be the rate applicable to the PRC exporter that supplied that non-PRC exporter. These deposit requirements, when imposed, shall remain in effect until further notice.

Notification to Importers

This notice also serves as a preliminary reminder to importers of their responsibility under 19 CFR 351.402(f)(2) to file a certificate regarding the reimbursement of antidumping duties prior to liquidation of the relevant entries during the POR. Failure to comply with this requirement could result in the Department's presumption that reimbursement of antidumping duties occurred and the subsequent assessment of double antidumping duties.

These preliminary results are issued and published in accordance with sections 751(a)(1) and 777(i)(1) of the Act.

Dated: August 2, 2017.

Carole Showers,

Executive Director, Office of Policy performing the duties of Deputy Assistant Secretary for Enforcement and Compliance.

Appendix

List of Topics Discussed in the Preliminary Decision Memorandum

I. Summary
II. Background
III. Scope of the Order
IV. Discussion of the Methodology
  A. Partial Rescission
  B. NME Country Status
  C. Separate Rates
V. Recommendation

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DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

[Docket No. 160719634–7697–02]

RIN 0648–XE756

Listing Endangered and Threatened Wildlife and Plants; Notice of 12-Month Finding on a Petition To List the Pacific Bluefin Tuna as Threatened or Endangered Under the Endangered Species Act

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

ACTION: Notice of 12-month petition finding.

SUMMARY: We, NMFS, announce a 12-month finding on a petition to list the Pacific bluefin tuna (*Thunnus orientalis*) as a threatened or endangered species under the Endangered Species Act (ESA) and to designate critical habitat concurrently with the listing. We have completed a comprehensive status review of the species in response to the petition. Based on the best scientific and commercial data available, including the status review report, and after taking into account efforts being made to protect the species, we have determined that listing of the Pacific bluefin tuna is not warranted. We conclude that the Pacific bluefin tuna is not an endangered species throughout all or a significant portion of its range, nor likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. We also announce the availability of a status review report, prepared pursuant to the ESA, for Pacific bluefin tuna.

DATES: This finding was made on August 8, 2017.

ADDRESSES: The documents informing the 12-month finding are available by submitting a request to the Assistant Regional Administrator, Protected Resources Division, West Coast Regional Office, 501 W. Ocean Blvd., Suite 4200, Long Beach, CA 90802, Attention: Pacific Bluefin Tuna 12-month Finding. The documents are also available electronically at *http://www.westcoast.fisheries.noaa.gov/.*

FOR FURTHER INFORMATION CONTACT: Gary Rule, NMFS West Coast Region at *gary.rule@noaa.gov,* (503) 230–5424; or Marta Nammack, NMFS Office of Protected Resources at *marta.nammack@noaa.gov,* (301) 427–8469.

SUPPLEMENTARY INFORMATION:

Background

On June 20, 2016, we received a petition from the Center for Biological Diversity (CBD), on behalf of 13 other co-petitioners, to list the Pacific bluefin tuna as threatened or endangered under the ESA and to designate critical habitat concurrently with its listing. On October 11, 2016, we published a positive 90-day finding (81 FR 70074) announcing that the petition presented substantial scientific or commercial information indicating that the petitioned action may be warranted. In our 90-day finding, we also announced the initiation of a status review of the Pacific bluefin tuna and requested information to inform our decision on whether the species warrants listing as threatened or endangered under the ESA.

ESA Statutory Provisions

The ESA defines ''species'' to include any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any vertebrate fish or wildlife which interbreeds when mature (16 U.S.C. 1532(16)). The U.S. Fish and Wildlife Service (FWS) and NMFS have adopted a joint policy describing what constitutes a DPS under the ESA (61 FR 4722; February 7, 1996). The joint DPS policy identifies two criteria for making a determination that a population is a DPS: (1) The population must be discrete in relation to the remainder of the species to which it belongs; and (2) the population must be significant to the species 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, we interpret an ''endangered species'' to be one that is presently in danger of extinction. A ''threatened species,'' on the other hand, is not presently in danger of extinction, but is likely to become so in the foreseeable future (that is, at a later time). In other words, the primary statutory difference between a threatened and endangered species is the timing of when a species may be in danger of extinction, either presently (endangered) or in the foreseeable future (threatened).

We determine whether any species is endangered or threatened as a result of any one or a combination 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.

The petition to list Pacific bluefin tuna identified the risk classification made by the International Union for Conservation of Nature (IUCN). The IUCN assessed the status of Pacific bluefin tuna and categorized the species as ''vulnerable'' in 2014, meaning that the species was considered to be facing a high risk of extinction in the wild (Collette *et al.,* 2014). Species classifications under IUCN and the ESA are not equivalent; data standards, criteria used to evaluate species, and treatment of uncertainty are not necessarily the same. Thus, when a petition cites such classifications, we will evaluate the source of information that the classification is based upon in light of the ESA's standards on extinction risk and threats discussed above.

Status Review

As part of our comprehensive status review of the Pacific bluefin tuna, we formed a status review team (SRT) comprised of Federal scientists from NMFS' Southwest Fisheries Science Center (SWFSC) having scientific expertise in tuna and other highly migratory species biology and ecology, population estimation and modeling, fisheries management, conservation biology, and climatology. We asked the SRT to compile and review the best available scientific and commercial information, and then to: (1) Conduct a ''distinct population segment'' (DPS) analysis to determine if there are any DPSs of Pacific bluefin tuna; (2) identify whether there are any portions of the species' geographic range that are significant in terms of the species' overall viability; and (3) evaluate the extinction risk of the population, taking into account both threats to the population and its biological status. While the petitioner did not request that we list any particular DPS(s) of the Pacific bluefin tuna, we decided to evaluate whether any populations met the criteria of our DPS Policy, in case doing so might result in a conservation benefit to the species. Generally, however, we opt to consider the species' rangewide status, rather than considering whether any DPSs might exist.

In order to complete the status review, the SRT considered a variety of scientific information from the literature, unpublished documents, and direct communications with researchers working on Pacific bluefin tuna, as well as technical information submitted to NMFS. Information that was not previously peer-reviewed was formally reviewed by the SRT. Only the best-available science was considered further. The SRT evaluated all factors highlighted by the petitioners as well as additional factors that may contribute to Pacific bluefin tuna vulnerability.

In assessing population (stock) structure and trends in abundance and productivity, the SRT relied on the International Scientific Committee for Tuna and Tuna-Like Species' (ISC) recently completed peer-reviewed stock assessment (ISC 2016). The ISC was established in 1995 for the purpose of enhancing scientific research and cooperation for conservation and rational utilization of HMS species of the North Pacific Ocean, and to establish the scientific groundwork for the conservation and rational utilization of the HMS species in the North Pacific Ocean. The ISC is currently composed of scientists representing the following seven countries: Canada, Chinese Taipei, Japan, Republic of Korea, Mexico, People's Republic of China, and the United States. The ISC conducts regular stock assessments to assemble fishery statistics and biological information, estimate population parameters, summarize stock status, and develop conservation advice. The results are submitted to Regional Fishery Management Organizations (RFMOs), in particular the Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC), for review and are used as a basis of management actions. NMFS believes the ISC stock assessment (ISC 2016) represents best available science because: (1) It is the only scientifically based stock assessment of Pacific bluefin tuna; (2) it was completed by expert scientists of the ISC, including key contributions from the United States; (3) it was peer reviewed; and (4) we consider the input parameters to the assessment to represent the best available data, information, and assumptions.

The SRT analyzed the status of Pacific bluefin tuna in a 3-step progressive process. First, the SRT evaluated 25 individual threats (covering the five factors in ESA section 4(a)(1)(A)–(E)). The SRT evaluated how each threat affects the species and contributes to a decline or degradation of Pacific bluefin tuna by ranking each threat in terms of severity (1–4, with ''1'' representing the lowest contribution, and ''4'' representing the highest contribution). The threats were evaluated in light of the Pacific bluefin tuna's vulnerability of and exposure to the threat, and its biological response.

Following the initial rankings of specific threats, the SRT identified those threats where the range of rankings across the SRT was greater than one. For these threats, subsequent discussions ensured that the interpretation of the threat and its time-frame were clear and consistent across team members. For example, it was necessary to clarify that threats were considered only as they related to existing management measures and not historical management. After clarification, and a final round of discussion, each team member provided a final set of severity rankings for each specific threat.

There were three specific threats (Illegal, Unregulated, and Unreported fishing, International Management, and sea surface temperature rise) for which the range of severity rankings remained greater than one after they had been discussed thoroughly. For these threats the SRT carried out a Structured Expert Decision Making process (SEDM) to determine the final severity rank. In this SEDM approach, each team member was asked to apportion 100 plausibility points across the four levels of severity. Points were totaled and mean scores were calculated. The severity level with the highest mean was determined to be the final ranking. As will be further detailed in the Analysis of Threats and Extinction Risk Analysis sections of this notice, the SRT also used SEDM in steps 2 and 3 of its analysis.

The purpose of decision structuring is to provide a rational, thorough, and transparent decision, the basis for which is clear to both the decision maker(s) and to other observers, and to provide a means to capture uncertainty in the decision(s). Use of qualitative risk analysis and structured expert opinion methods allows for a rigorous decision-making process, the defensible use of expert opinion, and a well-documented record of how a decision was made. These tools also accommodate limitations in human understanding and allow for problem solving in complex situations. Risk analysis and other structured processes require uncertainty to be dealt with explicitly and biases controlled for. The information used may be empirical data, or it may come from subjective rankings or expert opinion expressed in explicit terms. Even in cases where data are sufficient to allow a quantitative analysis, the structuring process is important to clearly link outcomes and decision standards, and thereby reveal the reasoning behind the decision.

This initial evaluation of individual threats and the potential demographic risk they pose forms the basis of understanding used during steps 2 and 3 of the SRT's analysis.

In the second step of its analysis, the SRT used the same ranking system to evaluate the risk of each of the five factors in ESA section 4(a)(1)(A)–(E) contributing to a decline or degradation of Pacific bluefin tuna. This involved a consideration of the combination of all threats that fall under each of the five factors. In the final step, the SRT evaluated the overall extinction risk for Pacific bluefin tuna over two timeframes—25 years and 100 years.

The SRT's draft status review report was subjected to independent peer review as required by the Office of Management and Budget (OMB) Final Information Quality Bulletin for Peer Review (M– 05–03; December 16, 2004). The draft status review report was peer reviewed by independent specialists selected from the academic and scientific community, with expertise in tuna and/or highly migratory species biology, conservation, and management. The peer reviewers were asked to evaluate the adequacy, appropriateness, and application of data used in the status review report, including the extinction risk analysis. All peer reviewer comments were addressed prior to dissemination and finalization of the draft status review report and publication of this finding.

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 Pacific bluefin tuna. Much of the information discussed below on Pacific bluefin tuna biology, distribution, abundance, threats, and extinction risk is attributable to the status review report. However, in making the 12-month finding determination, 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 (50 CFR part 424); our Policy Regarding the Recognition of Distinct Vertebrate Population Segments Under the Endangered Species Act (DPS Policy, 61 FR 4722; February 7, 1996); and our Final Policy on Interpretation of the Phrase ''Significant Portion of Its Range'' in the Endangered Species Act's Definitions of ''Endangered Species'' and ''Threatened Species (SPR Policy, 79 FR 37578; July 1, 2014).

Pacific Bluefin Tuna Description, Life History, and Ecology

Taxonomy and Description of Species

Pacific bluefin tuna (*Thunnus orientalis*) belong to the family Scombridae (order Perciformes). They are one of three species of bluefin tuna; the other two are the southern bluefin tuna (*Thunnus maccoyii*) and the Atlantic bluefin tuna (*Thunnus thynnus*). The three species can be distinguished based on internal and external morphology as described by Collette (1999). The three species are also distinct genetically (Chow and Inoue 1993; Chow and Kishino 1995) and have limited overlap in their geographic ranges.

Pacific bluefin tuna are large predators reaching nearly 3 meters (m) in length and 500 kilograms (kg) in weight (ISC 2016). They are pelagic species known to form large schools. As with all tunas and mackerels, Pacific bluefin tuna are fusiform in shape and possess numerous adaptations to facilitate efficient swimming. These include depressions in the body that accommodate the retraction of fins to reduce drag and a lunate tail that is among the most efficient tail shapes for generating thrust in sustained swimming (Bernal *et al.,* 2001).

One of the most unique aspects of Pacific bluefin tuna biology is their ability to maintain a body temperature that is above ambient temperature (endothermy). While some other tunas and billfishes are also endothermic, these adaptations are highly advanced in the bluefin tunas (Carey *et al.,* 1971; Graham and Dickson 2001) that can elevate the temperature of their viscera, locomotor muscle and cranial region. The elevation of their body temperature enables a more efficient energy usage and allows for the exploitation of a broader habitat range than would be available otherwise (Bernal, *et al.,* 2001).

Range, Habitat Use, and Migration

The Pacific bluefin tuna is a highly migratory species that is primarily distributed in sub-tropical and temperate latitudes of the North Pacific Ocean (NPO) between 20° N. and 50° N., but is occasionally found in tropical waters and in the southern hemisphere, in waters around New Zealand (Bayliff 1994).

As members of a pelagic species, Pacific bluefin tuna use a range of habitats including open-water, coastal seas, and seamounts. Pacific bluefin tuna occur from the surface to depths of at least 550 m, although they spend most of their time in the upper 120 m of the water column (Kitagawa, *et al.,* 2000; 2004; 2007; Boustany *et al.* 2010). As with many other pelagic species, Pacific bluefin tuna are often found along frontal zones where forage fish tend to be concentrated (Kitagawa, *et al.,* 2009). Off the west coast of the United States, Pacific bluefin tuna are often more tightly clustered near areas of high productivity and more dispersed in areas of low productivity (Boustany, *et al.,* 2010).

Pacific bluefin tuna exhibit large inter-annual variations in movement (*e.g.,* numbers of migrants, timing of migration and migration routes); however, general patterns of migration have been established using catch data and tagging study results (Bayliff 1994; Boustany *et al.,* 2010; Block *et al.,* 2011; Whitlock *et al.,* 2015). Pacific bluefin tuna begin their lives in the western Pacific Ocean (WPO). Generally, age 0–1 fish migrate north along the Japanese and Korean coasts in the summer and south in the winter (Inagake *et al.,* 2001; Itoh *et al.,* 2003; Yoon *et al.,* 2012). Depending on ocean conditions, an unknown portion of young individuals (1–3 years old) from the WPO migrate eastward across the NPO, spending several years as juveniles in the eastern Pacific Ocean (EPO) before returning to the WPO (Bayliff 1994; Inagake *et al.,* 2001; Perle 2011). Their migration rates have not been quantified and it is unknown what proportion of the population migrates to the EPO and what factors contribute to the high degree of variability across years.

While in the EPO, the juveniles make north-south migrations along the west coast of North America (Kitagawa *et al.,* 2007; Boustany *et al.,* 2010; Perle, 2011). Pacific bluefin tuna tagged in the California Current span approximately 10° of latitude between Monterey Bay (36° N.) and northern Baja California (26° N.) (Boustany *et al.,* 2010; Block *et al.,* 2011; Whitlock *et al.,* 2015), although some individuals have been recorded as far north as Washington. This migration loosely follows the seasonal cycle of sea surface temperature, such that Pacific bluefin tuna move northward as temperatures warm in late summer to fall (Block *et al.,* 2011). These movements also follow shifts in local peaks in primary productivity (as measured by surface chlorophyll) (Boustany *et al.,* 2010; Block *et al.,* 2011). In the spring, Pacific bluefin tuna are concentrated off the southern coast of Baja California; in summer, Pacific bluefin tuna move northwest into the Southern California Bight; by fall, they are largely distributed between northern Baja California and northern California. In winter, Pacific bluefin tuna are generally more dispersed, with some individuals remaining near the coast, and some moving farther offshore (Boustany *et al.,* 2010).

After spending up to 5 years in the EPO, individuals return to the WPO where the only two spawning grounds (a southern area near the Philippines and Ryukyu Islands, and a northern area in the Sea of Japan) have been documented. No spawning activity, eggs, or larvae have been observed in the EPO. The timing of spawning and the particular spawning ground used after their return to the WPO has not been established. Mature adults in the WPO generally migrate northwards to feeding grounds after spawning, although a small proportion of fish may move southward or eastward (Itoh 2006). Some of the mature individuals that migrate south are taken in New Zealand fisheries (Bayliff 1994, Smith *et al.,* 2001), but the migration pathway of these individuals is unknown. It is also not known how long they may remain in the South Pacific.

Reproduction and Growth

Like most pelagic fish, Pacific bluefin tuna are broadcast spawners and spawn more than once in their lifetime, and they spawn multiple times in a single spawning season (Okochi, *et al.,* 2016). They are highly fecund, and the number of eggs they release during each spawning event is positively and linearly correlated with fish length and weight (Okochi *et al.,* 2016; Ashida *et al.,* 2015). Estimates of fecundity for female tuna from the southern spawning area (Philippines and Ryukyu Islands) indicate that individual fish can produce from 5 to 35 million eggs per spawning event (Ashida *et al.,* 2015; Shimose *et al.,* 2016; Chen *et al.,* 2006). Females in the northern spawning ground (Sea of Japan) produce 780,000–13.89 million eggs per spawning event in fish 116–170 cm fork length (FL) (Okochi, *et al.,* 2016).

Histological studies have shown that approximately 80 percent of the individuals found in the Sea of Japan from June to August are reproductively mature (Tanaka, *et al.,* 2006, Okochi *et al.,* 2016). This percentage does not necessarily represent the whole population as fish outside the Sea of Japan were not examined.

Spawning in Pacific bluefin tuna occurs in only comparatively warm waters, so larvae are found within a relatively narrow sea surface temperature (SST) range (23.5–29.5 °C) compared to juveniles and adults (Kimura *et al.,* 2010; Tanaka & Suzuki 2016). Larvae are thought to be transported primarily by the northward flowing Kuroshio Current and are largely found off coastal Japan, both in the Pacific Ocean and Sea of Japan (Kimura *et al.,* 2010).

As discussed above, spawning in Pacific bluefin tuna has been recorded only in two locations: Near the Philippines and Ryukyu Islands, and in the Sea of Japan (Okochi *et al.,* 2016; Shimose & Farley 2016). These two spawning grounds differ in both timing and the size composition of individuals. Near the Philippines and Ryukyu Islands, spawning occurs from April to July and fish are from 6–25 years of age, though most are older than 9 years of age. In the Sea of Japan, spawning occurs later (June to August) and fish are 3–26 years old.

Pacific bluefin tuna exhibit rapid growth, reaching 58 cm or more in length by age 1 and frequently more than 1 m in length by age 3 (Shimose *et al.,* 2009; Shimose and Ishihara 2015). The species tends to reach its maximum length of around 2.3 m at age 15 (Shimose *et al.,* 2009; Shimose and Ishihara 2015). The oldest Pacific bluefin tuna recorded was 26 years old and measured nearly 2.5 m in length (Shimose *et al.,* 2009).

Feeding habits

Pacific bluefin tuna are opportunistic feeders. Small individuals (age 0) feed on small squid and zooplankton (Shimose *et al.,* 2013). Larger individuals (age 1+) have a diverse forage base that is temporally variable and, in both the EPO and WPO, they feed on a variety of fishes, cephalopods, and crustaceans (Pinkas *et al.,* 1971; Shimose *et al.,* 2013; Madigan *et al.,* 2016; O. Snodgrass, NMFS SWFSC, unpublished data). Diet data indicate they forage in surface waters, on mesopelagic prey and even on benthic prey. The SWFSC conducted stomach content analysis of age 1–5 Pacific bluefin tuna caught off the coast of California from 2008 to 2016 and found that Pacific bluefin tuna are generalists altering their feeding habits depending on localized prey abundance (O. Snodgrass, NMFS SWFSC, unpublished data).

Species Finding

Based on the best available scientific and commercial information summarized above, we find that the Pacific bluefin tuna is currently considered a taxonomically-distinct species and, therefore, meets the definition of ''species'' pursuant to section 3 of the ESA. Below, we evaluate whether the species warrants listing as endangered or threatened under the ESA throughout all or a significant portion of its range.

Distinct Population Segment Determination

While we were not petitioned to list a distinct population segment (DPS) of the Pacific bluefin tuna and are therefore not required to identify DPSs, we decided, in this case, to evaluate whether any populations of the species meet the DPS Policy criteria. As described above, the ESA's definition of ''species'' includes ''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.'' The DPS Policy requires the consideration of two elements: (1) The discreteness of the population segment in relation to the remainder of the species to which it belongs; and (2) the significance of the population segment to the species to which it belongs.

A population segment of a vertebrate species may be considered discrete if it satisfies either one of the following conditions: (1) It is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. Quantitative measures of genetic or morphological discontinuity may provide evidence of this separation; or (2) it is delimited by international governmental boundaries within which differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms exist that are significant in light of section 4(a)(1)(D) of the ESA. If a population segment is found to be discrete under one or both of the above conditions, its biological and ecological significance to the taxon to which it belongs is evaluated. Factors that can be considered in evaluating significance may include, but are not limited to: (1) Persistence of the discrete population segment in an ecological setting unusual or unique for the taxon; (2) evidence that the loss of the discrete population segment would result in a significant gap in the range of a taxon; (3) evidence that the discrete population segment represents the only surviving natural occurrence of a taxon that may be more abundant elsewhere as an introduced population outside its historic range; or (4) evidence that the discrete population segment differs markedly from other populations of the species in its genetic characteristics.

Pacific bluefin tuna are currently managed as a single stock with a trans-Pacific range. We considered a number of factors related to Pacific bluefin tuna movement patterns, geographic range, and life history that relate to the discreteness criteria. Among the many characteristics of Pacific bluefin tuna that were discussed as contributing factors to the determination of ESA discreteness, three were regarded as carrying the most weight in the identification of DPSs. The strongest argument for the existence of a DPS was the spatial specificity of Pacific bluefin tuna spawning. The strongest arguments against the existence of a DPS included Pacific bluefin tuna migratory behavior and genetic characteristics of the Pacific bluefin tuna.

Based on the current understanding of Pacific bluefin tuna movements, Pacific bluefin tuna use one of two areas in the WPO to spawn. There is no evidence to suggest that these represent two separate populations but rather that, as fish increase in size, they shift from using the Sea of Japan to using the spawning ground near the Ryukyu Islands (*e.g.,* Shimose *et al.,* 2016). The spawning areas are also characterized by physical oceanographic conditions (*e.g.,* temperature), rather than a spatially fixed feature (*e.g.,* a seamount or promontory). This implies that the location of the spawning grounds may be temporally and spatially fluid, as conditions change over time. Given these considerations, the existence of two spatially distinct spawning grounds does not provide compelling evidence that discrete population segments exist for Pacific bluefin tuna. In addition, concentrations of adult Pacific bluefin tuna on the spawning grounds are found only during spawning times and not year-round.

Catch data and conventional and electronic tagging data demonstrate the highly migratory nature of Pacific bluefin tuna. Results support broad mixing around the Pacific. While fish cross the Pacific from the WPO to the EPO, results indicate that they then return to the WPO to spawn. Furthermore, the limited genetic data currently available (Tseng *et al.,* 2012; Nomura *et al.,* 2014) do not support the presence of genetically distinct population segments within the Pacific bluefin tuna.

Pacific Bluefin Tuna Stock Assessment

The ISC stock assessment presented population dynamics of Pacific bluefin tuna based on catch per unit effort data from 1952–2015 using a fully integrated age-structured model. The model included various life-history parameters including a length/age relationship and natural mortality estimates from tag-recapture and empirical life-history studies. Specific details on the modelling methods can be found in the ISC stock assessment available at *http://isc.fra.go.jp/reports/stock_assessments.html.*

The 2016 ISC Pacific bluefin tuna stock assessment indicated three major trends: (1) Spawning stock biomass (SSB) fluctuated from 1952–2014; (2) SSB declined from 1996 to 2010; and (3) the decline in SSB has ceased since 2010 yet remains near to its historical low.

Based on the stock assessment model, the 2014 SSB was estimated to be around 17,000 mt, which represents 143,053 individuals capable of spawning. Relative to the theoretical, model-derived SSB had there been no fishing (*i.e.,* the ''unfished'' SSB; 644,466 mt), 17,000 mt represents approximately 2.6 percent of fish in the spawning year classes. It is important to note that unfished SSB is a theoretical number derived from the stock assessment model and does not represent a ''true'' estimate of what the SSB would have been with no fishing. This is because it is based on the equilibrium assumptions of the model (*e.g.,* no environmental or density-dependent effects) and it changes with model structures. That is, in the absence of density-dependent effects on the population, the estimate may overestimate the population size that can be supported by the environment and may change with improved input parameters. When compared to the highest SSB of 160,004 mt estimated by the model in 1959, the SSB in 2014 is 10.6 percent of the 1952–2014 historical peak.

It is important to note that while the SSB as estimated by the ISC stock assessment is 2.6 percent of the theoretical, model-derived, ''unfished'' SSB, this value is based on a theoretical unfished population, and only includes fish of spawning size/age. Based on the estimated number of individuals at each age class, the number of individuals capable of spawning in 2014 was 143,053. However, total population size, including non-spawning capable individuals that have not yet reached spawning age, is estimated at 1,625,837. This yields an 8 percent ratio of spawning-capable individuals to total population. From 1952–2014, this ratio has ranged from 28 percent in 1960 to 2.5 percent in 1984, with a mean of 8 percent. The ratio in 2014 indicates that, relative to population size, there were more spawning-capable fish than in some years even with a similarly low total population size (*e.g.,* 1982–84), and the ratio was at the average for the period 1952–2014.

The 2016 ISC stock assessment was also used to project changes in SSB through the year 2034. The assessment evaluated 11 scenarios in which various management strategies were altered from the status quo (*e.g.,* reduction in landings of smaller vs. larger individuals) and recruitment scenarios were variable (*e.g.,* low to high recruitment). None of these 11 scenarios resulted in a projected reduction in SSB through fishing year 2034.

The stock assessment also indicates that Pacific bluefin tuna is overfished and that overfishing is occurring. This assessment, however, is based on the abundance of the species through 2014. As described in the following section on existing regulatory measures, the first Pacific bluefin tuna regulations that placed limits on harvest were implemented in 2012 with additional regulations implemented in 2014 and 2015.

Summary of Factors Affecting Pacific Bluefin Tuna

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; inadequacy of existing regulatory mechanisms; or other natural or manmade factors affecting its continued existence. We evaluated whether and the extent to which each of the foregoing factors contribute to the overall extinction risk of Pacific bluefin tuna, with a ''significant'' contribution defined, for purposes of this evaluation, as increasing the risk to such a degree that the factor affects the species' demographics (*i.e.,* abundance, productivity, spatial structure, diversity) either to the point where the species is strongly influenced by stochastic or depensatory processes or is on a trajectory toward this point.

For their extinction risk analysis, the SRT members evaluated threats and the extinction risk over two time frames. The SRT used 25 years (~3 generations for Pacific bluefin tuna) for the short time frame and 100 years (~13 generations) for the long time frame. The SRT concluded that the short time frame was a realistic window to evaluate current effects of potential threats with a good degree of reliability, especially when considering the limits of population forecasting models (*e.g.,* projected population trends in stock assessment models). The SRT also concluded that 100 years was a more realistic window through which to evaluate the effects of a threat in the more distant future that, by nature, may not be able to be evaluated over shorter time periods. For example, the potential effects of climate change from external forces are best considered on multi-decadal to centennial timescales, due to the predominance of natural variability in determining environmental conditions in the shorter term.

The following sections briefly summarize our findings and conclusions regarding threats to the Pacific bluefin tuna and their impact on the overall extinction risk of the species. More details can be found in the status review report, which is incorporated here by reference.

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

Water Pollution

Given their highly migratory nature, Pacific bluefin tuna may be exposed to a variety of contaminants and pollutants. Pollutants vary in terms of their concentrations and composition depending on location, with higher concentrations typically occurring in coastal waters. There are two classes of pollutants in the sea that are most prevalent and that could pose potential risks to Pacific bluefin tuna: Persistent Organic Pollutants (POPs) and mercury. However, the SRT also considered Fukushima derived radiation and oil pollution as independent threats.

Persistent organic pollutants are organic compounds that are resistant to environmental degradation and are most often derived from pesticides, solvents, pharmaceuticals, or industrial chemicals. Common POPs in the marine environment include the organochlorine Dichlorodiphenyltrichloroethane (DDT) and Polychlorinated biphenyls (PCBs). Because they are not readily broken down and enter the food-web, POPs tend to bioaccumulate in marine organisms. In fishes, some POPs have been shown to impair reproductive function (*e.g.,* white croaker; Cross *et al.,* 1988; Hose *et al.,* 1989).

Specific information on POPs in Pacific bluefin tuna is limited. Ueno *et al.* (2002) examined the accumulation of POPs (*e.g.,* PCBs, DDTs, and chlordanes (CHLs)) in the livers of Pacific bluefin tuna collected from coastal Japan. They determined, as expected, that the uptake of these organochlorines was driven by dietary uptake rather than through exposure to contaminated water (*i.e.,* through the gills). This research showed that levels of organochlorines were positively and linearly correlated with body length. Body length normalized values for PCBs, DDTs, and CHLs were calculated as 530–2,600 ng/g lipid weight, 660–800 ng/g lipid weight, and 87–300 ng/g lipid weight, respectively. More recently, Chiesa *et al.* (2016) measured pollutants from Pacific bluefin tuna in the Western Central Pacific Ocean and found that 100 percent of the individuals sampled tested positive for five of the six PCBs assayed. Three POPs (specifically, polybrominated diphenyl ethers) were detected in 5–60 percent of fish examined. Two organochlorines were detected in 30–80 percent of samples. Unlike the findings of Ueno *et al.* (2002) from coastal Japan, no DDT or its end-products were detected in Pacific bluefin tuna in the Western Central Pacific Ocean.

While POPs have been detected in the tissues of Pacific bluefin tuna (see above), much higher levels have been measured in other marine fish (*e.g.,* pelagic sharks; Lyons *et al.,* 2015). While there is a lack of direct experimentation on the potential impacts of POPs on Pacific bluefin tuna, there are currently no studies which indicate that they exist at levels that are harmful to Pacific bluefin tuna. Based on the findings in the status review, we conclude that POPs pose no to low risk of contributing to a decline or degradation of the Pacific bluefin tuna.

Mercury (Hg) enters the oceans primarily through the atmosphere-water interface. Initial sources of Hg are both natural and anthropogenic. One of the main sources of anthropogenic Hg is coal-fired power-plants. Total Hg emissions to the atmosphere have been estimated at 6,500–8,200 Mg/yr, of which 4,600–5,300 Mg/yr (50–75 percent) are from natural sources (Driscoll *et al.,* 2013). In water, elemental Hg is converted to methyl-Hg by bacteria. Once methylated, Hg is easily absorbed by plankton and thus enters the marine food-web. As with POPs, Hg bioaccumulates and concentrations increase in higher trophic level organisms.

As a top predator, Pacific bluefin tuna can potentially accumulate high levels of Hg. Several studies have examined Hg in Pacific bluefin tuna and reported a wide range of concentrations that vary based on geographic location. In the WPO, measured Hg concentrations ranged from 0.66–3.23 μg/g wet mass (Hisamichi *et al.,* 2010; Yamashita *et al.,* 2005), whereas in the EPO they ranged from 0.31–0.508 μg/g wet mass (Lares *et al.,* 2012; Coman *et al.,* 2015). The latter study demonstrated that in the EPO individuals that had recently arrived from the WPO contained higher Hg concentrations than those that had resided in the EPO for 1–3 years, including wild-caught individuals being raised in net pens. By comparison, concentrations of Hg in Atlantic bluefin tuna have been measured at 0.25–3.15 mg/kg wet mass (Lee *et al.,* 2016). Notably, Lee *et al.* (2016) demonstrated that Hg concentrations in Atlantic bluefin tuna declined 19 percent over an 8-year period from the 1990s to the early 2000s, a result of reduced anthropogenic Hg emissions in North America. Tunas are also known to accumulate high levels of selenium (Se), which is suggested to have a detoxifying effect on methyl-Hg compounds (reviewed in Ralston *et al.,* 2016).

The petitioners suggest that since some bluefin products are above 1 ppm, the U.S. Food and Drug Administration's (FDA) threshold, there is cause for concern with regard to bluefin tuna health. The FDA levels are set at the point at which consumption is not recommended for children and women of child bearing age and are not linked to fish health. While methyl Hg compounds have been shown to cause neurobiological changes in a variety of animals, there have been no studies on tuna or tuna-like species showing detrimental effects from methyl Hg. As with the POPs, other marine species have much higher levels of Hg contamination (Montiero and Lopes 1990; Lyons *et al.,* 2015). The SRT was unanimous in the determination that Hg contamination does not pose a direct threat to Pacific bluefin tuna.

We find that water pollution poses no risk of contributing to a decline or degradation of the Pacific bluefin tuna. While we acknowledge that bioaccumulation of pollutants in Pacific bluefin tuna may result in some risk to consumers, the absence of empirical studies showing that water pollution has direct effects on Pacific bluefin tuna implies that water pollution is not a high risk for Pacific bluefin tuna themselves.

Plastic Pollution

Plastics have become a major source of pollution on a global scale and in all major marine habitats (Law 2017). In 2014, global plastic production was estimated to be 311 million metric tons (mt) (Plast. Eur. 2015). Plastics are the most abundant material collected as floating marine debris or from beaches (Law *et al.,* 2010; Law 2017) and are known to occur on the seafloor. Impacts on the marine environment vary with type of plastic debris. Larger plastic debris can cause entanglement leading to injury or death, while ingestion of smaller plastic debris has the potential to cause injury to the digestive tract or accumulation of indigestible material in the gut. Studies have also shown that chemical pollutants may be adsorbed into plastic debris which would provide an additional pathway for exposure (*e.g.,* Chua *et al.,* 2014). Small plastics (microplastics) have been documented as the primary source of ingested plastic materials among fish species, particularly opportunistic planktivores (*e.g.,* Rochman *et al.,* 2013; 2014; Matsson *et al.,* 2015). Few studies have examined microplastic ingestion by larger predatory fishes such as Pacific bluefin tuna and results from these studies are mixed.

Cannon *et al.* (2016) found no evidence of plastics in the digestive tracts of skipjack tuna (*Katsuwonis pelamis*) and blue mackerel (*Scomber australensis*) in Tasmania. Choy and Drazen (2013) found no evidence of plastic ingestion in *K. pelamis* and yellowfin tuna (*Thunnus albacares*) in Hawaiian waters, but found that approximately 33 percent of bigeye tuna (*Thunnus obesus*) had anthropogenic plastic debris in their stomachs. While no specific studies on plastic ingestion in Pacific bluefin tuna are available, a study of foraging ecology in the EPO found no plastic in over 500 stomachs examined from 2008–2016 (O. Snodgrass, NMFS, unpublished data).

We find that plastic ingestion by Pacific bluefin tuna poses no to low risk of contributing to a decline or degradation of the Pacific bluefin tuna. This was based in large part upon the absence of empirical evidence of large amounts of macro- and micro-plastic directly impacting individual Pacific bluefin tuna health.

Oil and Gas Development

There are numerous examples of oil and gas exploration and operations posing a threat to marine organisms and habitats. Threats include seismic activities during exploration and construction and events such as oil spills or uncontrolled natural gas escape where released chemicals can have severe and immediate effects on wildlife.

Unfortunately, there is limited information on the direct impacts of oil and gas exploration and operation on pelagic fishes such as Pacific bluefin tuna. Studies looking at the impacts of seismic exploration on fish have mixed results. Wardle *et al.* (2001) and Popper *et al.* (2005) documented low to moderate impacts on behavior or hearing, whereas McCauley *et al.* (2003) reported long-term hearing loss from air-gun exposure. Risk associated with seismic exploration would likely be less of a concern for highly migratory species that can move away and do not use sounds to communicate. Reduced catch rates in areas for a period of time after air guns have been used are considered evidence for this avoidance behavior in a range of species (Popper and Hastings 2009).

The effects of seismic exploration on larval Pacific bluefin tuna, however, could be greater than on older individuals due in part to the reduced capacity of larvae to move away from affected areas. Davies *et al.* (1989) stated that fish eggs and larvae can be killed at sound levels of 226–234 decibel (dB), which are typically found at 0.6–3.0 m from an air gun such as those used during seismic exploration. Visual damage to larvae can occur at 216 dB, levels found approximately 5 m from the air gun. Less obvious impacts such as disruptions to developing organs are harder to gauge and are little explored in the scientific literature; however, severe physical damage or mortality appears to be limited to larvae within a few meters of an air gun discharge (Dalen *et al.,* 1987; Patin & Cascio 1999).

The most relevant study, for the purposes of the SRT, is an evaluation of the impacts of oil pollution on the larval stage of Atlantic bluefin tuna. Oil released from the 2010 Deepwater Horizon oil spill in the Gulf of Mexico covered approximately 10 percent of the spawning habitat, prompting concerns about larval survival (Muhling *et al.,* 2012). Modeled western Atlantic bluefin tuna recruitment for 2010 was low compared to historical values, but it is not yet clear whether this was primarily due to oil-induced mortality, or unfavorable oceanographic conditions (Domingues *et al.,* 2016). Results from laboratory studies showed that exposure to oil resulted in significant defects in heart development in larval Atlantic bluefin tuna (Incardona *et al.,* 2014) with a likely reduction in fitness. A similar response would be expected in Pacific bluefin tuna. Consequently, an oil spill in or around the spawning grounds has the potential to impact larval survival of Pacific bluefin tuna. Previous spills near the spawning grounds have mostly been from ships (*e.g.,* Varlamov *et al.,* 1999; Chiau 2005), and have resulted in much smaller, more coastally confined releases into the marine environment than from the Deepwater Horizon incident. However, offshore oil exploration has increased in the region in recent years, potentially increasing the risks of a large-scale spill. Despite these considerations, the overall risks to Pacific bluefin tuna associated with an oil spill were considered to be low for a number of reasons: (1) Large oil spills are rare events; (2) Pacific bluefin tuna larvae are spread over two spawning grounds with little oceanographic connectivity between them, reducing risk to the population as a whole; and (3) the population is broadly dispersed overall.

Oil and gas infrastructure may have beneficial impacts on the marine environment by providing habitat for a range of species and *de facto* no fishing zones. California has been a prime area of research into the effects of decommissioned oil platforms. Claisse *et al.* (2014) showed that offshore oil platforms have the highest measured fish production of any habitat in the world, exceeding even coral reefs and estuaries. Caselle *et al.* (2002) showed that even remnant oil field debris (*e.g.,* defunct pipe lines, piers, and associated structures) harbored diverse fish communities. This pattern is not unique to California. For example, Fabi *et al.* (2004) showed that fish diversity and richness increased within the first year after installation of two gas platforms in the Adriatic Sea, and that biomass of fishes on these platforms was substantial. Consequently, oil platforms may provide forage and refuge for Pacific bluefin tuna.

In summary, we consider oil and gas development to pose no to low risk of contributing to a decline or degradation of the Pacific bluefin tuna.

Wind Energy Development

Concerns about climate impacts linked to the use of petroleum products has led to an increase in renewable energy programs over the past two decades. Offshore and coastal wind energy generating stations have been among the fastest growing renewable energy sectors, particularly in shallow coastal areas, which generally have consistent wind patterns and reduced infrastructure costs due to shallow depths and proximity to land.

Impacts of wind energy generating stations on marine fauna have been well studied (see Köppel, 2017 for examples). There have been some studies predicting negative effects on marine life, particularly birds and benthic organisms, but few empirical studies have demonstrated direct impacts to fishes. Wilson *et al.* (2010) reviewed numerous papers discussing the impacts of wind energy infrastructure and concluded that while they are not environmentally benign, the impacts are minor and can often be ameliorated by proper placement.

Studies on wind energy development and its impact on fishes has largely focused on demersal species assemblages. Similar to oil and gas platforms, wind energy platforms have been shown to have a positive effect on demersal fish communities in that they tend to harbor high diversity and biomass of fish populations (*e.g.,* Wilhelmsson *et al.,* 2006). Following construction of ''wind farms,'' one particular concern has been the effects of noise created by the operating mechanisms on fish. Wahlberg and Westerberg (2005) concluded that wind farm noise does not have any destructive effects on the hearing ability of fish, even within a few meters. The major impact of the noise is largely restricted to masking communication between fish species which use sounds (Wahlberg and Westerberg, 2005). Given that Pacific bluefin tuna are not known to use sounds for communication, the impact of noise would be minimal if any. Additionally, wind farms are likely to serve as de facto fish aggregating devices and may prove beneficial at attracting prey and thus Pacific bluefin tuna as well. Also, given the highly migratory nature of Pacific bluefin tuna and their broad range, wind farms would not take up a large portion of their range and could be avoided.

We find that wind energy development poses no to low risk of contributing to a decline or degradation of the Pacific bluefin tuna. This was based largely on the ability of Pacific bluefin tuna to avoid wind farms and the absence of empirical evidence showing harm directly to Pacific bluefin tuna.

Large-Scale Aquaculture

Operation of coastal aquaculture facilities can degrade local water quality, mostly through uneaten fish feed and feces, leading to nutrient pollution. The severity of these issues depends on the species being farmed, food composition and uptake efficiency, fish density in net pens, and the location and design of pens (Naylor *et al.,* 2005). There are several offshore culture facilities throughout the world, most being within 25 kilometers (km) of shore.

The petition by CBD highlights a proposed offshore aquaculture facility in California as a potential threat to Pacific bluefin tuna. The proposed Rose Canyon aquaculture project would construct a facility to raise yellowtail jack approximately 7 km from the San Diego coast. The high capacity of the proposed project (reaching up to 5,000 mt annually after 8 years of operation) has raised concerns about resulting impacts to the surrounding marine environment. As the proposed aquaculture facility would act as a point source of pollutants, the potential impacts to widely distributed pelagic species such as Pacific bluefin tuna will depend on oceanographic dispersal of these pollutants within the Southern California Bight (SCB) and surrounding regions.

Data from current meters and Acoustic Doppler Current Profilers (ADCPs) near Point Loma have recorded seasonally reversing, and highly variable, alongshore flows (Hendricks 1977; Carson *et al.,* 2010). However, cross-shelf currents were much weaker. Similarly, Lahet and Stramski (2010) showed that river plumes in the San Diego area identified by satellite ocean color imagery moved variably north or south along the coast until dispersing, but were not advected offshore. Recent studies using high-resolution simulations of a regional oceanic modeling system have also shown limited connectivity between the nearshore region off San Diego and the open SCB (Dong *et al.,* 2009; Mitari *et al.,* 2009). This suggests that pollutants resulting from the proposed Rose Canyon aquaculture facility would likely be dispersed along the southern California and northern Baja California coasts rather than offshore. Pacific bluefin tuna are distributed throughout much of the California Current ecosystem, and are often caught more than 100 km from shore (Holbeck *et al.,* 2017). Tagging studies have also shown very broad habitat use of Pacific bluefin tuna offshore of Baja California and California (Boustany *et al.,* 2010). It should be noted that any aquaculture facilities in the United States are subjected to rigorous environmental reviews and standards prior to being permitted.

We find that habitat degradation from large-scale aquaculture poses no to low risk of contributing to population decline or degradation in Pacific bluefin tuna over both time-scales largely due to the very small proportion of their habitat which would be impacted as well as the absence of empirical evidence showing harm directly to Pacific bluefin tuna.

Prey Depletion

As highly migratory, fast-swimming top predators, tunas have relatively high energy requirements (Olson and Boggs 1986; Korsmeyer and Dewar 2001; Whitlock *et al.,* 2013; Golet *et al.,* 2015). They fulfill these needs by feeding on a wide range of vertebrate and invertebrate prey, the relative contribution of which varies by species, region, and time period. Pacific bluefin tuna in the California Current ecosystem have been shown to prey on forage fish such as anchovy, as well as squid and crustaceans (Pinkas *et al.,* 1971; Snodgrass *et al.,* unpublished data). As commercial fisheries also target some of these species, substantial removals could conceivably reduce the prey base for predators such as Pacific bluefin tuna. Previous studies have used trophic ecosystem models to show that high rates of fishing on forage species could adversely impact other portions of the ecosystem, including higher-order predators (Smith *et al.,* 2011; Pikitch *et al.,* 2012).

Biomass of the two main forage fish in the California Current, sardine and anchovy, has been low in recent years (Lindegren *et al.,* 2013; Lluch-Cota 2013). This likely represents part of the natural cycle of these species, which appear to undergo frequent ''boom and bust'' cycles, even in the absence of industrial-scale fishing (Schwartzlose *et al.,* 1999; McClatchie *et al.,* 2017). Pacific bluefin tuna appear to be generalists and consequently are less impacted by these shifts in abundance than specialists. Pinkas *et al.* (1971) found that Pacific bluefin tuna diets in the late 1960s were mostly anchovy (>80 percent), coinciding with a period of relatively high anchovy biomass. In contrast, more recent data from the 2000s show a much higher dominance of squid and crustaceans in Pacific bluefin tuna diets, with high interannual variability (Snodgrass *et al.,* unpublished data). Neither study recorded a substantial contribution of sardine to Pacific bluefin tuna diets, but both diet studies (Pinkas *et al.,* Snodgrass *et al.,* unpublished data) were conducted during years in which sardine biomass was comparatively low.

This ability to switch between prey species may be one reason why Hilborn *et al.* (2017) found little evidence that forage fish population fluctuations drive biomass of higher order consumers, including tunas. This disconnect is clear for Pacific bluefin tuna. For example, in the 1980s, Pacific bluefin tuna biomass and recruitment were both very low, but forage fish abundances in both the California Current and Kuroshio-Oyashio ecosystems were high (Lindegren *et al.,* 2013; Yatsu *et al.,* 2014). Hilborn *et al.* (2017) considered that a major weakness of previous trophic studies was a lack of consideration of this strongly fluctuating nature of forage fish populations through time. Predators have thus likely adapted to high variability in abundance of forage fish and other prey species by being generalists.

However, although Pacific bluefin tuna have a broad and varied prey base in the California Current, the physiological effects of switching between dominant prey types are not well known. Some species are more energy-rich than others, and may have lower metabolic costs to catch and digest (Olson & Boggs 1986; Whitlock *et al.,* 2013). Fluctuations in the energy content and size spectra of a prey species may also be important, as was found for the closely-related Atlantic bluefin tuna (Golet *et al.,* 2015). It is therefore not yet clear how periods of strong reliance on anchovy vs. invertebrates, for example, may impact the condition and fitness of Pacific bluefin tuna.

We find that prey depletion poses a very low threat to Pacific bluefin tuna over the 25-year time frame, primarily because it is clear that they are generally adapted to natural fluctuations of forage fish biomass through prey switching. We also find that prey depletion may pose a low to moderate threat over the 100-year timeframe, albeit with low certainty. This was mainly because climate change is expected to alter ecosystem structure and function to produce potentially novel conditions, over an evolutionarily short time period. If this results in a less favorable prey base for Pacific bluefin tuna, in either the California Current or other foraging areas, impacts on the population may be more deleterious than they have been in the past.

B. Overutilization for Commercial, Recreational, Scientific or Educational Purposes

Potential threats to the Pacific bluefin tuna from overutilization for commercial, recreational, scientific or educational purposes also includes illegal, unregulated and unreported fishing. Each of these potential threats is discussed in the following sections.

Commercial Fishing

Commercial fishing for Pacific bluefin tuna has occurred in the western Pacific since at least the late 1800s. Records from Japan indicate that several methods were used prior to 1952 when catch records began to be taken in earnest and included longline, pole and line, drift net, and set net fisheries. Estimates of global landings prior to 1952 peaked around 47,635 mt (36,217 mt in the WPO and 11,418 mt in the EPO) in 1935 (Muto *et al.,* 2008). After 1935, landings dropped in response to a shift in maritime activities caused by World War II. Fishing activities expanded across the North Pacific Ocean after the conclusion of the war, and landings increased consistently for the next decade prior to becoming more variable (Muto *et al.,* 2008).

There are currently five major contributors to the Pacific bluefin tuna fisheries: Japan, Korea, Mexico, Taiwan, and the United States. Each operates in nearshore coastal waters in the Pacific Ocean while a few also operate in distant offshore waters. In modern fisheries, Pacific bluefin tuna are taken by a wide range of fishing gears (*e.g.,* longline, purse seine, set net, troll, pole-and-line, drift nets, and hand line fisheries), which target different size classes (see below). Among these fisheries, purse seine fisheries are currently the primary contributor to landings, with the Japanese fleet being responsible for the majority of the catch. Much of the global purse-seine catch supports commercial grow-out facilities where fish aged approximately 1–3 are kept in floating pens for fattening prior to sale.

Estimates of landings indicate that annual catches of Pacific bluefin tuna by country have fluctuated dramatically from 1952–2015. During this period reported catches from the five major contributors to the ISC peaked at 40,144 mt in 1956 and reached a low of 8,627 mt in 1990, with an average of 21,955 mt. Japanese fisheries are responsible for the majority of landings, followed by Mexico, the United States, Korea and Taiwan. In 2014, the United States reported commercial landings of 408 mt, Taiwan reported 525 mt, Korea reported 1,311 mt, Mexico reported 4,862 mt, and Japan reported 9,573 mt. These represent 2.4 percent, 3 percent, 7.7 percent, 28.4 percent, and 56 percent of the total landings, respectively. Landings in the southern hemisphere are small and concentrated around New Zealand.

The commercial Japanese Pacific bluefin tuna fisheries are comprised of both distant-water and coastal longline vessels, coastal trolling vessels, coastal pole-and-line vessels, coastal set net vessels, coastal hand line vessels, and purse seiners. Each fishery targets specific age classes of Pacific bluefin tuna: Coastal trolling and pole and line target fish less than 1 year old, coastal set net and coastal hand-line target ages 1–5, purse seiners target ages 0–10, and the distant-water and coastal longline vessels target ages 5–20. The distant water longline fisheries have operated for the longest time while the coastal longline fisheries did not begin in earnest until the mid-1960s. Between 1952 and 2015, total annual catches by Japanese fisheries have fluctuated between a maximum of approximately 34,000 mt in 1956 and a minimum of approximately 6,000 mt in 2012, and they have averaged 15,653 mt.

The Japanese troll fleet harvests small, age-0 Pacific bluefin tuna for its commercial aquaculture grow-out facilities. From 2005–2015, the harvest of Pacific bluefin tuna for grow-out by the troll fishery has averaged 14 percent of Japan's total landings (approximately 8.5 percent of global landings) by weight.

Nearly all commercial Pacific bluefin tuna catches by U.S. flagged vessels on the west coast of the United States are landed in California. Historically, the commercial fisheries for Pacific bluefin tuna focused their efforts on the fishing grounds off Baja California, Mexico, until the 1980s. Following the creation of Mexico's EEZ, the U.S. purse seine fisheries largely ceased their efforts in Mexico and became more opportunistic (Aires-da-Silva *et al.,* 2007). Since 1980, commercial landings of Pacific bluefin tuna have fluctuated dramatically, averaging 859.2 mt with two peaks in 1986 (4,731.4 mt) and 1996 (4,687.6 mt). The low catch rates are not caused by the absence of Pacific bluefin tuna, but rather the absence of a dedicated fishery, low market price, and the inability to fish in the Mexican EEZ. In 2014, commercial landings of Pacific bluefin tuna in the United States were 408 mt, representing 2.4 percent of the total global landings.

Mexico's harvest of Pacific bluefin tuna is dominated by its purse seine fisheries, which dramatically increased in size following the creation of Mexico's EEZ. While most of the purse seine fisheries target yellowfin tuna (the dominant species in the catch) in tropical waters, Pacific bluefin tuna are caught by purse seine near Baja California. Since 1952, reported landings in Mexico have ranged from 1–9,927 mt with an average of 1,766.7 mt (ISC catch database *http://isc.fra.go.jp/fisheries_statistics/index.html*). Since grow-out facilities began in Mexico in 1997, the purse seine fishery for Pacific bluefin tuna almost exclusively supports these facilities. These facilities take in age 1–3 Pacific bluefin tuna and ''fatten'' them in floating pens for export and represent virtually all of Mexico's reported capture of Pacific bluefin tuna. From 2005–2015, Mexico's harvest for its grow-out facilities has averaged 26.8 percent of the global landings.

The Korean take of Pacific bluefin tuna is dominated by its offshore purse seine fishery with a small contribution by the coastal troll fisheries. The fisheries generally operate off Jeju Island with occasional forays into the Yellow Sea (Yoon *et al.,* 2014). The purse seine fisheries did not fully develop until the mid-1990s, and landings were below 500 mt prior to this. Landings gradually increased and peaked at 2,601 mt in 2003, but have declined since then, with 676 mt landed in 2015. Since 1952, the average reported Korean landings of Pacific bluefin tuna has been 535 mt (data not reported from 1952–1971).

Historically, the Taiwanese fisheries have used a wide array of gears, but since the early 1990s the fisheries are largely comprised of small-scale longline vessels. These vessels are targeting fish on the spawning grounds near the Ryukyu Islands. The highest reported catch was in 1990 at 3,000 mt; however, landings declined to less than 1,000 mt in 2008 and to their lowest level of about 200 mt in 2012. Landings have since increased and the preliminary estimate of Pacific bluefin tuna landings in 2015 was 542 mt. Since 1952, Taiwanese landings of Pacific bluefin tuna have averaged 658 mt.

We acknowledge the Petitioner's concern that a large proportion of Pacific bluefin tuna caught are between 0 and 2 years of age. The petition states that 97.6 percent of fish are caught before they have a chance to reproduce, and argues that this is a worrisome example of growth overfishing. The interpretation of the severity of this statement requires acknowledging several factors that are used to evaluate the production (amount of ''new'' fish capable of being produced by the current stock). Importantly, the estimate of production includes considering factors such as recruitment, growth of individuals (thus moving from one age class to the next and potentially reaching sexual maturity), catch, and natural mortality. Excluding all other parameters except catch results in erroneous interpretations of the severity of a high proportion of immature fish being landed on an annual basis. If all year classes are taken into account, the percentage of fish in the entire population (not just in the age 0 age class) that are harvested before reaching maturity is closer to 82 percent. While we acknowledge that this is not an ideal harvest target, it is a more accurate representation of the catch of immature fish.

Growth overfishing occurs when the average size of harvested individuals is smaller than the size that would produce the maximum yield per recruit. The effect of growth overfishing is that total yield (*i.e.,* population size) is less than it would be if all fish were allowed to grow to a larger size. Reductions in yield per recruit due to growth overfishing can be ameliorated by reducing fishing mortality (*i.e.,* reduced landings) and/or increasing the average size of harvested fish, both of which have been recommended by the relevant Regional Fisheries Management Organizations (RFMOs) and adopted for the purse seine fisheries in the western and central Pacific Ocean.

We consider commercial fishing to pose the greatest risk to contribute to the decline or degradation of the Pacific bluefin tuna. Threat scores given by the BRT members for commercial fishing ranged from moderate to high (severity score of 2 to 3 with a mean of 2.29). While we acknowledge that past trends in commercial landings have been the largest contributor to the decline in the Pacific bluefin tuna, we find the population size in the terminal year of the ISC stock assessment (2014; >1,625,000 individuals and >143,000 spawning-capable individuals) as sufficient to prevent extinction in the foreseeable future. This is due to the fact that the population size is large enough to prevent small population effects (*e.g.,* Allee effects) from having negative consequences. We also note that none of the scenarios evaluated in the ISC stock projections showed declining trends. This likely indicates that the proposed reductions in landings in the ISC stock assessment that were adopted by the relevant RFMOs and have been implemented by participating countries are likely to prevent future declines. Therefore, we consider commercial fishing to pose a moderate to high risk to contribute to the degradation of Pacific bluefin tuna.

Recreational Fishing

Recreational fishing for Pacific bluefin tuna occurs to some extent in most areas where Pacific bluefin tuna occur relatively close to shore. The majority of recreational effort appears to be in the United States, although this may be an artifact of a lack of record keeping outside of the United States. From the mid-1980s onward, the majority of U.S. Pacific bluefin tuna landings have been from recreational fisheries. Along the west coast of the United States, the recreational fishing fleet for highly migratory species such as Pacific bluefin tuna is comprised of commercial passenger fishing vessels (CPFVs) and privately owned vessels operating from ports in southern California.

The vast majority of recreational fishing vessels operate from ports in southern California from Los Angeles south to the U.S./Mexico border, with a large proportion operating out of San Diego. Much of the catch actually occurs in Mexican waters. The recreational catch for Pacific bluefin tuna is dominated by hook and line fishing with a very small contribution from spear fishing. The landings for Pacific bluefin tuna are highly variable. This variability is linked to changes in the number of young fish that move from the western Pacific (Bayliff 1994), and potentially regional oceanographic variability, and is not taken to reflect changes in overall Pacific-wide abundance.

In addition to variability in immigration to the EPO, regulatory measures impact the number of fish caught. As mentioned, most U.S. fishing effort occurs in Mexican waters. In July 2014, Mexico banned the capture of Pacific bluefin tuna in its EEZ for the remainder of the year, reducing the catch by the U.S. recreational fleet. In 2015, while this ban was lifted, the United States instituted a two fish per angler per day bag limit and a 6 fish per multi-day fishing trip bag limit on Pacific bluefin tuna, lowered from 10 fish per angler per day and 30 fish total for multi-day trips (80 FR 44887; July 28, 2015). It is difficult to quantify the effects of the reduced bag limit at the current time as there are only two years of landings data following the reduction (2015–16). This is further complicated by an absence of an index of availability of Pacific bluefin tuna to the recreational fishery. Anecdotal evidence in the form of informal crew and fisher interviews suggests that Pacific bluefin tuna have been in high abundance since 2012. CPFV landings in 2014–16 declined following an exceptionally productive year in 2013. Whether this was an effect of the reduced bag limit or an artifact of Pacific bluefin tuna availability is uncertain. While the petition raises the concern that the two fish per day per angler bag limit is insufficient as the fishery is ''open access'' (an angler may fish as many days as they wish), it is important to note that the number of anglers participating in CPFV trips has not increased dramatically since the late 1990s. It should also be noted that the average number of Pacific bluefin tuna caught per angler on an annual basis has never exceeded 1.4 (2013), thus the two fish per day per angler bag limit will effectively prevent a major expansion of the Pacific bluefin tuna recreational landings.

Since 1980, the peak of the U.S. recreational fishery was in 2013 when 63,702 individual fish were reported in CPFV log books, with an estimated weight of 809 tons. This was more than the total U.S. commercial catch in 2013 (10.1 mt), keeping in mind that commercial vessels cannot go into Mexican waters. The average recreational catch is far lower (264 mt average from 2006–2015). The peak recreational CPFV landings in the United States in 2013 represented 7 percent of the total global catch of Pacific bluefin tuna in that same year, whereas in 2015 it represented 3.2 percent of total global catch.

Private vessel landings are more difficult to quantify as they rely on voluntary interviews with fishers at only a few of the many landing ports. In 2015, the estimated landings by private vessels was 6,195 individual Pacific bluefin tuna, which represented approximately 30 percent of all U.S.

recreational landings. Note, that these values are not included in the estimates above and represent additional landings.

At 3.2 percent of the total global landings, we consider the U.S. recreational fishery to be a minor overall contributor to the global catch of Pacific bluefin tuna, and recent measures have been implemented to reduce landings. Given that recreational landings have been reduced through increased management, we consider recreational fishing as posing no or a low risk of contributing to population decline or degradation in Pacific bluefin tuna.

Illegal, Unreported, or Unregulated Fishing

Illegal, Unreported or Unregulated (IUU) fishing, as defined in 50 CFR 300.201, means:

(1) In the case of parties to an international fishery management agreement to which the United States is a party, fishing activities that violate conservation and management measures required under an international fishery management agreement to which the United States is a party, including but not limited to catch limits or quotas, capacity restrictions, bycatch reduction requirements, shark conservation measures, and data reporting;

(2) In the case of non-parties to an international fishery management agreement to which the United States is a party, fishing activities that would undermine the conservation of the resources managed under that agreement;

(3) Overfishing of fish stocks shared by the United States, for which there are no applicable international conservation or management measures, or in areas with no applicable international fishery management organization or agreement, that has adverse impacts on such stocks;

(4) Fishing activity that has a significant adverse impact on seamounts, hydrothermal vents, cold water corals and other vulnerable marine ecosystems located beyond any national jurisdiction, for which there are no applicable conservation or management measures or in areas with no applicable international fishery management organization or agreement; or

(5) Fishing activities by foreign flagged vessels in U.S. waters without authorization of the United States.

While there is likely some level of IUU fishing for Pacific bluefin tuna in the Pacific, no reports of substantial IUU fishing have emerged, thus the amount cannot be determined. However, improvements to catch document schemes in several countries have been proposed/implemented in an effort to combat IUU harvest, and the most recent advice from the relevant RFMOs requires improvements to reporting. The SRT members had a range of opinions on the effects of IUU fishing on population decline or degradation for Pacific bluefin tuna, ranging from no impact to moderate impact. The SRT therefore performed a SEDM analysis to arrive at the conclusion that the magnitude of potential IUU fishing losses for Pacific bluefin tuna were likely low relative to existing commercial catches and thus not likely to increase substantially in the future; however, the certainty around this determination is low.

Given the absence of estimates of IUU fishing losses for Pacific bluefin tuna, we have a low level of certainty for this threat. However, with the continued improvements in catch documentation and the assumption of low IUU take relative to the commercial harvest, we determined that IUU fishing represented a low to moderate risk of contributing to population decline or degradation in Pacific bluefin tuna.

Scientific and Educational Use

Pacific bluefin tuna are used in scientific research for a range of studies such as migration patterns, stable isotope analysis, and feeding preference. The amount of lethal use of Pacific bluefin tuna in scientific and educational pursuits is negligible, as most tissues used in research (*e.g.* otoliths, muscle samples) are sourced from fish already landed by fishers. We therefore find no evidence that scientific or educational use poses a risk to contribute to the decline or degradation of Pacific bluefin tuna.

C. Disease and Predation

Disease

Studies of disease in Pacific bluefin tuna are largely absent from the literature. Most studies involve the identification of parasites normally associated with cage culture. Parasites are often associated with mortalities and reduced production among farmed marine fishes (Hayward *et al.,* 2007). Epizootic levels of parasites with short, direct, one-host life cycles, such as monogeneans, can be reached very quickly in cultured fish because of the confinement and proximity of these fish (Thoney and Hargis 1991). Among wild marine fishes, parasites are usually considered benign, though they can be associated with reduced fecundity of their hosts (Jones 2005; Hayward *et al.,* 2007).

Munday *et al.* (2003) provided a summary of metazoan infections (myxosporeans, *Kudoa* sp., monogeneans, blood flukes, larval cestodes, nematodes, copepods) in tuna species. Many metazoans infect *Thunnus* spp., but not many are known to cause mortalities; most studies to date have focused on the health and/or economic importance of these diseases. For example, postmortem liquefaction of muscle due to myxosporean infections occurs in albacore, yellowfin tuna, and bigeye tuna (*Thunnus obesus*), and in poorly identified *Thunnus* spp. Lesions caused by *Kudoa* sp. have been found in yellowfin tuna and southern bluefin tuna (Langdon 1990; Kent *et al.,* 2001). Munday *et al.* (2003) report that southern bluefin tuna have been found to be infected with an unidentified, capsalid monogenean that causes respiratory stress but does not lead to mortality.

Young Pacific bluefin tuna are often infected with red sea bream iridoviral, but the disease never appears in Pacific bluefin tuna more than 1 year of age, and occurrence is restricted to periods of water temperatures greater than 24 °C (Munday *et al.,* 2003). Mortality rates rarely reach greater than 10 percent for young fish. The fish either die during the acute phase of the disease, or they become emaciated and die later.

There is no evidence of transmission of parasites or other pathogens from captive Pacific bluefin tuna in tuna ranches. This is likely due to the fact that wild Pacific bluefin tuna are not likely to be in close enough proximity to pens used to house Pacific bluefin tuna.

We find that disease poses no to low risk of contributing to population decline or degradation in Pacific bluefin tuna. This was based largely on the absence of empirical evidence of abnormal levels of natural disease outbreaks in Pacific bluefin tuna, the absence of observations of wild Pacific bluefin tuna swimming in close enough proximity to ''farms'' such that disease transmission is possible, and the absence of empirical evidence showing disease transmission from ''farms'' to wild Pacific bluefin tuna.

Predation

As large predators, Pacific bluefin tuna are not heavily preyed upon naturally after their first few years. Predators of adult Pacific bluefin tuna may include marine mammals such as killer whales (*Orcinus orca*) or shark species such as white (*Carcharodon carcharias*) and mako sharks (*Isurus* spp.) (Nortarbartolo di Sciara 1987; Collette and Klein-MacPhee 2002; de

Stephanis 2004; Fromentin and Powers 2005). Juvenile Pacific bluefin tuna may be preyed upon by larger opportunistic predators and, to a lesser degree, seabirds.

We find that natural predation poses no to low risk of contributing to population decline or degradation in Pacific bluefin tuna. This was based primarily on the limited diversity of predators and absence of empirical evidence showing abnormal decline/degradation of Pacific bluefin tuna by predation.

D. The Inadequacy of Existing Regulatory Mechanisms

The current management and regulatory schemes for Pacific bluefin tuna are intrinsically linked to the patterns of utilization discussed in the previous section ''Overutilization for Commercial, Recreational, Scientific or Educational Purposes.'' The evaluation in this section focuses on the adequacy or inadequacy of the current management and regulatory schemes to address the threats identified in the section on ''Overutilization for Commercial, Recreational, Scientific or Educational Purposes.''

Pacific bluefin tuna fisheries are managed under the authorities of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Tuna Conventions Act of 1950 (TCA), and the Western and Central Pacific Fisheries Convention Implementation Act (WCPFCIA). The TCA and WCPFCIA authorize the Secretary of Commerce to implement the conservation and management measures of the Inter-American Tropical Tuna Commission (IATTC) and Western and Central Pacific Fisheries Commission (WCPFC), respectively.

International Fisheries Management

Pacific bluefin tuna is managed as a single Pacific-wide stock under two RFMOs: The IATTC and the WCPFC. Both RFMOs are responsible for establishing conservation and management measures based on the scientific information, such as stock status, obtained from the ISC.

The IATTC has scientific staff that, in addition to conducting scientific studies and stock assessments, also provides science-based management advice. After reviewing the Pacific bluefin tuna stock assessment prepared by the ISC, the IATTC develops resolutions. Mexico and the United States are the two IATTC member countries that currently fish for, and have historically fished for, Pacific bluefin tuna in the EPO. Thus, the IATTC resolutions adopted were intended to apply to these two countries.

The WCPFC has a Northern Committee (WCPFC–NC), which consists of a subset of the WCPFC members and cooperating non-members, that meets annually in advance of the WCPFC meeting to discuss management of designated ''northern stocks'' (currently North Pacific albacore, Pacific bluefin tuna, and North Pacific swordfish). After reviewing the stock assessments prepared by the ISC, the WCPFC–NC develops the conservation and management measures for northern stocks and makes recommendations to the full Commission for the adoption of measures. Because Pacific bluefin tuna is a ''northern stock'' in the WCPFC Convention Area, without the recommendation of the Northern Committee, those measures would not be adopted by the WCPFC. The WCPFC's Scientific Committee also has a role in providing advice to the WCPFC with respect to Pacific bluefin tuna; to date its role has been largely limited to reviewing and endorsing the stock assessments prepared by the ISC.

The IATTC and WCPFC first adopted conservation and management measures for Pacific bluefin tuna in 2009, and the measures have been revised five times. The conservation and management measures include harvest limits, size limits, and stock status monitoring plans. In recent years, coordination among both RFMOs has improved in an effort to harmonize conservation and management measures to rebuild the depleted stock. The most relevant resolutions as they relate to recent Pacific bluefin tuna management are detailed below.

In 2012, the IATTC adopted Resolution C–12–09, which set commercial catch limits on Pacific bluefin tuna in the EPO for the first time. This resolution limited catch by all IATTC members to 5,600 mt in 2012 and to 10,000 mt in 2012 and 2013 combined, notwithstanding an allowance of up to 500 mt annually for any member with a historical catch record of Pacific bluefin tuna in the eastern Pacific Ocean (*i.e.,* the United States and Mexico). Resolution C–13–02 applied to 2014 only and, similar to C–12–09, limited catch to 5,000 mt with an allowance of up to 500 mt annually for the United States. Following the advice from the IATTC scientific staff, Resolution C–14–06 further reduced the catch limit by approximately 34 percent—6,000 mt for Mexico and 600 mt for the United States for 2015 and 2016 combined. The IATTC most recently adopted Resolution C–16–08. In accordance with the recommendations of the IATTC's scientific staff, this resolution maintains the same catch limits that were applicable to 2015 and 2016—6,600 mt in the eastern Pacific Ocean during 2017 and 2018 combined. The final rule implementing Resolution C–16–08 was published on April 21, 2017, and had an effective date of May 22, 2017. The most recent regulations represent roughly a 33 percent reduction compared to the average landings from 2010–2014 (5,142 mt). Resolution C–16–08 also outlined next steps in developing a framework for managing the stock in the long-term. This framework included an initial goal of rebuilding the SSB to the median point estimate for 1952–2014 by 2024 with at least 60 percent probability, and further specifies that the IATTC will adopt a second rebuilding target in 2018 to be achieved by 2030. The second Joint IATTC–WCPFC Northern Committee Working Group meeting on Pacific bluefin tuna, that will be held August 28–September 1, 2017, will discuss the development of a rebuilding strategy (second rebuilding target and timeline, etc.) and long-term precautionary management framework (*e.g.* management objectives, limit and target reference points, and harvest control rules).

The conservation and management measures adopted by the WCPFC have become increasingly restrictive since the initial 2009 measure. In 2009, total fishing effort north of 20° N. was limited to the 2002–2004 annual average level. At this time, an interim management objective—to ensure that the current level of fishing mortality rate was not increased in the western Pacific Ocean—was also established. In 2010, Conservation and Management Measure (referred to as CMM) 2010–04 established catch restrictions in addition to the effort limits described above for 2011 and 2012. A similar measure, CMM 2012–06, was adopted for 2013. In 2014 (CMM 2013–09) all catch of Pacific bluefin tuna less than 30 kilograms (kg) was reduced by 15 percent below the 2002–2004 annual average. In 2015 (CMM 2014–04) the harvest of Pacific bluefin tuna less than 30 kilograms was reduced to 50 percent of the 2002–2004 annual average. The CMM 2014–04 also limits all catches of Pacific bluefin tuna greater than 30 kg to no more than the 2002–2004 annual average level. The measure was amended in 2015 (CMM 2015–04) to include a requirement to adopt an ''emergency rule'' where additional actions would be triggered if recruitment in 2016 was extremely poor. However, this emergency rule was not agreed to at the 2016 Northern Committee annual meeting. It is expected that it will be discussed again at the Northern Committee meeting in August 2017. Lastly, the measure was amended in 2016 (CMM 2016–04) to allow countries to transfer some of their catch limit for Pacific bluefin tuna less than 30 kg to their limit on fish larger than 30 kg (*i.e.,* increase catch of larger fish and decrease catch of smaller fish); the reverse is not allowed. Unlike the IATTC resolutions for Pacific bluefin tuna, the current WCPFC Pacific bluefin tuna measure does not have an expiration date, although it may be amended or removed. Both the IATTC and WCPFC measures require reporting to promote compliance with the provisions of the measures.

In summary, the WCPFC adopted harvest limits for Pacific bluefin tuna in 2010 and further reduced those limits in 2012, 2014, and 2016. The IATTC adopted harvest limits for Pacific bluefin tuna in 2012 and further reduced those limits in 2014 and 2016. Additionally, both RFMOs addressed concerns about monitoring harvest by adopting monitoring and reporting plans in 2010. Furthermore, the ISC stock assessment predicts that under all scenarios the current harvest limits will allow for rebuilding the abundance of Pacific bluefin tuna to targets by 2030.

After thorough discussion, the SRT members had a range of opinions on the effects of international management on population decline or degradation for Pacific bluefin tuna, ranging from no impact to high impact. The SRT therefore used SEDM to arrive at the conclusion that inadequacy of international management poses a low risk of contributing to population decline or degradation in Pacific bluefin tuna over the short time period (25 years) and a moderate risk over the long time period (100 years).

Domestic Fisheries Management

Domestic fisheries are managed under the MSA. The MSA provides regional fishery management councils with authority to prepare Fishery Management Plans (FMPs) for the conservation and management of fisheries in the U.S. EEZ. The MSA was reauthorized and amended in 1996 by the Sustainable Fisheries Act (SFA) and again in 2006 by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA). Among other modifications, the SFA added requirements that FMPs include measures to rebuild overfished stocks.

The Pacific Fishery Management Council (Pacific Council) has purview over the U.S. West Coast fisheries, which catch the large majority of Pacific bluefin tuna caught by U.S. vessels. The Pacific Council makes recommendations on the implementation of the FMP for U.S. West Coast Fisheries for highly migratory species (HMS FMP) for consideration by NMFS. Additionally, the Pacific Council makes recommendations to NMFS on issues expected to be considered by the IATTC and WCPFC. During its November 2016 meeting, the Pacific Council, in response to a petition that NMFS received by the Center for Biological Diversity, recommended a review of domestic status determination criteria for Pacific bluefin tuna at upcoming meetings in March, June, and September 2017. The domestic status determination criteria, also commonly referred to as reference points, are targets for fishing effort and abundance of the population. At the March 2017 meeting, NMFS provided a report to the Pacific Council that included domestic status determination criteria for Pacific bluefin tuna.

The Pacific Council, in response to NMFS' 2013 determination that the Pacific bluefin tuna stock was overfished and subject to overfishing (78 FR 41033; July 9, 2013), recommended reducing the bag and possession limits for Pacific bluefin tuna in the recreational fishery. The Pacific Council recommended reducing the daily bag limit from 10 to 2 fish and the possession limit from 30 to 6 fish. Based on analyses conducted at the SWFSC, this was projected to reduce landings by 10.4 percent in U.S. waters and 19.4 percent in U.S. and Mexican waters combined (Stohs, 2016). We published a final rule in 2015 implementing the bag limit of two fish per day and possession limit of six fish per trip (80 FR 44887, July 28, 2015).

NMFS coordinates closely with the California Department of Fish and Wildlife (CDFW) to monitor the Pacific bluefin tuna fishery. The State of California requires that fish landed in California have a corresponding receipt, which indicates quantity landed. Together, NMFS and CDFW monitor landings to ensure catch limits agreed to by the IATTC are not exceeded.

In summary, NMFS initially set limits for commercial and recreational harvest limits in 2010 and further reduced those limits in 2012, 2014, and 2016. The CDFW monitors and reports commercial and recreation harvest to NMFS. When U.S. commercial catch limits are met, NMFS closes the fishery. Furthermore, the ISC stock assessment predicts that the current harvest limits will allow for stable or increasing Pacific bluefin tuna SSB. We expect the current harvest limits to be effective at reducing the impact of domestic commercial and recreational fisheries, and we will continue to monitor the effectiveness of those regulations. We find that U.S. domestic management of commercial and recreational fishing poses no or low risk of contributing to population decline or degradation in Pacific bluefin tuna.

E. Other Natural or Man-Made Factors Affecting Its Continued Existence

The other factors affecting the continued existence of Pacific bluefin tuna that we analyzed are climate change, radiation contamination from Fukushima, and the risks of low abundance levels inherent in small populations.

Climate Change

Over the next several decades climate change models predict changes to many atmospheric and oceanographic conditions. The SRT considered these predictions in light of the best available information. The SRT felt that there were three physical factors resulting from climate change predictions that would have the most impact on Pacific bluefin tuna: Rising sea surface temperatures (SST), increased ocean acidification, and decreases in dissolved oxygen.

Rising Sea Surface Temperatures

Rising SST may affect Pacific bluefin tuna spawning and larval development, prey availability, and trans-pacific migration habits. Pacific bluefin tuna spawning has only been recorded in two locations: Near the Philippines and Ryukyu Islands in spring, and in the Sea of Japan during summer (Okochi *et al.,* 2016; Shimose & Farley 2016). Spawning in Pacific bluefin tuna occurs in comparatively warm waters, and so larvae are found within a relatively narrow temperature range (23.5–29.5 °C) compared to adults (Kimura *et al.,* 2010; Tanaka & Suzuki 2016).

Currently, SSTs within the theoretically suitable range for larvae are present near the Ryukyu Islands between April and June, and in the Sea of Japan during July and August (Caiyun & Ge 2006; Seo *et al.,* 2014; Tanaka & Suzuki 2016). Warming of 1.5–3 °C in the region may shift suitable times to earlier in the year and/or places for spawning northwards. Under the most pessimistic (''business as usual'') CO_2 emission and concentration scenarios, SSTs in the North Pacific are likely to increase substantially by the end of the 21st century (Hazen *et al.,* 2013; Woodworth-Jefcoats *et al.,* 2016). However, there is considerable spatial heterogeneity in these projections. The southern Pacific bluefin tuna spawning area is projected to warm 1.5–2 °C by the end of the 21st century, with particularly weak warming in the Kuroshio Current region. In contrast, the Sea of Japan may warm by more than 3 °C compared to recent historical conditions (Seo *et al.,* 2014; Scott *et al.,* 2016; Woodworth-Jefcoats *et al.,* 2016).

The precise mechanisms by which warming waters will affect Pacific bluefin tuna larvae are not entirely clear. Kimura *et al.* (2010) assumed that the lethal temperature for larvae was 29.5 °C. However, Muhling *et al.* (2010) and Tilley *et al.* (2016) both reported larvae of the closely-related Atlantic bluefin tuna in the Gulf of Mexico at SSTs of between 29.5 and 30.0 °C. In addition, tropical tuna larvae can tolerate water temperatures of well above 30 °C (Sanchez-Velasco *et al.,* 1999; Wexler *et al.,* 2011; Muhling *et al.,* 2017). Pacific bluefin tuna larvae may have fundamentally different physiology from that of these other species, or it is possible that the observed upper temperature limit for Pacific bluefin tuna larvae in the field is more a product of the time and place of spawning, rather than an upper physiological limit.

Similar to other tuna species, larval Pacific bluefin tuna appear to have highly specialized and selective diets (Uotani *et al.,* 1990; Llopiz & Hobday 2015). Smaller larvae rely primarily on copepod nauplii, before moving to cladocerans, copepods such as *Farranula* and *Corycaeus* spp. and other zooplankton. In the Sea of Japan region, the occurrence of potentially favorable prey organisms for larval Pacific bluefin tuna appears to be associated with stable post-bloom conditions during summer (Chiba & Saino, 2003). This suggests a potential phenological match to Pacific bluefin tuna spawning. Environmentally-driven changes in the evolution of this zooplankton community, or the timing of spawning, could thus affect the temporal match between larvae and their prey. Woodworth-Jefcoats *et al.* (2016) project a 10–20 percent decrease in overall zooplankton density in the western Pacific Ocean, but how this may relate to larval Pacific bluefin tuna prey availability is not yet known.

Climate change may affect the foraging habitats of Pacific bluefin tuna. Adult and older juvenile (>1 year) Pacific bluefin tuna disperse from the spawning grounds in the western Pacific and older juveniles can make extensive migrations, using much of the temperate North Pacific. An unknown proportion of 1–2 year old fish migrate to foraging grounds in the eastern North Pacific (California Current LME) and typically remain and forage in this region for several years (Bayliff *et al.,* 1991; Bayliff 1994; Rooker *et al.,* 2001; Kitagawa *et al.,* 2007; Boustany *et al.,* 2010; Block *et al.,* 2011; Madigan *et al.,* 2013; Whitlock *et al.,* 2015).

Sea surface temperatures in the California Current are expected to increase up to 1.5–2 °C by the end of the 21st century (Hazen *et al.,* 2013; Woodworth-Jefcoats *et al.,* 2016). Pacific bluefin tuna tagged in the California Current demonstrate a seasonal north-south migration between Baja California (10° N.) and near the California-Oregon border (42° N.) (Boustany *et al.,* 2010; Block *et al.,* 2011; Whitlock *et al.,* 2015), although some fish travel as far north as Washington State. The seasonal migration follows local peaks in productivity (as measured by surface chlorophyll), such that fish move northward from Baja California after the local productivity peak in late spring to summer (Boustany *et al.,* 2010; Block *et al.,* 2011). Uniform warming in this region could impact Pacific bluefin tuna distribution by moving their optimal temperature range (and thermal tolerance) northward. However, it is unlikely that rising temperatures will be a limiting factor for Pacific bluefin tuna, as appropriate thermal habitat will likely remain available.

The high productivity and biodiversity of the California Current is driven largely by seasonal coastal upwelling. Although there is considerable uncertainty on how climate change will impact coastal upwelling, basic principles indicate a potential for upwelling intensification (Bakun 1990). Bakun's hypothesis suggested that the rate of heating over land would be enhanced relative to that over the ocean, resulting in a stronger cross-shore pressure gradient and a proportional increase in alongshore winds and resultant upwelling (Bakun *et al.,* 2015; Bograd *et al.,* 2017). A recent publication (Sydeman *et al.,* 2014) described a meta-analysis of historical studies on the Bakun hypothesis and found general support for upwelling intensification, but with significant spatial (latitudinal) and temporal (intraseasonal) variability between and within the eastern boundary current systems. In the California Current, a majority of analyses indicated increased upwelling intensity during the summer (peak) months, though this signal was most pronounced in the northern California Current (Sydeman *et al.,* 2014).

To date, global climate models have generally been too coarse to adequately resolve coastal upwelling processes (Stock *et al.,* 2010), although recent studies analyzing ensemble model output have found general support for projected increases in coastal upwelling in the northern portions of the eastern boundary current systems (Wang *et al.,* 2015; Rykaczewski *et al.,* 2015). Using an ensemble of more than 20 global climate models from the IPPC's Fifth Assessment Report, Rykaczewski *et al.* (2015) found evidence of a small projected increase in upwelling intensity in the California Current north of 40° N. latitude and a decrease in upwelling intensity to the south of this range by the end of the 21st century under RCP 8.5. Pacific bluefin tuna are more commonly found to the south of the 40° N. latitude mark. Perhaps more importantly, Rykaczewski *et al.* (2015) described projected changes in the phenology of coastal upwelling, with an earlier transition to positive upwelling within the peak upwelling domain. Overall, these results suggest a poleward displacement of peak upwelling and potential lengthening of the upwelling season in the California Current, even if upwelling intensity may decrease. The phenological changes in coastal upwelling may be most important, as these may lead to spatial and temporal mismatches between Pacific bluefin tuna and their preferred prey (Cushing 1990; Edwards and Richardson 2004; Bakun *et al.,* 2015). However, the bluefin tuna's highly migratory nature and plasticity in migratory patterns may help to mitigate shifts in phenology.

The information directly relating to food web alterations that may impact Pacific bluefin tuna is scarce. While changes to upwelling dynamics in foraging areas have been examined, it is still relatively speculative, and literature on the potential impacts of the projected changes is limited. Given their trophic position as an apex predator, and the fact that Pacific bluefin tuna are opportunistic feeders that can change their preferred diet from year to year, alterations to the food web may have less impact on Pacific bluefin tuna than on other organisms that are reliant on specific food sources.

Climate change may affect the Pacific bluefin tuna's migratory pathways. Pacific bluefin tuna undergo trans-Pacific migrations, in both directions, between the western Pacific spawning grounds and eastern Pacific foraging grounds (Boustany *et al.,* 2010; Block *et al.,* 2011). For both migrations, Pacific bluefin tuna remain within a relatively narrow latitudinal band (30–40° N.) within the North Pacific Transition Zone (NPTZ), which is characterized by generally temperate conditions. This region, marking the boundary between the oligotrophic subtropical and more productive subarctic gyres, is demarcated by the seasonally-migrating Transition Zone Chlorophyll Front (TZCF; Polovina *et al.,* 2001; Bograd *et al.,* 2004). Climate-driven changes in the position of the TZCF, and in the thermal environment and productivity within this region, could impact the migratory phase of the Pacific bluefin tuna life cycle.

Under RCP 8.5, SSTs in the NPTZ are expected to increase by 2–3 °C by the end of the 21st century (Woodworth-Jefcoats *et al.,* 2016), with the highest increases on the western side. The increased temperatures within the NPTZ are part of the broader projected changes in the central North Pacific Ocean, including an expansion of the oligotrophic Subtropical Gyre, a northward displacement of the transition zone, and an overall decline in productivity (Polovina *et al.,* 2011). The impacts of these changes on species that make extensive use of the NPTZ could be substantial, resulting in a gain or loss of core habitat, distributional shifts, and regional changes in biodiversity (Hazen *et al.,* 2013). Using habitat models based on a multi-species biologging dataset, and a global climate model run under ''business-as-usual'' forcing (the A2 CO_2 emission scenario from the IPCC's fourth assessment report), Hazen *et al.* (2013) found a substantial loss of core habitat for a number of highly migratory species, and small gains in viable habitat for other species, including Pacific bluefin tuna. Although the net change in total potential Pacific bluefin tuna core habitat was positive, the projected physical changes in the bluefin tuna's migratory pathway could negatively impact them. The northward displacement of the NPTZ and TZCF could lead to longer migrations requiring greater energy expenditure. The generally lower productivity of the region could also diminish the abundance or quality of the Pacific bluefin tuna prey base.

A recent study of projected climate change in the North Pacific that used an ensemble of 11 climate models, including measures of primary and secondary production, found that increasing temperatures could alter the spatial distribution of tuna and billfish species across the North Pacific (Woodworth-Jefcoats *et al.,* 2016). As with Hazen *et al.* (2013), this study found species richness increasing to the north following the northward displacement of the NPTZ. They also estimated a 2–5 percent per decade decline in overall carrying capacity for commercially important tuna and billfish species, driven by warming waters and a basin-scale decline in zooplankton densities (Woodworth-Jefcoats *et al.,* 2016). While there is still substantial uncertainty inherent in these climate models, we can say with some confidence that the central North Pacific, which encompasses a key conduit between Pacific bluefin tuna spawning and foraging habitat, is likely to become warmer and less productive through the 21st century.

Increasing Ocean Acidification and Decreasing Dissolved Oxygen

As CO_2 uptake by the oceans increases, ocean pH will continue to decrease (Feely *et al.,* 2009), with declines of between 0.2 and 0.4 expected in the western North Pacific by 2100 under the Intergovernmental Panel on Climate Change's Representative Concentration Pathway (RCP) 8.5 (Ciais *et al.,* 2013). RCP 8.5 is a high emission scenario, which assumes that radiative forcing due to greenhouse gas emissions will continue to increase strongly throughout the 21st century (Riahi *et al.,* 2011). Rearing experiments on larval yellowfin tuna suggest that ocean acidification may result in longer hatch times, sub-lethal organ damage, and decreased growth and survival (Bromhead *et al.,* 2014; Frommel *et al.,* 2016). Other studies on coral reef fish larvae show that acidification can impair sensory abilities of larvae, and in combination with warming temperatures, can negatively affect metabolic scope (Munday *et al.,* 2009a,b; Dixson *et al.,* 2010; Simpson *et al.,* 2011). Surface ocean pH on Pacific bluefin tuna spawning grounds is currently higher than that in the broader North Pacific (8.1–8.2) (Feely *et al.,* 2009). How this may affect the ability of Pacific bluefin tuna larvae (in particular) to adapt to ocean acidification is unknown. Recent studies have shown that future adaptation to rising CO_2 and acidification could be facilitated by individual genetic variability (Schunter *et al.,* 2017). In addition, transgenerational plasticity may allow surprisingly rapid adaptation across generations (Rummer & Munday 2017). However, these studies examined small coral reef fish species, so results may not transfer to larger, highly migratory species such as Pacific bluefin tuna. As well as incurring direct effects on Pacific bluefin tuna, ocean acidification is also likely to change the prey base available to all life stages of this species. Different organisms vary substantially in their sensitivity to the combined effects of acidification and warming (Byrne 2011). A shift in the prey assemblage towards organisms more tolerant to acidification is therefore likely in the future.

Current projections estimate a future decline in dissolved oxygen of 3–6 percent by 2100 under RCP 8.5 (Bindoff *et al.,* 2013; Ciais *et al.,* 2013). This may be most relevant for spawning-sized adult Pacific bluefin tuna, which may be subject to greater metabolic stress on spawning grounds. While some studies exist on the effects of temperature on metabolic rates, cardiac function and specific dynamic action in juvenile Pacific bluefin tuna (*e.g.* Blank *et al.,* 2004; 2007; Clark *et al.,* 2008; 2010; 2013; Whitlock *et al.,* 2015), there are no published studies on larger adults, or on larvae. While future warming and decreases in dissolved oxygen may reduce the suitability of some parts of the Pacific bluefin tuna range (*e.g.* Muhling *et al.,* 2016), likely biological responses to this are not yet known.

Another factor to include in considerations of climate change impacts is biogeochemical changes. Driven by upper ocean warming, changes in source waters, enhanced stratification, and reduced mixing, the dissolved oxygen content of mid-depth oceanic waters is expected to decline (Keeling *et al.,* 2010). This effect is especially important in the eastern Pacific, where the Oxygen Minimum Zone (OMZ) shoals to depths well within the vertical habitat of Pacific bluefin tuna and other highly migratory species and, in particular, their prey (Stramma *et al.,* 2010; Moffit *et al.,* 2015). The observed trend of declining oxygen levels in the Southern California Bight (Bograd *et al.,* 2008; McClatchie *et al.,* 2010; Bograd *et al.,* 2015), combined with an increase in the frequency and severity of hypoxic events along the U.S. West Coast (Chan *et al.,* 2008; Keller *et al.,* 2010; Booth *et al.,* 2012), suggests that declining oxygen content could drive ecosystem change. Specifically, the vertical compression of viable habitat for some benthic and pelagic species could alter the available prey base for Pacific bluefin tuna. Given that Pacific bluefin tuna are opportunistic feeders, they could have resilience to these climate-driven changes in their prey base.

The effects of increasing hypoxia on marine fauna in the California Current may be magnified by ocean acidification. Ekstrom *et al.* (2015) predicted the West Coast is highly vulnerable to ecological impacts of ocean acidification due to reduction in aragonite saturation state exacerbated by coastal upwelling of ''corrosive,'' lower pH waters (Feely *et al.,* 2008). The most acute impacts would be on calcifying organisms (some marine invertebrates and pteropods), which are not generally part of the adult Pacific bluefin tuna diet. While direct impacts of ocean acidification on Pacific bluefin tuna may be minimal within their eastern Pacific foraging grounds, some common Pacific bluefin tuna prey do rely on calcifying organisms (Fabry *et al.,* 2008).

Climate Change Conclusions

We find that ocean acidification and changes in dissolved oxygen content due to climate change pose a very low risk to the decline or degradation of the Pacific bluefin tuna on the short-term time scale (25 years), and low to moderate threat on the long-time scale (100 years). The reasoning behind this decision for acidification centered primarily on the disconnect between Pacific bluefin tuna and the lower trophic level prey which would be directly affected by acidification as well as by the lack of information on direct impacts on acidification on pelagic fish. Conclusions by the SRT members on the rising SST due to climate change required SEDM, as the range of values assigned by each SRT member was large. Following the SEDM, the SRT concluded that SST rise poses a low risk of contributing to population decline or degradation in PBF over the short (25 year) and long (100 year) time frames. This decision was reached primarily due to the highly migratory nature of Pacific bluefin tuna; despite likely latitudinal shifts in preferred habitat, it would take little effort for Pacific bluefin tuna to shift their movements along with the changing conditions.

Fukushima Associated Radiation

On 11 March, 2011, the Tōhoku megathrust earthquake at magnitude 9.1 produced a devastating tsunami that hit the Pacific coast of Japan. As a result of the earthquake, the Fukushima Daiichi Nuclear Power Plant was compromised, releasing radionuclides directly into the adjacent sea. The result was a 1- to 2-week pulse of emissions of the caesium radioisotopes Caesium-134 and Caesium-137. These isotopes were biochemically available to organisms in direct contact with the contaminated water (Oozeki *et al.,* 2017).

Madigan *et al.* (2012) reported on the presence of Caesium-134 and Caesium-137 in Pacific bluefin tuna caught in California in ratios that strongly suggested uptake as a result of the Fukushima Daiichi accident. The results indicated that highly migratory species can be vectors for the trans-Pacific movement of radionuclides. Importantly, the study highlighted that while the radiocaesium present in the Pacific bluefin tuna analyzed was directly traceable to the Fukushima accident, the concentrations were 30 times lower than background levels of naturally occurring radioisotopes such as potassium-40. In addition, Madigan *et al.* (2012) estimated the dose to human consumers of fish from Fukushima derived Caesium-137 was at 0.5 percent of the dose from Polonium-210, a natural decay product of Uranium-238, which is ubiquitously present and in constant concentrations globally.

Fisher *et al.* (2013) further evaluated the dosage and associated risks to marine organisms and humans (by consumption of contaminated seafood) of the caesium radioisotopes associated with the Fukushima Daiichi accident. They confirmed that dosage of radioisotopes from consuming seafood were dominated by naturally occurring radionuclides and that those stemming directly from Fukushima derived radiocaesium were three to four orders of magnitude below doses from these natural radionuclides. Doses to marine organisms were two orders of magnitude lower than the lowest benchmark protection level for ecosystem health (ICRP 2008). The study concluded that even on the date at which the highest exposure levels may have been reached, dosages were very unlikely to have exceeded reference levels. This indicates that the amount of Fukushima derived radionuclides is not cause for concern with regard to the potential harm to the organisms themselves.

We find that Fukushima associated radiation poses no risk of contributing to population decline or degradation in Pacific bluefin tuna. This was based largely on the absence of empirical evidence showing negative effects of Fukushima derived radiation on Pacific bluefin tuna.

Small Population Concerns

Small populations face a number of inherent risks. These risks are tied to survival and reproduction (*e.g.* Allee or other depensation effects) via three mechanisms: Ecological (*e.g.,* mate limitation, cooperative defense, cooperative feeding, and environmental conditioning), genetic (*e.g.,* inbreeding and genetic drift), and demographic stochasticity (*i.e.,* individual variability in survival and recruitment) (Berec *et al.,* 2007). The actual number at which populations would be considered critically low and at risk varies depending on the species and the risk being considered. While the Pacific bluefin tuna is estimated to contain at least 1.6 million individuals, of which more than 140,000 are reproductively capable, the SRT deemed it prudent to examine the factors above that are traditionally used to evaluate the impacts of relatively low population numbers. In the paragraphs that follow we discuss how small population size can affect reproduction, demographic stochasticity, genetics, and how it can be affected by stochastic and catastrophic events, and Allee effects.

In small populations, individuals may have difficulty finding a mate. However, the probability of finding a mate depends largely on density on the spawning grounds rather than absolute abundance. Pacific bluefin tuna are a schooling species and individual Pacific bluefin tuna are not randomly distributed throughout their range. They also exhibit regular seasonal migration patterns that include aggregating at two separate spawning grounds (Kitigawa *et al.,* 2010). This schooling and aggregation behavior serves to increase their local density and the probability of individuals finding a mate. This mating strategy could reduce the effects of small population size on finding mates over other strategies that do not concentrate individuals. It is unknown whether spawning behavior is triggered by environmental conditions or densities of tuna. If density of adults triggers spawning, then reproduction could be affected by high levels of depletion. However, the abundance of Pacific bluefin tuna has reached similar lows in the past and rebounded. The number of adult Pacific bluefin tuna is currently estimated to be 2.6 percent of its unfished SSB. The number of adult Pacific bluefin tuna reached a similar low in 1984 of 1.8 percent and rebounded in the 1990s to 9.6 percent, the second highest level since 1952.

Another concern with small populations is demographic stochasticity. Demographic stochasticity refers to the variability of annual population change arising from random birth and death events at the individual level. When populations are very small (*e.g.,* <100 individuals), chance demographic events can have a large impact on the population. Species with low mean annual survival rates are generally at greater population risk from demographic stochasticity than those that are long-lived and have high mean annual survival rates. In other words, species that are long-lived and have high annual survival rates have lower ''safe'' abundance thresholds, above which the risk of extinction due to chance demographic processes becomes negligible. Even though the percentage of adult Pacific bluefin tuna relative to historical levels is low, they still number in the hundreds of thousands. In addition, the total population size in 2014 as estimated by the 2016 ISC stock assessment was 1,625,837. The high number of individuals, both mature and immature, should therefore counteract a particular year with low survivorship.

Small populations may also face Allee effects. If a population is critically small in size, Allee effects can act upon genetic diversity to reduce the prevalence of beneficial alleles through genetic drift. This may lower the population's fitness by reducing adaptive potential and increasing the accumulation of deleterious alleles due to increased levels of inbreeding. Population genetic theory typically sets a threshold of 50 individuals (*i.e.,* 25 males, 25 females) below which irreversible loss of genetic diversity is likely to occur in the near future. This value, however, is not necessarily based upon the number of individuals present in the population (*i.e.,* census population size, N_C) but rather on the effective population size (N_E), which is linked to the overall genetic diversity in the population and is typically less than N_C. In extreme cases N_E may be much (*e.g.* 10–10,000 times) smaller, typically for species that experience high variance in reproductive success (*e.g.,* sweepstakes recruitment events). N_E may also be reduced in populations that deviate from a 1:1 sex ratio and from species that have suffered a genetic bottleneck.

With respect to considerations of N_E in Pacific bluefin tuna, the following points are relevant. Although there are no available data for nuclear DNA diversity in Pacific bluefin tuna, the relatively high number of unique mitochondrial DNA haplotypes (Tseng *et al.,* 2014) can be used as a proxy for evidence of high levels of overall genetic diversity currently within the population. With two separate spawning grounds, and adult numbers remaining in the hundreds of thousands, genetic diversity is expected to still be at high levels with little chance for inbreeding, given that billions of gametes combine in concentrated spawning events.

Animals that are highly mobile with a large range are less susceptible to stochastic and catastrophic events (such as oil spills) than those that occur in concentrated areas across life history stages. Pacific bluefin tuna are likely to be resilient to catastrophic and stochastic events for the following reasons: (1) They are highly migratory, (2) there is a large degree of spatial separation between life history stages, (3) there are two separated spawning areas, and (4) adults reproduce over many years such that poor recruitment even over a series of years will not result in reproductive collapse. As long as this spatial arrangement persists and poor recruitment years do not exceed the reproductive age span for the species, Pacific bluefin tuna should be resilient to both stochastic and catastrophic events.

Although Pacific bluefin tuna are resilient to many of the risks that small populations face, there is increasing evidence for a reduction in population growth rate for marine fishes that have been fished to densities below those expected from natural fluctuations (Hutchings 2000, 2001). These studies focus on failure to recover at expected rates. A far more serious issue is not just reducing population growth but reducing it to the point that populations decrease (death rates exceed recruitment). Unfortunately, the reviews of marine fish stocks do not make a distinction between these two important categories of depensation: Reduced but neutral or positive growth versus negative growth. Many of the cases reviewed suggested depensatory effects for populations reduced to relatively low levels (0.2 to 0.5 SSB_{msy}) that would increase time to recovery, but no mention was made of declining towards extinction. However, these cases did not represent the extent of reduction observed in Pacific bluefin tuna (0.14 SSB_{msy}). Thus, this case falls outside that where recovery has been observed in other marine fishes and thus there remains considerable uncertainty as to how the species will respond to reductions in fishing pressure.

Hutchings *et al.* (2012) also show that there is no positive relationship between per capita population growth rate and fecundity in a review of 233 populations of teleosts. Thus, the prior confidence that high fecundity provides more resilience to population reduction and ability to quickly recover should be abandoned. These findings, although not providing examples that marine fishes exploited to low levels will decline towards extinction, suggest that at a minimum such populations may not recover quickly. However, Pacific bluefin tuna recently showed an instance of positive growth from a population level similar to the most recent stock assessment. This suggests potential for recovery at low population levels. However, the conditions needed to allow positive growth remain uncertain.

Small Populations Conclusion

We find that small population concerns pose low risk of contributing to population decline or degradation in Pacific bluefin tuna over both the 25- and 100-year time scales, though with low certainty. This was largely due to the estimated population size of more than 1.6 million individuals, of which at least 140,000 are reproductively capable. This, coupled with previous evidence of recovery from similarly low numbers and newly implemented harvest regulations, strongly suggests that small population concerns are not particularly serious in Pacific bluefin tuna.

Analysis of Threats

As noted previously, the SRT conducted its analysis in a 3-step progressive process. First, the SRT evaluated the risk of 25 different threats (covering all of the ESA section 4(a)(1) categories) contributing to a decline or degradation of Pacific bluefin tuna. The second step was to evaluate the extinction risk in each of the 4(a)(1) categories. Finally, they performed an overall extinction risk analysis over two timeframes—25 years and 100 years.

In step one, the evaluation of the risk of individual threats contributing to a decline or degradation of Pacific bluefin tuna considered how these threats have affected and how they are expected to continue to affect the species. The threats were evaluated in light of the vulnerability of and exposure to the threat, and the biological response. This evaluation of individual threats and the potential demographic risk they pose forms the basis of understanding used during the extinction risk analysis to inform the overall assessment of extinction risk.

Within each threat category, individual threats have not only different magnitudes of influence on the overall risk to the species (weights) but also different degrees of certainty. The overall threat within a category is cumulative across these individual threats. Thus, the overall threat is no less than that for the individual threat with the highest influence but may be greater as the threats are taken together. For example, some of the individual threats rated as ''moderate'' may result in an overall threat for that category of at least ''moderate'' but potentially ''high.'' When evaluating the overall threat, individual team members considered all threats taken together and performed a mental calculation, weighting the threats according to their expertise using the definitions below.

Each team member was asked to record his or her confidence in their overall scoring for that category. If, for example, the scoring for the overall threat confidence was primarily a function of a single threat and that threat had a high level of certainty, then they would likely have a high level of confidence in the overall confidence score. Alternatively, the overall confidence score could be reduced due to a combination of threats, some of which the team members had a low level of certainty about and consequently communicated this lower overall level of confidence with a corresponding score (using the definitions below). Generally, the level of confidence will be most influenced by the level of certainty in the threats of highest severity. The level of confidence for threats with no to low severity within a category that contains moderate to high severity threats will not be important to the overall level of confidence.

The level of severity is defined as the level of risk of this threat category contributing to the decline or degradation of the species over each time frame (over the next 25 years or over the next 100 years). Specific rankings for severity are: (1) High: The threat category is likely to eliminate or seriously degrade the species; (2) moderate: The threat category is likely to moderately degrade the species; (3) low: The threat category is likely to only slightly impair the species; and (4) none: The threat category is not likely to impact the species.

The level of confidence is defined as the level of confidence that the threat category is affecting, or is likely to affect, the species over the time frame considered. Specific rankings for confidence are: (1) High: There is a high degree of confidence to support the conclusion that this threat category is affecting, or is likely to affect, the species with the severity ascribed over the time frame considered; (2) moderate: There is a moderate degree of confidence to support the conclusion that this threat category is affecting, or is likely to affect, the species with the severity ascribed over the time frame considered; (3) low: There is a low degree of confidence to support the conclusion that this threat category is affecting, or is likely to affect, the species with the severity ascribed over the time frame considered; and (4) none: There is no confidence to support the conclusion that this threat category is affecting, or is likely to affect, the species with the severity ascribed over the time frame considered.

Based on the best available information and the SRT's SEDM analysis, we find that overutilization, particularly by commercial fishing activities, poses a moderate risk of decline or degradation of the species over both the 25 and 100-year time scales. While the degree of certainty for this risk assessment was moderate for the 25-year time frame, it was low for the 100-year time frame. This largely reflects the inability to accurately predict trends in both population size and catch over the longer time frame. In addition, management regimes may shift in either direction in response to the population trends at the time.

Over the short and long time frames, we find that habitat destruction, disease, and predation are not likely to pose a risk to the extinction of the Pacific bluefin tuna. Among the specific threats in the Habitat Destruction category, water pollution was ranked the highest (mean severity score 1.5). This was largely due to the fact that any degradation to Pacific bluefin tuna by water pollution is a passive event. That is, behavioral avoidance might not be possible, whereas other specific threats involved factors where active avoidance would be possible.

We also find that based on the best available information and the SRT's SEDM analysis, the inadequacy of existing regulatory mechanisms poses a low risk of decline or degradation to the species over both the 25- and 100-year time scales, given the stable or upward trends of future projected SSB over the short time scale from various harvest scenarios in the 2016 ISC stock assessment. The confidence levels were moderate for the 25-year time frame and low for the 100-year time frame.

Lastly, we find that other natural or manmade factors, which included climate change and small population concerns, pose a low risk of decline or degradation to the species over the 25-year time frame and moderate risk over the 100-year time frame.

Extinction Risk Analysis

As described previously, following the evaluation of the risk of 25 specific threats contributing to the decline or degradation of Pacific bluefin tuna, the SRT then conducted step 2 and step 3 to perform an extinction risk analysis. In step two the SRT used SEDM to evaluate the contribution of each section 4(a)(1) factor to extinction risk. Finally, in step 3 the SRT performed an overall extinction risk analysis over two timeframes—25 years and 100 years.

This final risk assessment considered the threats, the results from the recent stock assessment, the species life history, and historical trends. After considering all factors, team members were asked to distribute 100 plausibility points into one of three risk categories for the short term and long term time frames. The short-term time frame was 25 years and the long-term time frame was 100 years.

The SRT defined the extinction risk categories as low, moderate, and high. The species is deemed to be at low risk of extinction if at least one of the following conditions is met: (1) The species has high abundance or productivity; (2) There are stable or increasing trends in abundance; and (3) The distributional characteristics of the species are such that they allow resiliency to catastrophes or environmental changes. The species is deemed to be at moderate risk of extinction if it is not at high risk and at least one of the following conditions is met: (1) There are unstable or decreasing trends in abundance or productivity which are substantial relative to overall population size; (2) There have been reductions in genetic diversity; or (3) The distributional characteristics of the species are such that they make the species vulnerable to catastrophes or environmental changes. Finally, the species is deemed to be at high risk of extinction if at least one of the following conditions is met: (1) The abundance of the species is such that depensatory effects are plausible; (2) There are declining trends in abundance that are substantial relative to overall population size; (3) There is low and decreasing genetic diversity; (4) There are current or predicted environmental changes that may strongly and negatively affect a life history stage for a significant period of time; or (5) The species has distributional characteristics that result in vulnerability to catastrophes or environmental changes.

The SRT members distributed their plausibility points across all three risk categories, with most members placing their points in the low and moderate risk categories. Over the 25-year time frame, a large proportion of plausibility points were assigned to the low and moderate risk by some team members. Over the 100-year time frame, more points were assigned to the moderate risk category by all members and a few members assigned points to the high risk category. After the scores were recorded, the SRT calculated the average number of points for each risk category under both the 25 and 100-year timeframes. For both timeframes, the greatest number of points were in the low risk category. The average number of points for the low risk category was 68 for the 25-year timeframe and 51 for the 100-year timeframe.

There are a number of factors that contributed to the low ranking of the overall extinction risk over both the 25 and 100-year time frames. The large number of mature individuals, while small relative to the theoretical, model-derived unfished population, coupled with the total estimated population size, was deemed sufficiently large for Pacific bluefin tuna to avoid small population effects. Harvest regulations have been adopted by member nations to reduce landings and rebuild the population, with all model results from the ISC analysis showing stable or increasing trends under current management measures. Also, the SRT noted that over the past 40 years the SSB has been low relative to the theoretical, model-derived unfished population (less than 10 percent of unfished), and it has increased before. While the SRT agreed that climate change has the potential to negatively impact the population, many members of the team felt that the Pacific bluefin tuna's broad distribution across habitat, vagile nature, and generalist foraging strategy were mitigating factors in terms of extinction risk.

After evaluating the extinction risk SEDM analysis conducted by the SRT over the 25-year and 100-year timeframes, we considered the overall extinction risk categories described below:

High risk: A species or DPS with a high risk of extinction is at or near a level of abundance, productivity, spatial structure, and/or diversity that places its continued persistence in question. The demographics of a species or DPS at such a high level of risk may be highly uncertain and strongly influenced by stochastic or depensatory processes. Similarly, a species or DPS may be at high risk of extinction if it faces clear and present threats (*e.g.,* confinement to a small geographic area; imminent destruction, modification, or curtailment of its habitat; or disease epidemic) that are likely to create present and substantial demographic risks.

Moderate risk: A species or DPS is at moderate risk of extinction if it is on a trajectory that puts it at a high level of extinction risk in the foreseeable future (see description of ''High risk'' above). A species or DPS may be at moderate risk of extinction due to projected threats or declining trends in abundance, productivity, spatial structure, or diversity. The appropriate time horizon for evaluating whether a species or DPS is more likely than not to be at high risk in the foreseeable future depends on various case- and species-specific factors. For example, the time horizon may reflect certain life history characteristics (*e.g.,* long generation time or late age-at-maturity) and may also reflect the time frame or rate over which identified threats are likely to impact the biological status of the species or DPS (*e.g.,* the rate of disease spread). (The appropriate time horizon is not limited to the period that status can be quantitatively modeled or predicted within predetermined limits of statistical confidence. The biologist (or Team) should, to the extent possible, clearly specify the time horizon over which it has confidence in evaluating moderate risk.)

Low risk: A species or DPS is at low risk of extinction if it is not at moderate or high level of extinction risk (see ''Moderate risk'' and ''High risk'' above). A species or DPS may be at low risk of extinction if it is not facing threats that result in declining trends in abundance, productivity, spatial structure, or diversity. A species or DPS at low risk of extinction is likely to show stable or increasing trends in abundance and productivity with connected, diverse populations.

The SRT evaluation of extinction risk placed the majority of distributed points in the low risk category for both the 25-year and 100-year timeframes. The SRT members explained their assessment of low risk over those timeframes recognizing that the large number of mature individuals, while small relative to the theoretical, model-derived unfished population, coupled with the total estimated population size, was deemed sufficiently large for Pacific bluefin tuna to avoid small population effects. Harvest regulations have been adopted by member nations to reduce landings and rebuild the population, with all model results from the ISC stock assessment analysis (ISC 2016) showing stable or increasing trends under current management measures. Also, the SRT noted that over the past 40 years the SSB has been low relative to the theoretical, model-derived unfished population (less than 10 percent of unfished), and it has increased before. While the SRT agreed that climate change has the potential to negatively impact the population, many members of the team felt that the Pacific bluefin tuna's broad distribution across habitat, its vagile nature, and its generalist foraging strategy were mitigating factors in terms of extinction risk.

Based upon the expert opinion of the SRT and for the reasons described above, we determine that the overall extinction risk to Pacific bluefin tuna is most accurately characterized by the description of the low risk category as noted above.

Review of Conservation Efforts

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 are not aware of additional conservation efforts being made by any state or foreign nation to protect and conserve the species other than the fishery management agreements already considered, thus no additional measures were evaluated in this finding.

Significant Portion of Its Range Analysis

As the definitions of ''endangered species'' and ''threatened species'' make clear, the determination of extinction risk can be based on either assessment of the rangewide status of the species, or the status of the species in a ''significant portion of its range'' (SPR). Because we determined that the Pacific bluefin tuna is at low risk of extinction throughout its range, the species does not warrant listing based on its rangewide status. Next, we needed to determine whether the species is threatened or endangered in a significant portion of its range. According to the SPR Policy (79 FR 37577; July 1, 2014), if a species is found to be endangered or threatened in a significant portion of its range, the entire species is listed as endangered or threatened, respectively, and the ESA's protections apply to all individuals of the species wherever found.

On March 29, 2017, the Arizona District Court in *Center for Biological Diversity, et al.,* v. *Zinke, et al.,* 4:14–cv–02506–RM (D. Ariz.), a case brought against the U.S. Fish and Wildlife Service (FWS), remanded and vacated the joint FWS/NMFS SPR Policy after concluding that the policy's definition of ''significant'' was invalid. NMFS is not a party to the litigation. On April 26, 2017, the FWS filed a Motion to Alter or Amend the Court's Judgment, which is pending. In the meantime, we based our SPR analysis on our joint SPR Policy, as discussed below.

The SPR Policy sets out the following three components:

(1) *Significant:* A portion of the range of a species 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.

(2) The range of a species is considered to be the general geographical area within which that species can be found at the time 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 SPR.

(3) If the species is endangered or threatened throughout a significant portion of its range, and the population in that significant portion is a valid DPS, we will list the DPS rather than the entire taxonomic species or subspecies.

When we conduct a SPR analysis, we first identify any portions of the range that warrant further consideration. The range of a species can theoretically be divided into portions in an infinite number of ways. However, there is no purpose to analyzing portions of the range that are not reasonably likely to be of relatively greater biological significance, or in which a species may not be endangered or threatened. To identify only those portions that warrant further consideration, we 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 SPR, rather, it is a step in determining whether a more detailed analysis of the issue is required. 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.

If this preliminary determination identifies a particular portion or portions that may be significant and that may be threatened or endangered, those portions must then be evaluated under the SPR Policy as to whether the portion is in fact both significant and endangered or threatened. In making a determination of significance under the SPR Policy we would consider the contribution of the individuals in that portion to the viability of the species. That is, we would determine whether 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. Depending on the biology of the species, its range, and the threats it faces, it may be more efficient to address the ''significant'' question first, or the status question first. If we determine that a portion of the range we are examining is not significant, we would not need to determine whether the species is endangered or threatened there; if we determine that the species is not endangered or threatened in the portion of the range we are examining, then we would not need to determine if that portion is significant.

Because Pacific bluefin tuna range broadly throughout their lifecycle around the Pacific basin, there was no portion of the range that, if lost, would increase the population's extinction risk. In other words, risk of specific threats to Pacific bluefin tuna are buffered both in space and time. To be thorough, the SRT examined the potential for a SPR by considering the greatest known threats to the species and whether these were localized to a significant portion of the range of the species. The main threats to Pacific bluefin tuna identified by the SRT were overutilization, inadequacy of management, and climate change. Generally, these threats are spread throughout the range of Pacific bluefin tuna and not localized to a specific region.

We also considered whether any potential SPRs might be identified on the basis of threats faced by the species in a portion of its range during one part of its life cycle. We further evaluated the potential for the two known spawning areas to meet the two criteria for a SPR. The spawning areas for Pacific bluefin tuna are likely to be somewhat temporally and spatially fluid in that they are characterized by physical oceanographic conditions (*e.g.,* temperature) rather than a spatially explicit area. While commercial fisheries target Pacific bluefin tuna on the spawning grounds, spatial patterns of commercial fishing have not changed significantly over many decades. The historical pattern of exploitation on the spawning areas was part of the consideration in evaluating the threat of overexploitation to the species as a whole, and was determined to not significantly increase the species' risk of extinction for the members utilizing that portion of the range for the spawning stage of their life cycle. Given that the species has persisted throughout this time frame and has experienced similarly low levels of standing stock biomass, it has shown the ability to rebound and has yet to reach critically low levels. Therefore, it was determined that this fishery behavior has not significantly increased the species' risk of extinction for this life cycle phase.

Significant Portion of Its Range Determination

Pacific bluefin tuna range broadly throughout their life cycle around the Pacific basin, and there is no portion of the range that merits evaluation as a potential SPR. If a threat was determined to impact the fish in the spawning area, it would impact the fish throughout its range and, therefore, the species would warrant listing as threatened or endangered based on its status throughout its entire range. Based on our review of the best available information, we find that there are no portions of the range of the Pacific bluefin tuna that were likely to be of heightened biological significance (relative to other areas) or likely to be either endangered or threatened themselves.

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 (81 FR 70074; October 11, 2016), the status review report, and other published and unpublished information, and have consulted with species experts and individuals familiar with Pacific bluefin tuna. We considered each of the statutory factors to determine whether it presented an extinction risk to the species on its own, now or in the foreseeable future, and also considered the combination of those factors to determine whether they collectively contributed to the extinction risk of the species, now or in the foreseeable future.

Our determination set forth here 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. Based on our consideration of the best available scientific and commercial information, as summarized here and in the status review report, we conclude that no population segments of the Pacific bluefin tuna meet the DPS policy criteria and that the Pacific bluefin tuna faces an overall low risk of extinction. Therefore, we conclude that the species is not currently in danger of extinction throughout its range nor is it likely to become so within the foreseeable future. Additionally, we did not identify any portions of the species' range that were likely to be of heightened biological significance (relative to other areas) or likely to be either endangered or threatened themselves. Accordingly, the Pacific bluefin tuna does not meet the definition of a threatened or endangered species, and thus, the Pacific bluefin tuna does not warrant listing as threatened or endangered at this time.

This is a final action, and, therefore, we are not soliciting public comments.

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: August 3, 2017.

Samuel D. Rauch III,

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

[FR Doc. 2017–16668 Filed 8–7–17; 8:45 am]

BILLING CODE 3510–22–P

DEPARTMENT OF DEFENSE

Office of the Secretary

[Transmittal No. 17–34]

Arms Sales Notification

AGENCY: Defense Security Cooperation Agency, Department of Defense.

ACTION: Arms sales notice.

SUMMARY: The Department of Defense is publishing the unclassified text of an arms sales notification.

FOR FURTHER INFORMATION CONTACT: Pamela Young, (703) 697–9107, *pamela.a.young14.civ@mail.mil* or Kathy Valadez, (703) 697–9217, *kathy.a.valadez.civ@mail.mil;* DSCA/DSA–RAN.

SUPPLEMENTARY INFORMATION: This 36(b)(1) arms sales notification is published to fulfill the requirements of section 155 of Public Law 104–164 dated July 21, 1996. The following is a copy of a letter to the Speaker of the House of Representatives, Transmittal 17–34 with attached Policy Justification and Sensitivity of Technology.

Dated: August 2, 2017.

Aaron Siegel,

Alternate OSD Federal Register Liaison Officer, Department of Defense.

BILLING CODE 5001–06–P

DEFENSE SECURITY COOPERATION AGENCY
201 12TH STREET SOUTH, STE 203
ARLINGTON, VA 22202-5408

JUL 10 2017

The Honorable Paul D. Ryan
Speaker of the House
U.S. House of Representatives
Washington, DC 20515

Dear Mr. Speaker:

Pursuant to the reporting requirements of Section 36(b)(1) of the Arms Export Control Act, as amended, we are forwarding herewith Transmittal No. 17-34, concerning the Navy's proposed Letter(s) of Offer and Acceptance to the Government of Australia for defense articles and services estimated to cost $101.4 million. After this letter is delivered to your office, we plan to issue a news release to notify the public of this proposed sale.

Sincerely,

J. W. Rixey
Vice Admiral, USN
Director

Enclosures:
1. Transmittal
2. Policy Justification
3. Sensitivity of Technology