not be fully implemented or enforced. In fact, thresher sharks were marketed in local markets up until at least early 2011 despite IOTC Resolution 12/09. However, the IOTC reported 0 mt of bigeye thresher in their most recent catch estimates for 2013 and 2014 (IOTC, 2015), which may indicate that CPCs are beginning to adhere to the retention ban. Nevertheless, the IOTC itself acknowledges that its own retention ban for thresher sharks may not be adequate for the bigeye thresher shark due to its high bycatch-related mortality rates, low productivity, as well as high rates of illegal fishing and the reluctance of CPCs to adequately report discards in the Indian Ocean. However, as of 2015, the IOTC recommended that the retention ban remain in place, as it likely confers some conservation benefit (albeit limited) to bigeye thresher. Thus, due to the high fishing pressure in this region, combined with likely ineffective implementation and enforcement of regulations, the IOTC's main regulation to conserve thresher species may be ineffective (IOTC, 2014). Like the WCPFC, the IOTC also prohibits fins onboard that weigh more than five percent of the weight of sharks to curb the practice of shark finning. As previously noted, these regulations do not prohibit the fishing of sharks and there are a number of issues related to the five percent fin to carcass ratio. However, unlike the WCPFC, we have no information regarding the trend of finning of thresher sharks to determine whether these regulations have had any effect on the fate of thresher sharks in Indian Ocean longline fisheries. Thus, the ERA team concluded, and we agree, that regulatory mechanisms are likely inadequate to control for potential overutilization of bigeye thresher shark in the Indian Ocean. However, as previously noted, due to a lack of abundance estimates and catch records for bigeye thresher in this region, the magnitude of population decline in the Indian Ocean could not be determined. Further, the ERA team also concluded that overutilization and inadequate existing regulatory mechanisms in one portion of the species' range does not automatically place the species at a high risk of extinction globally, now or in the foreseeable future.

Although inadequate regulations to control for overutilization via the shark fin trade were an initial concern to the ERA team, as the bigeye thresher was identified to species in several genetic tests of fins in various portions of its range, and seemed to comprise a large portion of fins in markets across Indonesia (one of the largest shark catching countries in the world), we note that overall, thresher fins do not make up a large portion of the shark fin trade (~2.3 percent) relative to other species, such as blue, mako, and hammerhead sharks. Additionally, the reported 2.3 percent is for the thresher complex and likely includes a large number of pelagic thresher sharks, given their range and distribution overlaps with bigeye thresher, they comprise a significant component of thresher fins identified in the aforementioned genetic studies, and they comprise the majority of thresher catches in some areas. As noted previously, thresher shark fins are also not considered highly valued or ''first choice'' among some traders. Finally, and as previously discussed, the situation regarding the fin trade appears to be improving in some areas (refer back to common thresher—*Overutilization for Commercial, Recreational, Scientific, and Educational Purposes* section), with an overall decline in the global fin trade occurring in recent years. For example, a decrease in landings of thresher sharks was reported in Hawaii and American Samoa, which has been attributed to regulations that prohibit shark finning in the United States, and may also be indicative of the efficacy of these regulations. Further, several RFMOs, countries and local governments have enacted both shark finning and species-specific retention bans that likely confer some benefit to bigeye thresher sharks by reducing the number of sharks retained solely for their fins. We note these retention and finning bans may not be effective in some areas, such as the Indian Ocean; however, they may be more effective in other portions of the species' range. For example, the fate of thresher sharks as ''finned'' in the Western and Central Pacific has been on a decline since 2007. Additionally, since the implementation of ICCAT Recommendation 09–07 on the conservation of thresher sharks, as well as Spain's national retention ban for all thresher species, reported landings of bigeye thresher to ICCAT have significantly declined. This indicates that at least in some portions of the species' range, regulations may be adequate in their intended purpose. Overall, although bigeye thresher shark fins are somewhat prevalent in the shark fin trade, the effect of the shark fin trade (from both legal and illegal harvest) on their extinction risk was not viewed as a significant threat. Additionally, as both the supply and demand for shark fins continue to decrease (as demonstrated by the increase in finning regulations and decrease in shark fin consumption and price, respectively), so should the threat of finning and illegal harvest. While an increase in the demand for shark meat is apparent in recent years, we have no evidence to suggest that the bigeye thresher will experience new or increased demand as a result of this shift in the market (refer back to the common thresher *Overutilization for Commercial, Recreational, Scientific, or Educational Purposes* section for more details), particularly since bigeye thresher meat is not highly regarded as food due to its lower quality.

Based on the above review of regulatory measures (in addition to the regulations described in Young *et al.,* 2015), the ERA team concluded that these existing regulations are adequate and do not contribute to the species' extinction risk throughout its range, now or in the foreseeable future. The team noted that some areas of the species' range do have adequate measures in place to prevent overutilization, such as in the Northwest Atlantic where U.S. fishery management measures are helping to monitor the catch of bigeye threshers, preventing any further population declines. These U.S. conservation and management measures (as previously summarized) are viewed as adequate in decreasing the extinction risk to the bigeye thresher shark in this portion of its range by minimizing demographic risks (preventing further abundance declines) and the threat of overutilization (strictly prohibiting bigeye threshers in both commercial and recreational fisheries) currently and in the foreseeable future. Likewise, U.S. management regulations for the Hawaii-based pelagic longline fishery are also likely adequate in reducing impacts to the bigeye thresher, as evidenced by a stable and possibly increasing abundance trend of the species in this region of the Central Pacific. Although regulations specific to bigeye thresher sharks are lacking in other parts of its range, it is unclear whether overutilization presents a significant threat to the species in these regions (see *Overutilization for Commercial, Recreational, Scientific or Educational Purposes* section discussed earlier in this notice), and thus it is difficult to determine whether the inadequacy of current regulatory measures is placing the species at an increased risk of extinction throughout its global range. Overall, implementation and enforcement of regulatory mechanisms is variable throughout the range of the bigeye thresher. We recognize the mere existence of regulatory mechanisms does not necessarily equate to their effectiveness in achieving their intended purpose. Issues related to community awareness, compliance, enforcement, regional priorities, and complex political climates within many countries in which thresher sharks occur can limit the effectiveness of well-intended statutes and legislation. However, based on the best available information, we find that although improvements are needed in the monitoring and reporting of fishery interactions of this species, the threat of inadequate existing regulatory mechanisms is not likely causing the species to have a high risk of extinction throughout its global range, now or in the foreseeable future.

Other Natural or Manmade Threats

As previously described, the ERA team assessed the effects of climate change as a potential threat to bigeye thresher sharks; however, since most of the studied impacts from climate change are habitat-focused, the threat of climate change is addressed in the *Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range* section of this finding. Other threats that fall under Factor E (ESA section 4(a)(1)(E)), including pollution and potential threats to important prey species are addressed in the status review report (Young *et al.,* 2015), but were not identified as threats that rose to the level of increasing the species' risk of extinction.

Overall Risk Summary

Guided by the results 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 bigeye thresher shark now and in the foreseeable future. The ERA team concluded that the bigeye thresher shark is currently at a low risk of extinction. However, due to a lack of abundance trends and catch data for a large portion of the species' range, the ERA team expressed uncertainty by spreading their likelihood points across all categories. Likelihood points attributed to the overall level of extinction risk categories were as follows: Low Risk (34.5/70), Moderate Risk (30.5/70), High Risk (5/70). The ERA team reiterated that across the species' range, regional abundance trends are highly variable, with no clear trend for the global population. There is also no evidence to suggest depensatory processes are currently at work. The species is found globally, throughout its historical range, appears to be well-adapted, and is not limited by habitat. Although the global abundance of bigeye thresher shark is highly uncertain, none of the available regional studies that reported recent standardized CPUEs (Northwest Atlantic, South Atlantic, Hawaii, Western and Central Pacific), and give some insight into the species' current abundance, show a significant or continuing decline such that demographic risks are significantly contributing to the species' risk of extinction. Based on most recent fisheries data, the ERA team concluded that at least some populations of bigeye thresher are not overutilized and current fishing pressure and associated mortality on these populations may be sustainable. We recognize that the bigeye thresher's tropical distribution may increase the species' exposure to many high seas industrial fisheries operations throughout its range, particularly where fishing pressure is likely highest within the Indo-Pacific. This is evidenced by the fact that the species is commonly observed or caught throughout this portion of its range (including where regulations may be inadequate—which may increase the impact of this potential threat on its contribution to the extinction risk of the species) and is present in several genetic tests of shark fins throughout its range, indicating that the species is utilized to some degree in the shark fin trade. We recognize that the bigeye thresher may be experiencing some degree of population decline in the Western and Central Pacific and Indian Oceans; however, the magnitude of decline in the Western and Central Pacific was considered to be ''slight'' in recent years, with a conservative assumption that the available CPUE and landings data (which are reported for the thresher complex (all three *Alopias* spp.)) are indeed reflective of trends in bigeye thresher. Additionally, the potential decline in the Indian Ocean is considered to be highly uncertain given that fisheries data (including nominal and standardized CPUE trends) are largely lacking from this portion of the species' range, with landings data also pooled for all thresher species. However, the ERA team agreed that the potential declines of bigeye thresher in these portions of its range are not likely to be so severe such that they place the species at a high risk of extinction throughout its global range, now or in the foreseeable future.

The available information indicates that most of the observed declines occurred historically, before any significant management regulations were in place. Since then, current regulatory measures in some parts of the bigeye thresher range are reducing the threat of overutilization, and likely preventing further abundance declines in these portions in the foreseeable future. Therefore, the ERA team concluded that at least some populations are not suffering from overutilization and are well managed, thus decreasing the likelihood of extinction of the global population. The ERA team acknowledged that given the species' low productivity and high bycatch-related mortality rates, it is generally more vulnerable to unsustainable levels of exploitation. However, given the best available information, the ERA team concluded that over the next 50 years, it is unlikely that the bigeye thresher shark has a high risk of extinction throughout its global range, now or in the foreseeable future, due to current trends in its abundance, productivity, spatial structure, or diversity or influenced by depensatory processes, effects of environmental stochasticity, or catastrophic events.

Significant Portion of Its Range

If we find that the bigeye thresher is not in danger of extinction now or in the foreseeable future throughout all of its range, we must go on to evaluate whether the species is in danger of extinction, or likely to become so in the foreseeable future, in a ''significant portion of its range'' (79 FR 37578; July 1, 2014). Please refer back to the common thresher *Significant Portion of Its Range* section of this finding for detailed information regarding the SPR Policy and process.

Applying the SPR policy to the bigeye thresher shark, we first evaluated whether there is substantial information indicating that the species may be threatened or endangered in any portion of its range. After a review of the best available information, the ERA team concluded, and we agree, that the Indian Ocean likely has more concentrated threats than other portions of the bigeye thresher's range due to the intensive fishing pressure in this region, combined with the species' high rates of bycatch-related mortality and low productivity. However, with virtually no information regarding abundance trends or catch data of bigeye thresher from this region, we cannot conclude that the species is in danger of extinction or likely to become so in the foreseeable future in this portion of its range. Even if the bigeye thresher was in danger of extinction in the Indian Ocean (or likely to become so in the foreseeable future), the ERA team concluded that the loss of the Indian Ocean population of bigeye thresher would not result in the remainder of the species being endangered or threatened. In particular, we did not find substantial evidence to indicate that the loss of this portion would result in a level of abundance for the remainder of the species to be so low or variable, that it would cause the species to be at a moderate or high risk of extinction due to environmental variation, anthropogenic perturbations, or depensatory processes. Bigeye thresher sharks are highly mobile, globally distributed, and have no known barriers to migration. Although there is preliminary evidence of possible genetic partitioning between ocean basins, this was based on one study with a limited sample size (see Trejo, 2005_ENREF_224). Thus, there is no substantial evidence to suggest that the loss of the Indian Ocean portion of its range would severely fragment and isolate the species to the point where the remaining populations would be at risk of extinction from demographic processes. In fact, we found no information that would suggest that the remaining populations could not repopulate the lost portion, and, if for some reason the species could not repopulate the lost portion, it would still not constitute a significant risk of extinction to the remaining populations. We did not find substantial evidence to indicate that the loss of genetic diversity from one portion (such as loss of the Indian Ocean population) would result in the remaining population lacking enough genetic diversity to allow for adaptations to changing environmental conditions. Additionally, areas exhibiting source-sink dynamics, which could affect the survival of the species, were not evident in any part of the bigeye thresher shark range. There is also no evidence of a portion that encompasses aspects that are important to specific life history events but another portion that does not, where loss of the former portion would severely impact the growth, reproduction, or survival of the entire species. There is also limited information regarding nursery grounds or other important habitats utilized by the species that could be considered limiting factors for the species' survival. In fact, we found evidence that there are likely reproductive grounds and nursery areas in all three major ocean basins. In other words, the viability of the species does not appear to depend on the productivity of the population or the environmental characteristics in any one portion. Overall, we did not find any evidence to suggest that any specific portion of the species' range had increased importance over any other with respect to the species' survival. As such, we did not identify any portions of the bigeye thresher range, including the Indian Ocean, that meet both criteria under the SPR Policy (*i.e.,* the portion is biologically significant *and* the species may be in danger of extinction in that portion, or likely to become so within the foreseeable).

Final 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 (80 FR 48061; August 11, 2015), the status review report (Young *et al.,* 2015), and other published and unpublished information, and have consulted with species experts and individuals familiar with bigeye thresher sharks. We considered each of the ESA Section 4(a)(1) factors to determine whether it presented an extinction risk to the species on its own. We also considered the combination of those factors to determine whether they collectively contributed to the extinction of the species. As previously explained, no portion of the species' range is considered significant, so we concluded that the species is not threatened or endangered in a significant portion of its range. 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 entire range.

We conclude that the bigeye thresher shark is not presently in danger of extinction, nor is it likely to become so in the foreseeable future, throughout all of its range. We summarize the factors supporting this conclusion as follows: (1) The species is broadly distributed over a large geographic range, with no barrier to dispersal; (2) its current range is indistinguishable from its historical range and there is no evidence of habitat loss or destruction; (3) while the species possesses life history characteristics that increase its vulnerability to harvest, and has been found to be more susceptible to pelagic longline fisheries compared to other shark species (based on results from Ecological Risk Assessments), the species is still regularly encountered in fisheries and appears sustainable in some portions of its range despite decades of fishing pressure; (4) the best available information indicates that abundance is variable across the species' range, with reports of localized population declines but also evidence of stable and/or increasing abundance estimates; (5) based on the ERA team's assessment, while the current population size has likely declined from historical numbers, it is sufficient to maintain population viability into the foreseeable future; (6) there is no evidence that disease or predation is contributing to an increased risk of extinction of the species; (7) existing regulatory mechanisms to address the most important threats to the species (harvest) are not inadequate throughout its range, such that they contribute significantly to the species' risk of extinction globally; (8) there is no evidence that other natural or manmade factors are contributing to an increased risk of extinction of the species; and (9) while the global population has likely declined from historical numbers, there is no evidence that the species is currently suffering from depensatory processes (such as reduced likelihood of finding a mate or mate choice or diminished fertilization and recruitment success) or is at risk of extinction due to environmental variation or anthropogenic perturbations.

Based on these findings, we conclude that the bigeye thresher shark is not currently in danger of extinction throughout all or a significant portion of its range, nor is it likely to become so within the foreseeable future. Accordingly, the bigeye thresher shark does not meet the definition of a threatened or endangered species, and thus, the bigeye thresher shark does not warrant listing as threatened or endangered at this time.

References

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

Authority

The authority for this action is the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 *et seq.*).

Dated: March 28, 2016.

Samuel D. Rauch III,

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

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