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**Amendment to the Fishery Ecosystem Plan for the Pelagic Fisheries of the
Western Pacific Region
Including a Draft Environmental Assessment**

**Managing Loggerhead and Leatherback Sea Turtle Interactions in the Hawaii
Shallow-set Longline Fishery**

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**Amendment X to the Fishery Ecosystem Plan for the Pelagic Fisheries of the Western
Pacific Region
Including a Draft Environmental Assessment**

**Managing Loggerhead and Leatherback Sea Turtle Interactions in the Hawaii Shallow-set
Longline Fishery
Regulatory Identification Number (RIN) XXXX-XXXX**

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Abstract

The Hawaii shallow-set longline fishery, managed under the Western Pacific Regional Fishery Management Council's Pelagic Fishery Ecosystem Plan (FEP), reduced loggerhead and leatherback turtle interactions by approximately 90% through the implementation of new technologies (large circle hooks and mackerel-type bait). Regulatory Amendment 3 to the Pelagic Fishery Management Plan (FMP) that established the requirements for these gear measures also established annual interaction limits for loggerhead and leatherback turtles ("hard caps"), which, if reached, would trigger the closure of the fishery for the remainder of the calendar year. The existing annual fleet-wide hard caps, first implemented in 2004, prevent loggerhead and leatherback takes above the specified limit, but do not provide early response to higher interaction rates that may indicate a potential for higher impacts to sea turtle populations or a fishery closure early in the calendar year. Effective management of loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery should consider responsive measures that can help ensure year-round fishing operations while addressing the needs for protected species conservation.

The Council at its 177th Meeting on April 12, 2019, recommended amending the Pelagic FEP to establish a framework for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery that consists of 1) annual fleet-wide hard cap limits on the number

North Pacific loggerhead and leatherback turtle interactions consistent with the anticipated level of annual interactions that is set forth in the current valid Biological Opinion (BiOp) and 2) individual trip interaction limits for loggerhead and leatherback turtles. An individual trip limit differs from a fleet-wide hard cap in that the trip limit applies to an individual vessel, and once a vessel reaches its individual limit, it must return to port without making additional sets. The Council also recommended setting limits under the framework as follows: 1) annual hard cap limits of 36 North Pacific loggerhead and 16 leatherback turtles; and 2) individual trip limit of 5 North Pacific loggerhead turtles and 2 leatherback turtles. A new no-jeopardy Biological Opinion for the Hawaii shallow-set longline fishery issued June 26, 2019, includes Reasonable and Prudent Measures (RPMs) and associated Terms and Conditions (T&C) to mitigate the impact of take. Compliance with these measures is mandatory for the Section 9 exemption under ESA section 7(o) to apply. These measures, which have not yet been implemented by regulations, are similar to but not fully consistent with the Council's recommended action at the 177th meeting. The Council at its 179th Meeting on August 8, 2019, will consider taking final action on the management of the loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery, taking into account the RPMs and associated T&C in the final BiOp.

This draft Environmental Assessment (EA) evaluates potential environmental impacts of the following alternatives:

- Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813)
- Alternative 2: Implement the Council's Recommended Action from the 177th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery)
- Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp
- Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit

TABLE OF CONTENTS

1	INTRODUCTION	1
1.1	Background Information.....	1
1.1.1	December 2017 Ninth Circuit Court Decision on the 2012 Biological Opinion and Associated Stipulated Settlement Agreement and Court Order.....	3
1.1.2	2019 Biological Opinion for the Continued Authorization of the Hawaii Shallow-set Longline Fishery.....	4
1.1.3	Initial Council Actions.....	5
1.2	Proposed Action.....	8
1.3	Purpose and Need for Action.....	8
1.4	Action Area.....	9
1.5	Decision(s) to be Made.....	10
1.6	List of Preparers.....	11
1.7	Public Involvement.....	11
2	DESCRIPTION OF THE ALTERNATIVES CONSIDERED	12
2.1	Development of the Alternatives	12
2.2	Description of the Alternatives.....	15
2.2.1	Features Common to All Alternatives	16
2.2.2	Description of Measures Contained in the Alternatives	16
2.3	Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813).....	19
2.4	Alternative 2: Implement the Council’s Recommended Action from the 177 th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery)	20
2.5	Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp	23
2.6	Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit.....	25
2.7	Alternatives Considered, but Rejected from Further Analysis	27
3	DESCRIPTION OF THE AFFECTED ENVIRONMENT	32
3.1	Target and Non-Target Stocks.....	32
3.2	Protected Resources.....	40
3.2.1	Species Protected Under the Endangered Species Act.....	41
3.2.2	Species Protected Under the Marine Mammal Protection Act.....	46
3.2.3	Sea Turtles	48
3.2.4	Marine Mammals.....	53
3.2.5	Seabirds.....	56
3.2.6	Sharks and Rays.....	58
3.2.7	Critical Habitats	59
3.3	Socioeconomic Setting.....	62
3.4	Management Setting	66
3.5	Resources Eliminated from Detailed Study.....	68

4	ENVIRONMENTAL EFFECTS OF THE ALTERNATIVES	69
4.1	Potential Effects on Target and Non-target Stocks.....	69
4.1.1	Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813).....	69
4.1.2	Alternative 2: Implement the Council’s Recommended Action from the 177 th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery	69
4.1.3	Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp	70
4.1.4	Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit	70
4.2	Potential Effects on Protected Resources	71
4.2.1	Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813).....	71
4.2.2	Alternative 2: Implement the Council’s Recommended Action from the 177 th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery	72
4.2.3	Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp	77
4.2.4	Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit	78
4.3	Potential Effects on Socioeconomic Setting.....	79
4.3.1	Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813).....	79
4.3.2	Alternative 2: Implement the Council’s Recommended Action from the 177 th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery	80
4.3.3	Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Fleet-wide Turtle Hard Cap Limit Equivalent to the ITS in the Current BiOp	80
4.3.4	Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit	81
4.4	Potential Effects on Management Setting.....	81
4.4.1	Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813).....	81
4.4.2	Alternative 2: Implement the Council’s Recommended Action from the 177 th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery	81
4.4.3	Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp	82

4.4.4	Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit	82
4.5	Potential Cumulative Effects of the Alternatives.....	83
4.5.1	Cumulative Effects Related to Effects on Target and Non-Target Stocks	83
4.5.2	Cumulative Effects Related to Protected Resources.....	84
4.5.3	Cumulative Effects Related to Effects on the Socio-economic Setting.....	85
4.5.4	Climate Change.....	86
5	REFERENCES	90

LIST OF TABLES

Table 1.	Comparison of the Council’s 177 th Meeting Recommended Action and RPM T&C 1a and 1b.....	15
Table 2.	Number of loggerhead and leatherback turtle interactions per trip for trips with at least one interaction, 2004-2019.	18
Table 3.	Comparison of Features of the Alternatives.	30
Table 4.	Stock status of PMUS under the Pelagic FEP.	33
Table 5.	Released catch, retained catch, and total catch for the Hawaii shallow- set longline fishery, 2018.	40
Table 6.	ESA-listed marine species and critical habitat with the potential to interact with the Hawaii shallow-set longline fishery.....	42
Table 7.	Annual number of observed interactions (based on interaction date) of loggerhead, leatherback, green and olive ridley sea turtles in the Hawaii shallow-set longline fishery, 2004-2019.....	48
Table 8.	Anticipated level of sea turtle interactions in the Hawaii shallow-set longline fishery analyzed in the 2019 BiOp based on McCracken (2018).	49
Table 9.	Estimated sea turtle interactions and mortalities in the Hawaii shallow-set fishery over one calendar year in NMFS 2019 biological opinion.	50
Table 10.	Observed annual marine mammal interactions (including mortalities, serious injuries, and non-serious injuries) with the Hawaii shallow-set longline fishery from 2010-2019.....	55
Table 11.	Number of albatross interactions observed in the Hawaii shallow-set longline fishery, 2005- 2019.	57
Table 12.	Total ESA-listed shark and ray interactions with the Hawaii shallow-set longline fishery for 2004-2018.	58
Table 13.	Estimated oceanic whitetip shark and giant manta ray interactions and mortalities in the Hawaii shallow-set fishery over one calendar year in NMFS 2019 biological opinion.	59
Table 14.	Hawaii shallow-set longline fishery effort based on logbook data, 2004-2018.	62
Table 15.	Difference in fishery performance between hard cap closure years (2006, 2011) and the average of 1 year before and after each closure.....	66
Table 16.	Number of loggerhead and leatherback turtle interactions per trip for trips with at least one interaction, 2004-2019.	74
Table 17.	Simulation results applying a range of individual trip limits to observed interaction data from 2004-2019.....	76
Table 18.	Summary of Effects of the Alternatives.	88

LIST OF FIGURES

Figure 1. Location of shallow sets made by the Hawaii longline fishery from 2009– 2016. Some sets do not appear on the map due to confidentiality. (PIFSC Fisheries Research and Monitoring Division, 5/9/2017).	10
Figure 2. Geographic regions separating WCNPO and EPO swordfish stocks.....	34
Figure 3. Annual number of observed loggerhead (left) and leatherback (right) and “unused” annual hard cap for each species. Dark colors in each figure indicate the observed interactions and light colors indicate the unused portion of the hard cap.	51
Figure 4. Population projection results for North Pacific loggerhead turtles (left) and Western Pacific leatherback turtles (right). Model projections are of annual females in natural log space. Figures show 10,000 model projection runs for 100 years into the future from the final data year.	53
Figure 5. Map depicting the overlap of federal longline fishing area with the MHI IFKW range.	61
Figure 6. Catch and revenue for the Hawaii shallow-set longline fishery, 2005-2018.	63
Figure 7. Billfish CPUE for the Hawaii shallow-set longline fishery, 2005-2018.	63
Figure 8. Cumulative observed monthly effort in hooks for the Hawaii shallow-set longline fishery (100% observer coverage), 2004-2017.....	64
Figure 9. Average Monthly Swordfish Imports into the United States, 2013-2017	65
Figure 10. Hawaii shallow-set and deep-set longline fishery swordfish catch and total US domestic swordfish landings, 2006-2016.	65

1 INTRODUCTION

1.1 Background Information

The Western Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) manage fishing for swordfish (*Xiphias gladius*) and other pelagic management unit species (PMUS) in the Exclusive Economic Zone (EEZ or federal waters, generally 3-200 nautical miles or nm from shore) around American Samoa, Guam, the Commonwealth of the Northern Mariana Islands (CNMI) and Hawaii, and on the high seas through the Fishery Ecosystem Plan for Pelagic Fisheries of the Western Pacific Region (Pelagic FEP) as authorized by the Magnuson-Stevens Fishery Conservation and Management Act (MSA; 16 U.S.C. § 1801 *et seq.*).

Regulatory Amendment 3 to the Pelagic Fishery Management Plan (FMP; currently the Pelagic Fishery Ecosystem Plan (FEP)) established a model Hawaii shallow-set longline swordfish fishery and implemented a suite of measures in 2004 to achieve optimum yield while not jeopardizing the long-term existence of sea turtles and other listed species (69 FR 17329, April 2, 2004; WPRFMC 2004). The measures focused on reducing the number and severity of interactions by implementing new technologies (large circle hooks and mackerel-type bait) to reduce sea turtle interaction rates and requiring Hawaii longline vessels to carry approved de-hooking devices to maximize the post-hooking survival. The amendment also established a maximum effort limit of 2,120 shallow-sets per year administered through a set certificate program¹ and annual fleet-wide interaction limits for loggerhead and leatherback turtles (“hard caps”), which, if reached, would trigger the closure of the fishery for the remainder of the calendar year. These measures were intended to control fishing effort and sea turtle interactions while information was being gathered on the model fishery.

The fishery has been subject to 100% observer coverage since 2004, providing NMFS and the Council with over a decade’s worth of information available to assess the effectiveness of the circle hooks and mackerel-type bait intended to reduce sea turtle interactions. Evaluation of the effectiveness of these gear requirements in the shallow-set fishery for the period of May 2004 through March 2007 showed that sea turtle interaction rates were reduced by approximately 90 percent for loggerheads, 85 percent for leatherbacks, and 89 percent for combined species, compared to the period (1994-2001) when the fishery was operating without such gear (Gilman and Kobayashi 2007). A more recent analysis including observer data through 2014 show that the gear measures continue to be effective, with reductions in leatherback and loggerhead turtle interaction rates of 84% and 95%, respectively, for the post-regulation period (Swimmer et al. 2017).

Since the turtle mitigation measures were first implemented in 2004, fishing effort in the shallow-set fishery peaked in 2010 and has since declined. The number of vessels participating in the fishery declined from a high of 35 vessels in 2006 to a low of 11 vessels in 2018. Total catch and adjusted revenue have also declined, with total catch peaking in 2008 at 4.3 million pounds and adjusted revenue peaking in 2007 at \$8.5 million. The shallow-set longline fishery

¹ In 2008, the Council recommended and NMFS approved removal of the annual effort set limit to optimize the harvest of swordfish without jeopardizing sea turtle populations (74 FR 65460, December 10, 2009).

targeting swordfish is highly seasonal, with effort typically increasing in October and peaking in March.

The fishery has reached the hard cap three times since its implementation in 2004: in 2006 when the loggerhead hard cap of 17 turtles was reached (fishery closed on March 20, 2006); in 2011 when the leatherback hard cap of 16 turtles was reached (fishery closed on November 18, 2011); and in 2019 when the loggerhead hard cap of 17 turtles² was reached (fishery closed on March 19, 2019). The hard cap limits are set equal to the expected amount of incidental take set forth in the incidental take statement (ITS) included in the Biological Opinion (BiOp) issued by the National Marine Fisheries Service (NMFS) for the continued operation of the shallow-set fishery, pursuant to Section 7 of the Endangered Species Act (ESA). The limits themselves do not necessarily have biological significance for the species' survival and recovery because they are based on the anticipated level of interactions analyzed in the BiOp, but they help ensure that impacts do not exceed a threshold that triggers reinitiation of consultation.

When a hard cap limit is reached, the consequence to the fishery is closure for the remainder of the calendar year. Accordingly, a hard cap closure under the existing hard cap measure, especially during the peak Hawaii swordfish season, may reduce fishery yields and create a disruption in the U.S. domestic swordfish market. For example, the fishery's catch and revenue for 2006 when the fishery closed in March from reaching the loggerhead hard cap limit was 37% and 46% lower, respectively, compared to one year before and after the closure year.

Moreover, market spillover and transferred effects of the hard cap measure and associated closures may increase impacts to sea turtle populations for the U.S. swordfish market. Spillover and transferred effects may result from the market replacement of domestic swordfish with imported swordfish from countries with higher bycatch rates, as well as from production displacement of U.S. vessels with foreign vessels in the same general fishing area. Studies have demonstrated that the 2001-2004 closure of the Hawaii shallow-set longline fishery resulted in an increase of 2,882 sea turtle interactions associated with swordfish consumed in the U.S. (Rausser et al. 2009), and the subsequent reopening of the fishery contributed to 842 to 1,826 fewer sea turtle interactions over the period of 2005-2008 (Chan and Pan 2012).

The average annual number of observed interactions for the 2005-2016 period following the reopening of the fishery was 9.9 loggerhead turtles (range = 0-17) and 7.8 leatherback turtles (range = 2-16) per year. Loggerhead turtle interactions in the Hawaii shallow-set longline fishery in 2017 and 2018 were higher than levels observed since the fishery reopened in 2004 through 2016. The total number of loggerhead interactions for 2017 was 21, and 33 loggerhead interactions were observed from January to May 2018. While these numbers were lower than the hard cap limit of 34 loggerhead turtles based on the 2012 BiOp, they demonstrated that the fishery has the potential to experience higher interaction levels than the long-term average (12.4 loggerhead turtles annually from 2005-2018) in a short period. During the period of high loggerhead turtle interactions, a small number of vessels interacted with majority of the observed loggerhead turtles, while a large proportion of the shallow-set vessels targeting swordfish during the period of high interactions also had at least one observed interaction.

² In 2019, the fishery operated under a loggerhead hard cap based on the 2004 BiOp pursuant to a stipulated settlement agreement and court order. See Section 1.1.1.

NMFS Pacific Islands Fisheries Science Center (PIFSC) conducted a preliminary characterization of the recent loggerhead turtle interactions in the Hawaii shallow-set longline fishery compared to the years prior (PIFSC unpublished data). The analysis indicated that the spatial distribution of the interactions and fishing effort during the high interaction period in 2017 and 2018 were not anomalous compared to previous years, and there was no apparent change in other operational characteristics within the fishery (e.g., gear configuration, bait, timing, duration) to explain the higher loggerhead interaction rates. Additionally, the average size of individual turtles observed in 2017 and 2018 was consistent with the average size observed in previous years. PIFSC continues to explore the linkage of loggerhead turtle interactions in the Hawaii shallow-set longline fishery to hatchling production at nesting beaches in Japan as well as additional examination of the oceanographic environment and fishing behavior.

The existing annual fleet-wide hard caps are useful to prevent takes above the specified limit, but do not provide early response to higher interaction rates when the number of interactions is below the hard cap limit. Effective management of protected species interactions should consider responsive measures that can help ensure year-round operations while addressing the needs for protected species conservation. The 2017-2018 increase in loggerhead turtle interactions suggest the need for a more robust suite of conservation and management framework that can respond to higher interaction rates, fluctuations in sea turtle interactions that may indicate a potential for higher impacts to sea turtle populations or a fishery closure early in the calendar year. Development of a more responsive management approach would further minimize impacts to sea turtles, while helping to ensure the year round supply of fresh swordfish to meet market demands.

To address these needs, the Council considered and developed measures for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery under the Pelagic FEP, which is described in this document. The Council is also considering incorporating the implementation of Reasonable and Prudent Measures (RPMs) and associated Terms and Conditions (T&C) in the new Biological Opinion for the Hawaii shallow-set longline fishery issued on June 26, 2019.

1.1.1 December 2017 Ninth Circuit Court Decision on the 2012 Biological Opinion and Associated Stipulated Settlement Agreement and Court Order

On December 27, 2017, the Ninth Circuit Court of Appeals issued a 2-1 opinion finding that NMFS's 2012 BiOp's no-jeopardy determination and associated ITS for the loggerhead turtle to be arbitrary and capricious.³ The majority found that NMFS' failed to provide a rational explanation for its no-jeopardy determination and the results of a climate population viability assessment that projected future declines in the loggerhead population. The court affirmed NMFS's no-jeopardy determination and ITS for the leatherback turtle.

On May 4, 2018, the portion of the 2012 BiOp and accompanying ITS relating to loggerhead turtles was set aside. Under a stipulated settlement agreement and court order, NMFS agreed to close the fishery for the remainder of 2018, and when the fishery re-opened January 1, 2019, to

³ *Turtle Island Restoration Network, et al. v. U.S. Dep't of Commerce*, 878 F.3d 725 (9th Cir. 2017).

reinstate a hard cap limit of 17 for the loggerhead unless a new BiOp and hard cap rule have been implemented by NMFS. This limit of 17 is based on the ITS included in a 2004 BiOp. The court-ordered closure of the Hawaii shallow-set longline fishery became effective May 8, 2018. The fishery's loggerhead turtle interactions for 2018 were 33 at the time of the closure, and thus the fishery was closed prior to reaching the hard cap limit of 34 turtles. NMFS published a final rule on October 2, 2018, to implement the loggerhead hard cap limit of 17 by regulation (83 FR 49495).

This amendment to the Pelagic FEP includes measures for modifying hard cap limits for loggerhead and leatherback turtles. The hard caps were established in 2004 under Regulatory Amendment 3 of the Pelagic FMP, and hard caps themselves are not a requirement under the ESA.⁴ This amendment, developed pursuant to the MSA, provides the authority for establishing, modifying, and removing mitigation measures for loggerhead and leatherback turtles including hard caps, consistent with the new BiOp.

1.1.2 2019 Biological Opinion for the Continued Authorization of the Hawaii Shallow-set Longline Fishery

NMFS reinitiated ESA consultation on the fishery on April 20, 2018 due to the fishery's first-documented interaction with a threatened Guadalupe fur seal, issuance of a final rule listing 11 new green sea turtle distinct population segments (DPSs), the listing of two new species as threatened (oceanic whitetip shark and giant manta ray), and the fishery's exceedance of the ITS for olive ridley sea turtles. NMFS issued the final 2019 BiOp for the continued authorization of the Hawaii shallow-set longline fishery (2019 BiOp) on June 26, 2019.

The 2019 BiOp concluded that the continued operation of the fishery is not likely to jeopardize the continued existence of the following ESA-listed species: Endangered leatherback sea turtles, endangered North Pacific loggerhead sea turtles, threatened green sea turtles in the Eastern Pacific, Central North Pacific, East Indian West Pacific, Southwest Pacific, endangered green sea turtles in the Central West Pacific and Central South Pacific, threatened olive ridley sea turtles and olive ridley sea turtles from the endangered Mexico breeding population, threatened oceanic whitetip sharks, threatened manta rays, and threatened Guadalupe fur seals. The 2019 BiOp includes an ITS exempting the following number of interactions expected during one calendar year from the take prohibitions of the ESA: 21 leatherback turtles; 36 loggerhead turtles; 5 olive ridley turtles; 5 green turtles (all DPSs); 102 oceanic whitetip sharks; 13 giant manta rays; and 11 Guadalupe fur seals. The ITS also sets forth RPMs and associated T&C necessary to minimize the impacts of incidental take, which must be undertaken by NMFS for the take exemption in ESA section 7(o)(2) to apply. Of the six RPMs in the 2019 BiOp, RPM1 and associated T&C 1a and 1b requires immediate implementation of measures to reduce the incidental capture and mortality of leatherback and loggerhead sea turtles in the shallow-set longline fishery. This amendment provides the mechanism for implementing these RPMs under the Pelagic FEP.

⁴ While the ESA requires reinitiation of Section 7 consultation when an ITS is exceeded, it does not necessarily require that the fishery suspend operations upon reaching an ITS, or require hard caps or other mechanisms to close the fishery. Such requirements may result from measures under MSA to manage and reduce bycatch of protected species, or from measures in a BiOp that are intended to avoid jeopardy or otherwise to mitigate the impact of take.

RPM 1 and associated T&C 1a and 1b are as follows:

RPM 1: NMFS shall evaluate and develop a minimization measure, or a suite of minimization measures designed to reduce the incidental capture and mortality of leatherback and loggerhead sea turtles in the Hawaii shallow-set longline fishery.

T&C 1a: NMFS SFD shall, upon receiving a signed biological opinion, set an annual interaction limit for the fishery of 16 leatherback sea turtles, which represents an approximate 25% reduction in the number of turtles from our predicted interaction numbers in this biological opinion. If the fishery reaches this limit then NMFS shall close the Hawaii shallow-set longline fishery for the remainder of the calendar year. NMFS may modify this requirement as appropriate upon implementation of minimization measures identified in Term and Condition 1c.⁵

T&C 1b: NMFS SFD shall set a trip limit not to exceed 2 leatherback sea turtles or 5 loggerhead sea turtles per vessel trip. Any vessel that reaches the established trip limit must immediately stop fishing and return to port. These vessels will not engage in shallow set longline fishing for 5 days while NMFS evaluates vessel and turtle interactions to identify any problems and determine if guidance can be provided to the vessel to reduce the interactions.

Vessels that reach the per trip limit for either leatherback or loggerhead sea turtles twice in a calendar year shall be prohibited from shallow-set longline fishing for the remainder of the calendar year. NMFS shall require any vessel that reaches a trip limit for either species twice in one calendar year to have an annual vessel limit of 2 leatherbacks or 5 loggerheads for the following year.

1.1.3 Initial Council Actions

In response to the relatively stable loggerhead and leatherback turtle interactions from 2004-2016 and the lack of growth in fishing effort in the Hawaii shallow-set longline fishery, the Council, at its 171st Meeting in October 2017, reviewed whether the continuation of sea turtle hard caps is necessary to achieve the management objectives of Pelagic FEP. The Council reviewed information on the history of the hard cap measure, effectiveness of the gear requirements

⁵ T&C 1c requires that NMFS SFD “evaluate and develop minimization measures to reduce incidental catch and mortality of leatherback and loggerhead sea turtles. At a minimum, NMFS must consider the following minimization measures: closing the area east 140°W in the first and fourth quarters of the year; prohibit fishing in the dynamic boundary with the sea surface temperature (SST) range of 17°–18.5°C; prohibiting fishing in the dynamic boundary with the SST range of 22.4°–23.4°C consistent with Howell et al. (2015), or otherwise implement TurtleWatch under a regulatory framework, to develop meaningful measures to minimize incidental catch of leatherback sea turtles and loggerhead sea turtles. NMFS may replace or modify the requirements of Term and Condition 1a, if after this evaluation NMFS develops alternative minimization measures for both species that are commensurate with the goal of a 25% reduction of the incidental capture and mortality of leatherback and loggerhead sea turtles.” Evaluation and development of alternative minimization measures for T&C 1a have not been undertaken at this time, and is not considered further in this document.

implemented in 2004, interaction data since the implementation of hard caps, and the performance of the fishery. The Council recommended development of a draft amendment to the Pelagic FEP considering management options for hard caps and selecting as its preliminary preferred alternative the removal of the hard cap measure. Following the 171st Meeting, Council staff initiated development of the draft amendment, including additional alternatives that would establish a framework to implement more responsive measures that would ensure year-round operations while minimizing impacts to sea turtle populations.

Following the higher loggerhead turtle interaction rates in late 2017 and early 2018, and the Ninth Circuit Court decision in *Turtle Island Restoration Network v. NMFS & FWS*, 13-17123 (9th Cir. 2017), the Council at its 172nd Meeting in March 2018 considered a revised set of options that includes the development of a framework for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery. The Council recommended development of a framework that may include, among other measures, a) specification of hard caps; b) in-season measures to implement a temporary closure when a certain proportion of the loggerhead or leatherback limit is reached; c) real-time spatial management measures to monitor and manage interaction hotspots and fluctuations; and d) establishment of a fleet communication program to facilitate implementation of real-time spatial management measures and dissemination of interaction information to the fleet. The Council also directed staff to work with Hawaii shallow-set longline fishery participants to consider an industry-implemented cooperative framework where industry has discretion to manage fleet-wide sea turtle interactions based on hard caps identified by the Council and NMFS, and to identify communication pathways that may be implemented to provide more timely information to the fleet on sea turtle interactions.

In response to the Council directive at its 172nd Meeting, Council staff worked with SSC members and PIRO Sustainable Fisheries Division (SFD) to review examples of industry-led bycatch management programs implemented in Alaska, West Coast and Atlantic fisheries. Additionally, the Council and the Hawaii Longline Association convened an industry workshop on May 4, 2018, on the management of sea turtle interactions in the Hawaii shallow-set longline fishery to review examples from other fisheries, and discuss potential application of industry-led programs to the Hawaii shallow-set longline fishery. Workshop discussions suggested that participants of the Hawaii shallow-set longline fishery could start by entering into an information sharing agreement that would set up a data sharing and fleet communication platform. Under the agreement, the vessels could provide data related to sea turtle interactions and other relevant information to a third party and for that third party to provide data summaries back to the fleet in accordance with the terms of the agreement. The agreement could specify the types of data the participants would be willing to share with other vessels so that information that would assist vessels with sea turtle avoidance would be shared among the participants to the agreement while protecting proprietary fishing information. The agreement could be further developed in subsequent years to incrementally implement bycatch avoidance strategies (e.g., rolling hotspots) as more information is gathered through the data sharing platform. The review of examples from other fisheries and workshop discussions also identified potential regulatory structures to incentivize development and encourage participation in industry-implemented sea turtle avoidance strategies, such as through two-tiered interaction limits in which a lower limit would be established for vessels that do not participate in those initiatives.

The Council, at its 173rd Meeting in June 2018, considered measures to include in the framework for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery. The Council recommended an amendment to the Pelagic FEP to establish a management framework for the Hawaii shallow-set longline fishery that consists of 1) annual fleet-wide hard cap limits on the number North Pacific loggerhead and leatherback turtle interactions consistent with the anticipated level of annual interactions that is set forth in the current valid BiOp; and 2) individual trip interaction limits for loggerhead and leatherback turtles. The Council also recommended specifications under the framework as follows: 1) Annual hard cap limit of 37 North Pacific loggerhead and 21 leatherback turtles; and 2) individual trip interaction limit of 5 North Pacific loggerhead turtles. The Council's recommendation for the loggerhead and leatherback turtle annual limits was based on the anticipated level of interactions analyzed in the Biological Evaluation (BE) that reinitiated consultation of the Hawaii shallow-set longline fishery under the Endangered Species Act (ESA) Section 7 consultation process on April 20, 2018. As part of its recommendation, the Council noted that it would review its recommendation if the new BiOp from the consultation resulted in a jeopardy decision or otherwise resulted in a different ITS for North Pacific loggerheads or leatherbacks. The draft BiOp was expected to be available by October 1, 2018. However, completion of the draft BiOp was delayed.

The Council at its 173rd Meeting additionally established a three-year timeline for monitoring the development, implementation, and review of a sea turtle interaction avoidance pilot program utilizing fleet communication to be implemented by the industry. If the pilot program is successful in establishing an information sharing agreement and fleet communication platform, it may provide an additional tool for vessels to minimize impacts to loggerhead and leatherback turtles while maintain fishing opportunities throughout the fishing season. After a three-year period, the Council will review the development and implementation to determine whether the program may be further improved by establishing incentives as part of the management measures for mitigating sea turtle impacts in the shallow-set longline fishery under the Pelagic FEP.

At its 174th Meeting in October 2018, the Council received information on a new population vulnerability assessment (PVA) for loggerhead and leatherback turtles prepared for the ongoing Section 7 consultation. PVA results indicate that the North Pacific loggerhead population exhibits a long-term increasing trend at a mean estimated population growth rate of 2.4 percent, while the Western Pacific leatherback turtle population exhibits a long-term declining trend at a mean estimated population growth rate of -5.3 percent. The Council recommended convening an interim Council meeting, if needed, to review draft BiOp and consider any revisions to June 2018 recommendations based on the BiOp, and stated that it would reconsider a specification of leatherback individual trip limits if necessary.

At its 175th Meeting on December 17, 2018, the Council considered final action on additional mitigation measures for the Western Pacific leatherback turtles in advance of the draft BiOp completion, taking into consideration the results of the PVA model indicating a continuing long-term declining trend of the population. The Council deferred action until the draft BiOp and more complete information on the impacts of the fishery on the Western Pacific leatherback turtles are available to fully inform the Council decision.

At its 177th Meeting on April 12, 2019, the Council reviewed its recommendations on the management framework from the 173rd Meeting for consistency with the draft BiOp made available to the Council on March 28, 2019, and considered final action on the management framework. The draft BiOp contained RPMs that were not consistent with the Council's previously recommended action. The Council maintained its recommendation from the 173rd Meeting, additionally recommended setting an individual trip limit of 2 leatherback turtles, and recommended an annual review of the Hawaii shallow-set longline fishery's performance under the individual trip limits in the Annual Stock Assessment and Fishery Evaluation (SAFE) Report. The Council further requested that NMFS consider revising the RPMs in the draft BiOp for consistency with the Council recommended action.

NMFS delivered the final BiOp for the Hawaii shallow-set longline fishery on June 26, 2019, during the 178th Council meeting. The final BiOp incorporates the Council's recommended individual trip limit, but some differences remain between the Council's recommended action from the 177th meeting and the RPMs and associated T&Cs. For example, the BiOp individual trip limit measure includes additional restrictions on vessels that reach the trip limit twice in a calendar year, and does not require a fleet-wide hard cap limit for loggerhead turtles. The Council deferred final action at the 178th meeting to allow adequate time for the Council and the SSC to review the final BiOp, and recommended convening a teleconference meeting to consider final action. The Council additionally directed staff to work with PIRO SFD to prepare necessary analysis, incorporating the final BiOp and associated RPMs, to inform final action on the management of loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery at its 179th Meeting and to ensure timely review and transmittal of the amendment package following the 179th Meeting.

At its 179th Meeting, the Council will consider final action on the management of loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery, taking into consideration the final BiOp and associated RPMs.

1.2 Proposed Action

The proposed action is to be determined pending Council action at its 179th Meeting to be held on August 8, 2019. If the Council selects a preferred alternative, the action would amend the Pelagic FEP.

1.3 Purpose and Need for Action

The purpose of this action is to amend the Pelagic FEP to modify sea turtle mitigation measures for effectively managing impacts to leatherback and loggerhead sea turtles from the Hawaii shallow-set longline fishery, consistent with the requirements of the MSA and the RPMs and T&C 1a and 1b of the 2019 Biological Opinion pursuant to the ESA, while maintaining fishing opportunities during peak swordfish season (October through March). The existing annual fleet-wide interaction limits prevent loggerhead and leatherback takes above a specified limit, but do not provide early response to higher interaction rates that may indicate a potential for higher impacts to sea turtle populations or a fishery closure early in the calendar year. Effective management of loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline

fishery should consider responsive measures that can help ensure year-round operations while addressing the needs for protected species conservation.

This action is needed to provide managers and fishery participants with the necessary tools to respond to and mitigate fluctuations in loggerhead and leatherback turtle interactions, so as to ensure a continued supply of fresh swordfish to U.S. markets, consistent with the conservation needs of these sea turtles. The action is also needed ensure that the Hawaii shallow-set longline fishery operates in compliance with the RPMs and T&C of the 2019 BiOp. RPMs are actions necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take (50 CFR § 402.02). These measures should minimize the impacts of incidental take to the extent reasonable and prudent. The RPMs and implementing T&C in the 2019 BiOp are non-discretionary for the exemption in ESA section 7(o)(2) to apply, and to ensure the continued operation of the shallow-set fishery.

1.4 Action Area

The action area is the area of operation of the Hawaii shallow-set longline fishery, which include the US Exclusive Economic Zone (EEZ) around Hawaii and high seas to the north and northeast of the main Hawaiian Islands (MHI). Longline fishing is prohibited in the MHI longline fishing prohibited area ranging from 50-75 nm from shore, the Northwestern Hawaiian Islands (NWHI) protected species zone, and the Papahānaumokuākea Marine National Monument. From 2009-2016, the fishery operated in an area between 180°- 125° W and 17°- 45° N (Figure 11).

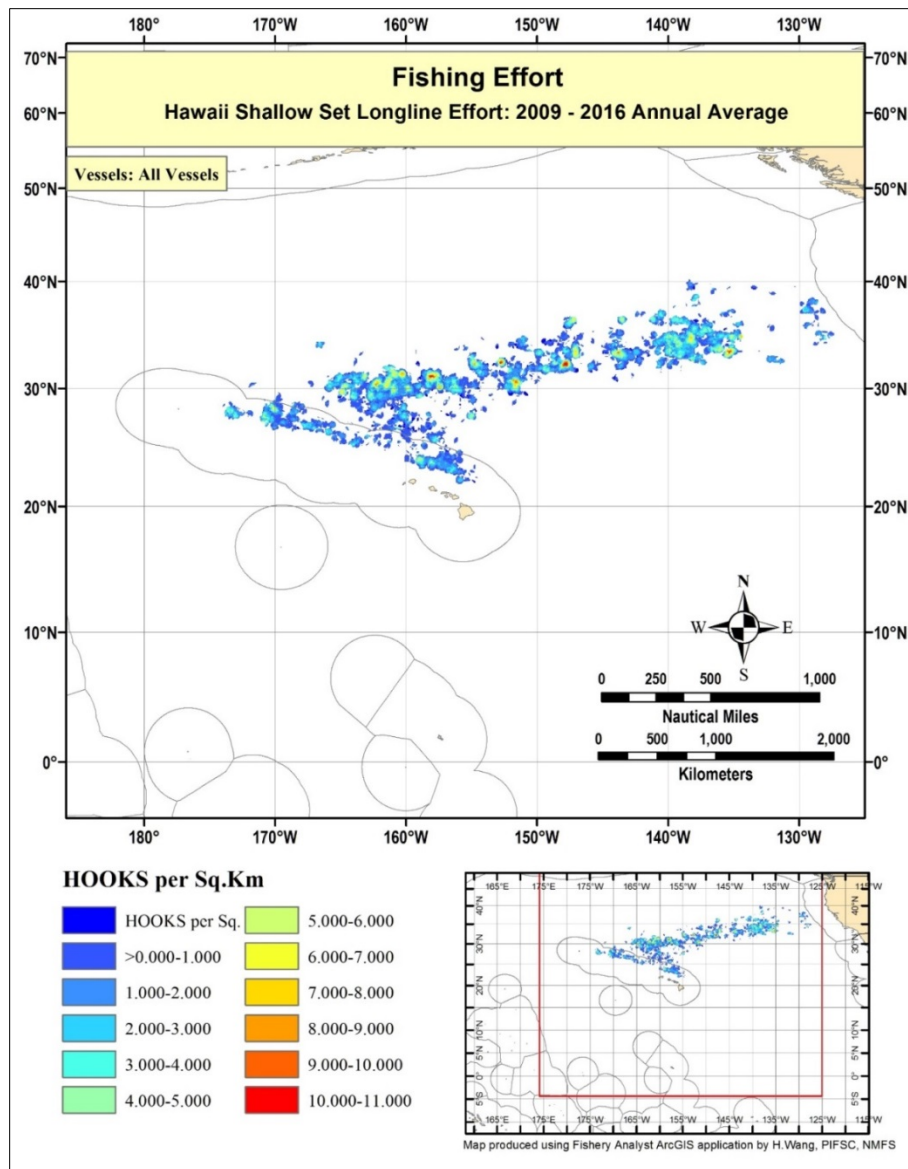


Figure 1. Location of shallow sets made by the Hawaii longline fishery from 2009– 2016. Some sets do not appear on the map due to confidentiality. (PIFSC Fisheries Research and Monitoring Division, 5/9/2017).

1.5 Decision(s) to be Made

This document will support a decision by the Regional Administrator (RA) of the NMFS Pacific Island Region, on behalf of the Secretary of Commerce, whether to approve, disapprove, or partially approve the Council’s recommendation. The RA will also use the information in this EA to make a determination about whether the proposed action would constitute a major federal action that has the potential to significantly affect the quality of the environment. If NMFS determines the action would *not* significantly affect the quality of the environment, NMFS will prepare a Finding of No Significant Impact (FONSI). If NMFS determines the proposed action is a major federal action that would significantly affect the quality of the environment, NMFS would prepare an environmental impact statement (EIS) before taking action.

1.6 List of Preparers

- Asuka Ishizaki, Protected Species Coordinator, WPFMC
- Joshua Lee, Fisheries Management Specialist, NMFS PIRO SFD

1.7 Public Involvement

The Council and SSC discussed the management of sea turtle interactions in the Hawaii shallow-set longline fishery at their meetings in October 2017, March 2018, June 2018, October 2018, December 2018, and April 2019. The Council and the SSC considered the proposed action at the 173rd Meeting (June 11-13, 2018) and the 129th Meeting (June 6-8, 2018), respectively. The Council considered and discussed issues relevant to the development of measures for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery, including sea turtle interaction data, recommendations of the Council's Statistical and Scientific Committee (SSC) made at the 129th SSC meeting, and other relevant information. All meetings of the Council and SSC were open to the public and advertised through notices in the *Federal Register*, and on the Council's website. The proposed action was additionally discussed at the following advisory group meetings: Protected Species Advisory Committee, April 19-20, 2018 (83 FR 13732); Pelagic Plan Team, May 14-16, 2018 (83 FR 17803); and Hawaii Archipelagic FEP Advisory Panel, May 24, 2018 (83 FR 20794). The Council at its 175th Meeting held December 17, 2018 (83 FR 62309), additionally considered additional mitigation measures for the Western Pacific leatherback turtles under the management framework recommended at the 173rd Meeting, but deferred action at this meeting. The Council at its 177th Meeting held April 12, 2019 (84 FR 10046; 84 FR 12229), reviewed the draft BiOp for the Hawaii shallow-set longline fishery and took action to recommend an amendment to the Pelagic FEP. The public had opportunities to comment at the meetings on the proposed action.

At its 179th Meeting to be held on August 8, 2019, the Council will consider taking final action on the management of the loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery, taking into account the RPMs and associated T&C in the final BiOp. The Council's Hawaii Archipelago Fishery Ecosystem Plan Advisory Panel and the SSC will also meet on April 7, 2019, to advise on the final action. All meetings will be open to the public and publicized in the Hawaii media, Federal Register, and on the Council's website. See: www.wpcouncil.org for more information.

After Council action, NMFS will publish in the *Federal Register* the proposed FEP amendment and regulatory revisions to implement the proposed action. The public will have another opportunity to provide a comment on the action, and NMFS will consider public comments on the proposed action before making a decision on the FEP amendment and publishing the final rule. Readers may find instructions on how to comment on the proposed rule and draft EA by searching on RIN at www.regulations.gov, or by contacting the responsible official or Council at the above addresses. NMFS must receive comments by the deadline specified in the proposed rule to be considered.

2 DESCRIPTION OF THE ALTERNATIVES CONSIDERED

2.1 Development of the Alternatives

The Council considered a range of options for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery at its 172nd Meeting in March 2018, 173rd meeting in June 2018, 175th meeting in December 2018, and 177th meeting in April 2019. The Council considered a broad range of measures, including specification of hard caps (single year, multi-year, and removal of hard caps); in-season measures (individual vessel limits, individual trip limits, and in-season temporary closures); real-time spatial measures to manage interaction hotspots, and non-regulatory measures (fleet communication, sea turtle avoidance pilot program, and research to minimize trailing gear).

In discussing the action, the SSC and Council considered the following information:

- Anticipated level of interactions in the BE for the Hawaii shallow-set longline fishery consultation reinitiated on April 20, 2018;
- 9th Circuit Court decision and settlement agreement;
- Potential development of industry initiative for a sea turtle avoidance program;
- Data on loggerhead and leatherback turtle interactions since 2004;
- Effort and economic performance trend of the fishery since 2004;
- Impacts of hard cap closure on the fishery's performance;
- Characteristics of the higher loggerhead interaction levels in 2017 and 2018, including:
 - Interactions concentrated in December 2017-January 2018;
 - Small number of vessels interacted with majority of the observed loggerhead turtles, while a large proportion of the shallow-set vessels targeting swordfish during the period of high interactions also had at least one observed interaction;
 - Spatial distribution of interactions in December 2017-January 2018 were not anomalous compared to previous years;
 - Proportion of loggerhead interactions occurring inside the TurtleWatch temperature band (17.5-18.5°C) and spatial effort distribution inside and outside the Turtle Watch temperature band were not anomalous compared to previous years;
 - Average size of loggerhead turtles captured in December 2017 and January 2018 were similar to the average size in December and January from previous years; and
 - PIFSC continues to explore the linkage of loggerhead turtle interactions in the Hawaii shallow-set longline fishery to hatchling production at nesting beaches in Japan as well as additional examination of the oceanographic environment and fishing behavior;
- Population assessments of the North Pacific loggerhead and Western Pacific leatherback turtle populations; and
- Draft BiOp for the Hawaii shallow-set longline fishery (dated March 27, 2019).

Based on the loggerhead and leatherback turtle interaction data and the economic performance of the fishery, the Council identified the primary needs for managing loggerhead and leatherback turtle interactions as follows:

- Mechanism for early detection and response to higher interaction rates that may indicate rapid accumulation of interactions, which would in turn reduce overall interactions in years with potentially high interactions such as those seen in 2017-2018 for loggerhead turtles; and
- Minimize further interactions when such higher interaction rates are detected while helping to ensure year-round supply of swordfish to meet domestic demand.

At the 177th meeting held April 12, 2019, the Council recommended amending the Pelagic FEP to establish a management framework for the Hawaii shallow-set longline fishery consisting of the following measures:

1. Establish an annual limit on the number of North Pacific loggerhead and leatherback turtle interactions that the Council will recommend to NMFS consistent with the anticipated level of annual interactions that is set forth in the current valid biological opinion. Once either one of these interaction limits is reached, the fishery closes for the remainder of the calendar year.
2. Establish individual trip interaction limits for loggerhead and leatherback turtles for the Hawaii limited entry permit vessels that declare their trips as a shallow-set trip
 - i. Upon determining that a vessel has reached either the loggerhead or leatherback turtle trip interaction limit based on data from NMFS observers, shallow-set vessels will be required to return to port without making additional sets.
 - ii. The vessel may resume shallow-set fishing operations after returning to port and providing the required 72-hour notification under 50 CFR 665.803 prior to departure.
 - iii. The Council may make recommendations to NMFS to revise the individual trip limits upon periodic review of the effectiveness of the limits.

Using the framework described above, the Council also recommended that:

1. The Hawaii shallow-set longline fishery be reopened and the following limits be implemented under the management framework:
 - i. Annual limit of 36 loggerhead turtles and 16 leatherback turtles, consistent with the draft shallow-set longline fishery BiOp. For the 2019 fishing year, interactions occurring from January 1, 2019 until the fishery closure on March 19, 2019 shall apply against the 36 loggerhead and 16 leatherback limit; and
 - ii. Individual trip limits of 5 loggerhead turtles and 2 leatherback turtles.
2. An annual review of the Hawaii shallow-set longline fishery's performance under the individual trip limits in the Annual SAFE Report.

The Council's recommendation to specify a loggerhead trip limit of 5 was based on the finding that it would provide a meaningful reduction in interactions in years with high interaction rates, such as those observed in 2017-2018. Observed sea turtle interaction data since 2004 indicate that most shallow-set longline trips with loggerhead turtle interactions have 1-2 interactions per trip, with a small proportion of trips having 4 or more interactions coinciding with years with the highest total fleet-wide interactions. Based on the PIFSC simulation applying different level of trip limits to past observed interactions, a limit of 5 loggerhead turtles per trip would have reduced loggerhead turtle interactions in 2018 by 30%, even without accounting for avoidance

behavior by the vessels (see Section 4.2.2). The Council therefore determined that the loggerhead trip limit of 5 would provide a mechanism for early detection and response to higher interaction rates, and minimize further interactions when such higher interaction rates are detected while helping to ensure year-round supply of swordfish to meet domestic demand.

The Council's earlier recommendation at its 173rd Meeting did not include specification of individual trip limits for leatherbacks because observed interaction data from 2004-2018 indicated that individual trip limits do not have a potential to provide substantial reduction of leatherback turtle interactions if interaction patterns remain similar to past years. Subsequently, the Council at its 177th Meeting recommended adding an individual trip limit specification of 2 leatherback turtles per trip, taking into consideration the long-term declining trend in the population assessment conducted for the BiOp, and recognizing the potential for reducing leatherback turtle interactions if vessels are able to avoid a second interaction after encountering the first leatherback on a given trip.

As described in Section 1.1.2, the final 2019 BiOp includes RPMs and associated T&Cs, compliance with which are mandatory for the Section 9 exemption under ESA section 7(o) to apply. Of the RPMs, RPM 1 and associated T&C 1a and 1b are to be immediately implemented for the continued authorization of the Hawaii shallow-set longline fishery. These measures are similar to the Council's recommended action at the 177th meeting in that they include fleet-wide hard caps and individual trip limits, but differ in that the individual trip limit measure includes additional restrictions on vessels that reach a trip limit twice in a calendar year. Additionally, RPM 1a requires a leatherback hard cap limit of 16, but does not require a hard cap limit for loggerhead turtles. The main features of the 177th Council meeting actions and RPM T&C 1a and 1b are summarized in Table 1.

Table 1. Comparison of the Council’s 177th Meeting Recommended Action and RPM T&C 1a and 1b.

Measures	177 th Meeting Council Action		RPM T&C 1a and 1b	
	Loggerhead	Leatherback	Loggerhead	Leatherback
Hard cap limits	36	16	None required	16
Procedures	<ul style="list-style-type: none"> ➤ Council to recommend limits to NMFS consistent with the anticipated level of interactions set forth in the current valid BiOp. ➤ Once either one of the limits is reached, fishery closes for the remainder of the calendar year. 		<ul style="list-style-type: none"> ➤ Not applicable 	<ul style="list-style-type: none"> ➤ Once the limit is reached, fishery closes for the remainder of the calendar year.
Trip limits	5	2	5	2
Procedures	<ul style="list-style-type: none"> ➤ Upon determining that a vessel has reached either of the trip limits based on data from NMFS observers, the vessel would be required to return to port without making additional sets. ➤ The vessel may resume shallow-set fishing operations after returning to port and providing the required 72-hour notification under 50 CFR 665.803 prior to departure. ➤ Annually review the Hawaii shallow-set longline fishery’s performance under the trip limits in the Annual SAFE Report. ➤ Council may make recommendations to NMFS to revise the trip limits upon periodic review of the effectiveness of the limits. 		<ul style="list-style-type: none"> ➤ Any vessel that reaches the established trip limit must immediately stop fishing and return to port. ➤ Vessels that reach a trip limit will not engage in shallow-set longline fishing for 5 days while NMFS evaluates vessel and turtle interactions to identify any problems and determine if guidance can be provided to the vessel to reduce the interactions. ➤ Vessels that reach the trip limit for either leatherback or loggerhead sea turtles twice in a calendar year shall be prohibited from shallow-set longline fishing for the remainder of the calendar year. Such vessels shall have an annual vessel limit equivalent to a single trip limit for the following calendar year. 	

2.2 Description of the Alternatives

This section describes the alternatives for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery and the expected fishery outcomes that would occur under each alternative. Alternative 1 is the No Action alternative, and Alternative 2 is based on the Council’s recommended action at the 177th meeting, consisting of annual fleet-wide hard cap limits and individual trip interaction limits for both loggerhead and leatherback turtles. Alternatives 3 combines the Council’s recommended action from the 177th meeting with RPM T&C 1a and 1b in the 2019 BiOp, consisting of a hard cap limit for leatherback turtles and individual trip interaction limits for both loggerhead and leatherback turtles with additional restrictions on vessels that reach a trip limit twice in a calendar year, and modifying the loggerhead hard cap limit equivalent to the ITS in the 2019 BiOp. Alternative 4 further modifies Alternative 3 by not setting a loggerhead hard cap limit. Features common to all alternatives are described in Section 2.2.1, and general descriptions of measures contained in the alternatives are provided in Section 2.2.2.

Comparison of features of the Alternatives considered and possible fishery outcomes are summarized in Table 3.

2.2.1 Features Common to All Alternatives

Under all alternatives considered, the Hawaii shallow-set longline fishery will continue to be managed under existing gear and handling requirements to minimize impacts to sea turtles. These include the required use of 18/0 or larger circle hooks with no more than 10° offset and mackerel-type bait, adherence to regulations for safe handling and release of sea turtles, and possession on board the vessel required turtle handling and dehooking gear. These measures have successfully reduced loggerhead and leatherback turtle interactions by approximately 90% since their implementation in 2004 (Gilman and Kobayashi 2007, Swimmer et al. 2017).

Under all alternatives considered, NMFS would continue to monitor the Hawaii shallow-set longline fishery under statistically reliable observer coverage (currently 100 percent) and provide near real-time data on loggerhead and leatherback turtle interactions. Current NMFS observer data collection protocols for the Hawaii longline fishery instruct observers to report sea turtle interactions using a satellite phone after each observation. These call-in reports are used to monitor the existing hard caps in near real-time.

2.2.2 Description of Measures Contained in the Alternatives

All alternatives contain existing or modified annual fleet-wide hard cap limits, and Alternatives 2-4 contain individual trip limits, with some variation in the details of the measures by alternative. This section describes the general features of the annual fleet-wide hard cap limits and the individual trip limits.

2.2.2.1 Annual Fleet-wide Hard Cap Limits

The Council may recommend setting annual fleet-wide hard cap limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery. The Council's recommended hard cap limits would be consistent with the anticipated level of annual interactions set forth in the current BiOp, or any applicable RPMs in the current BiOp. Once implemented, the limits would remain in place until such time that the Council makes a recommendation to NMFS to revise the specifications.

Loggerhead and leatherback turtle interactions are monitored in near real-time by NMFS observers. Current NMFS observer data collection protocols for the Hawaii longline fishery instruct observers to report sea turtle interactions using a satellite phone after each observation. Upon reaching either of the interaction limits, NMFS would close the Hawaii shallow-set longline fishery until the end of the calendar year in which the limit was reached.

Hard caps were first established in 2004 under Regulatory Amendment 3 of the Pelagic FMP as part of the measures intended to control fishing effort and sea turtle interactions while information was being gathered on the effectiveness of using circle hooks and mackerel-type bait in the Hawaii shallow-set longline fishery. At the time, this gear and bait combination had only been tested in Atlantic longline fishery experiments prior to approval for use in Hawaii fishery,

and the Hawaii shallow-set longline fishery operated as a model fishery to collect data on the effectiveness of these mitigation measures. These measures were developed by the Council under the Pelagic FMP to allow the Hawaii shallow-set longline fishery to reopen following a three-year closure, and were not required under the BiOp prepared pursuant to the ESA. While the ESA requires reinitiation of Section 7 consultation when an ITS is exceeded, it does not necessarily require that the fishery suspend operations upon reaching an ITS, or require hard caps or other mechanisms to close the fishery. The limits themselves do not necessarily have biological significance for the species' survival and recovery because they are based on the anticipated level of interactions analyzed in the BiOp, but they provide additional assurance that the interactions remain below a fixed level analyzed in the BiOp and may eliminate the need for reinitiation of ESA consultation by preventing an exceedance of the ITS.

As previously described, the stipulated settlement agreement and court order of May 4, 2018, states that NMFS may not increase the allowable incidental take of loggerhead turtles above the court-ordered hard cap limit of 17 loggerhead turtles except through a new regulation issued under applicable authority and after issuance of a new BiOp. The hard caps were established in 2004 under Regulatory Amendment 3 of the Pelagic FMP, and are not implemented as a requirement under the ESA. This amendment, developed pursuant to the MSA, therefore provides the authority for establishing a revised hard cap limit for loggerhead turtles based on the new BiOp.

2.2.2.2 Individual Trip Limits

Alternatives 2-4 contain individual trip limits on the number of loggerhead and leatherback turtle interactions for the Hawaii limited entry permit vessels that declare their trips as a shallow-set trip. The individual trip limit would apply to all trips declared as shallow-set gear under the Hawaii limited entry permit program and all interactions counting toward the individual trip limit would also count toward the fleet-wide hard cap limit, if applicable. Upon determining that a vessel has reached either the loggerhead or leatherback turtle trip limit based on the data from NMFS observers, the vessel would be required to return to port without making additional sets. Conditions upon which the vessel may resume shallow-set fishing operations differ by alternative.

The Council may recommend different trip limits for the two sea turtle species. Once implemented, the limits would remain in place until such time that the Council makes a recommendation to NMFS to revise the specifications. The Council may make recommendations to NMFS to revise the individual trip limits upon periodic review of the effectiveness of the limits.

Individual trip limits are intended to mitigate a large proportion of loggerhead and leatherback turtle interactions from occurring in a single trip. Observed sea turtle interaction data since 2004 indicate that trips with loggerhead turtle interactions typically have 1-2 interactions per trip in years with low fleet-wide loggerhead turtle interactions. Conversely, trips with 3 or more loggerhead turtle interactions have been observed in years with high fleet-wide interactions. In 2018, when the highest number of loggerhead turtle interactions was observed, 16% of the trips contributed to 58% of the total fleet-wide interactions. Monitoring the number of loggerhead

turtle interactions per trip would provide an early detection mechanism for higher fleet-wide interactions, and the individual trip limit would provide a “dampening” response by minimizing further interactions on those trips.

Leatherback turtle interactions in the shallow-set fishery have been less variable than loggerhead turtle interactions, with most trips with leatherback turtle interactions having 1-2 interaction per trip and only one trip having 3 interactions since 2004 (Table 2). Individual trip limits for leatherback turtle interactions may serve as a preventative measure if higher interaction rates are observed in the future, and if vessels are able to avoid additional interactions after encountering the first leatherback on a given trip.

Individual trip limits would provide an individual vessel incentive to avoid sea turtle interactions because shallow-set vessels may fish 500-1,000 nm from port and require considerable up-front costs for each trip, and thus a shortened trip duration may result in net loss for that trip. Given the economic disincentive of reaching the trip limit, vessel operators are more likely to employ additional avoidance strategies if they encounter multiple interactions in a trip, such as moving away from the area and avoiding areas with higher potential for interactions using information from NMFS’ TurtleWatch program. If vessels reach a trip limit once, that vessel is more likely to avoid fishing in the same area as the previous trip and employ additional avoidance strategies to prevent further economic loss. Thus conservation benefits are expected even before the individual trip limit is triggered.

The individual trip limit also has an inherent cooling-off period due to the distance between fishing grounds and ports in Honolulu and California where vessels fishing shallow-set gear under the Hawaii longline limited entry permit land their catch. The travel distance from port to the areas where the shallow-set vessels typically operate is at minimum 2-3 days and may take as long as 5-6 days one-way. If a vessel reaches a trip limit, the travel time back to port, time in port, and travel time to return to fishing grounds would result in a minimum of 7-10 day days of no fishing by the applicable vessel. The required time between trips differs by alternative. This time lag between the last set on the trip in which a vessel reaches a trip limit and the first set on the subsequent trip provides a cooling-off period that allows for the conditions contributing to the high interactions to dissipate and reduces the likelihood of additional interactions in that area in subsequent trips. The trip limit also places the accountability of interactions on individual vessels and ensures that the consequence burden remains with the vessel that reaches the individual trip limit.

Table 2. Number of loggerhead and leatherback turtle interactions per trip for trips with at least one interaction, 2004-2019.

Loggerhead turtles			Leatherback turtles		
Number of turtles per trip	Number of trips	Percent of trips with ≥1 turtle interactions	Number of turtles per trip	Number of trips	Percent of trips with ≥1 turtle interactions
1	100	74.1%	1	85	89.5%
2	24	17.8%	2	9	9.5%
3	6	4.4%	3	1	1.1%
4	2	1.5%	4	0	NA
≥5	3	2.2%	≥5	0	NA

Source: PIFSC unpublished data

Additional Restrictions on Vessels that Reach Trip Limits Twice in a Calendar Year

Alternatives 3-4 contain additional restrictions on vessels that reach individual trip limits twice in a calendar as required under RPM T&C 1b. Specifically, vessels that reach the trip limit for either leatherback or loggerhead sea turtles twice in a calendar year would be prohibited from shallow-set longline fishing for the remainder of the calendar year. In the subsequent calendar year, such vessels would be subject to an annual vessel limit equivalent to a single trip limit for the applicable turtle species. If the vessel's cumulative number of interactions for the applicable turtle species reaches the conditional annual vessel limit in the year subsequent to reaching a trip limit twice, the vessel would be required to return to port without making additional sets, and would be prohibited from shallow-set longline fishing for the remainder of the calendar year.

2.3 Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813)

Under Alternative 1, no changes would be made to the management measures and the fishery would continue to be managed under existing measures to minimize impacts to sea turtles, including gear and handling requirements, as well as the hard cap limits codified in regulations at 50 CFR 665.813(b)(1). The No Action Alternative would not implement any new management measures intended to respond to and mitigate fluctuations in loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery, and would not implement RPM T&C 1a and 1b in the 2019 BiOp.

Under Alternative 1, the fishery would operate under hard cap limits of 17 loggerhead turtles per year and 26 leatherback turtles per year. The loggerhead and leatherback hard cap was previously 34 and 26, respectively, under the final rule implementing revised hard caps based on the 2012 BiOp (76 FR 60637, October 4, 2012). On May 4, 2018, the portion of the 2012 BiOp pertaining to loggerhead turtles was vacated and remanded to NMFS under a stipulated settlement agreement and court order. The Hawaii shallow-set longline fishery was closed effective May 8, 2018, until December 31, 2018, pursuant to the court order (83 FR 21939, May 11, 2018), and reopened on January 1, 2019. The court order also required NMFS to promulgate a new regulation to become effective on January 1, 2019, establishing the hard cap limit for loggerhead turtles at 17 per year, consistent with the ITS from the 2004 BiOp published on February 23, 2004, unless a new biological opinion is completed and a supporting hard cap rule is in place. NMFS published a final rule on October 2, 2018 revising the loggerhead hard cap limit pursuant to the court order (83 FR 49495). The court order did not affect the leatherback turtle portions of the 2012 BiOp, and thus the existing hard cap limit of 26 leatherback turtles remains in place. After the fishery reopened on January 1, 2019, the fishery reached the loggerhead hard cap of 17 and closed on March 19, 2019.

Expected Fishery Outcomes

Under Alternative 1, the Hawaii shallow-set longline fishery would continue to be managed under existing measures to minimize impacts to sea turtles, including gear and handling requirements, as well as the existing hard cap limits of 17 loggerhead turtles and 26 leatherback

turtles. This alternative does not implement any measures for early response to higher interaction rates or fluctuations that may indicate a potential for higher impacts to sea turtle populations or a fishery closure early in the calendar year.

The court-ordered requirement to implement a loggerhead hard cap limit of 17 per year is based on the ITS in the 2004 BiOp. The ITS was based on predictive modeling of the anticipated level of interactions using 1994-1999 data (observer coverage of 3.3-5.8% annually for both shallow-set and deep-set longline fisheries) and applying the interaction reduction rates associated with circle hooks and mackerel bait from experimental results in the Atlantic (Kobayashi 2003). Since the Hawaii shallow-set longline fishery's reopening in April 2004, the fishery has accumulated 14 additional years of operational data under the circle hook and mackerel-type bait measures under 100% observer coverage. Additionally, improved information on loggerhead abundance and fishery impacts on population trends are available. Therefore, under the No Action Alternative, the fishery would operate under a conservative loggerhead hard cap limit that does not reflect the best available scientific information for the species' conservation status or needs.

RPM T&C 1h of the 2019 BiOp states that, if T&C 1a and 1 b have not been implemented by regulation by January 1, 2020, the Hawaii shallow-set longline fishery may reopen under an annual interaction limit of 16 leatherback and 17 loggerhead sea turtles until such regulations are in place. Therefore, under Alternative 1, additional action would be necessary if the fleet-wide leatherback turtle interactions reach 16 to implement RPM T&C 1h of the 2019 BiOp and to ensure compliance with ESA.

Under this alternative, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year). Sea turtle interactions are likely to fluctuate substantially between years, and the fishery is likely to close early in the calendar year when loggerhead turtle interactions are higher than average due to the conservative hard cap limit. When a hard cap is reached, the fishery remains closed until December 31 of the same calendar year, which may delay the start of the fishing season that typically starts around October.

2.4 Alternative 2: Implement the Council's Recommended Action from the 177th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery)

Under Alternative 2, the Pelagic FEP would be amended to modify mitigation measures for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery, consisting of 1) annual limits on the number of loggerhead and leatherback turtle interactions (fleet-wide hard cap limits); and 2) individual trip interaction limits (trip limits), based on the Council's recommended action at its 177th Meeting. Specifically, this alternative would:

1. Set an annual limit on the number of North Pacific loggerhead and leatherback turtle interactions that the Council will recommend to NMFS consistent with the anticipated level of annual interactions that is set forth in the current valid biological opinion. Once either one of these interaction limits is reached, the fishery closes for the remainder of the

calendar year. The limits would initially be set at 36 loggerhead turtles consistent with the ITS in the 2019 BiOp, and 16 leatherback turtles consistent with RPM T&C 1a in the 2019 BiOp.

2. Establish individual trip limits for loggerhead and leatherback turtle interactions for the Hawaii limited entry permit vessels that declare their trips as a shallow-set trip as follows:
 - i. Initially set trip limits of 5 loggerhead turtles and 2 leatherback turtles.
 - ii. Upon determining that a vessel has reached either the loggerhead or leatherback turtle trip limit based on data from NMFS observers, shallow-set vessels will be required to return to port without making additional sets.
 - iii. The vessel may resume shallow-set fishing operations after returning to port and providing the required 72-hour notification under 50 CFR 665.803 prior to departure.
 - iv. Annually review the Hawaii shallow-set longline fishery's performance under the trip limits in the Annual SAFE Report.
 - v. The Council may make recommendations to NMFS to revise the trip limits upon periodic review of the effectiveness of the limits.

The Council's recommendation to set a loggerhead trip limit of 5 was based on the finding that it would provide a meaningful reduction in interactions in years with high interaction rates, such as those observed in 2017-2018. Observed sea turtle interaction data since 2004 indicate that most shallow-set longline trips with loggerhead turtle interactions have 1-2 interactions per trip, with a small proportion of trips having 4 or more interactions coinciding with years with the highest total fleet-wide interactions. Based on the PIFSC simulation applying different level of trip limits to past observed interactions, a limit of 5 loggerhead turtles per trip would have reduced loggerhead turtle interactions in 2018 by 30% (see Section 4.2.2), even without accounting for avoidance behavior by the vessels. The Council therefore determined that the loggerhead trip limit of 5 would provide a mechanism for early detection and response to higher interaction rates, and minimize further interactions when such higher interaction rates are detected while ensuring year-round supply of swordfish to meet domestic demand.

The Council's recommendation to set a leatherback trip limit of 2 took into consideration the long-term declining trend in the population assessment conducted for the BiOp, and recognized the potential for reducing leatherback turtle interactions if vessels are able to avoid a second interaction after encountering the first leatherback on a given trip.

Alternative 2 does not require additional time in port after a vessel reaches a trip limit beyond the existing 72-hour notification requirement prior to departure under 50 CFR 665.803. The travel distance from port to the areas where the shallow-set vessels typically operate is at minimum 2-3 days and may take as long as 5-6 days one-way. If a vessel reaches a trip limit, the travel time back to port, the required 72-hour notice, and travel time to return to fishing grounds would result in a minimum of 7-10 day days of no fishing by the applicable vessel.

This alternative would be partially consistent with RPM T&C 1b, as it would implement trip limits but does not implement additional restrictions on vessels that reach an individual trip limit

twice in a calendar year. Additional action would be necessary to fully implement RPM T&C 1b and to ensure consistency with ESA.

Expected Fishery Outcomes

Under Alternative 2, the fishery would be managed under annual fleet-wide hard cap limits consistent with the best available scientific information in the current BiOp, and the additional individual trip limits that would provide an early response mechanism to higher interaction rates when the fleet-wide interaction levels are below the hard cap limit. The fleet-wide hard cap limits help ensure that loggerhead and leatherback turtle interactions do not exceed a threshold that triggers reinitiation of ESA consultation. The individual trip limits are expected to help ensure year-round operations of the Hawaii shallow-set longline fishery.

This alternative would modify the loggerhead hard cap limit to be consistent with the anticipated level of annual interactions set forth in the current BiOp, and the leatherback hard cap limit to be consistent with RPM T&C 1a. This alternative would also allow the loggerhead hard cap to be revised consistent with the best available scientific information in the current BiOp, rather than being based on an outdated 2004 BiOp under the No Action Alternative. Both hard cap limits for the loggerhead and leatherback turtle would be set equal to or below the level authorized in the ITS and associated RPMs in the 2019 BiOp. This level is based on the anticipated number of interactions analyzed in the 2019 BiOp, which NMFS concluded would not jeopardize the continued existence of loggerhead and leatherback turtles.

The individual trip limits are expected to reduce the likelihood of reaching the loggerhead hard cap because it would prevent a large proportion of loggerhead turtles from being taken in a single trip, which are typically associated with years with high interaction rates. Under this alternative, the individual trip limit for loggerhead turtles would be initially set at 5. Based on 2004-2018 simulation results, a limit of 5 loggerhead interactions per trip would have reduced interactions by 14% in 2017 and 30% in 2018 (see Section 4.2.2), even without accounting for avoidance behavior by the vessels. This level of reduction is expected to reduce the likelihood of reaching the annual fleet-wide loggerhead hard cap. Based on 2004-2018 simulation results, 3% of trips with observed loggerhead interactions during that period would have been affected by a trip limit of 5 interactions, all of which would have contributed to additional reductions in interactions by returning to port.

Under this alternative, the individual trip limit for leatherback turtles would be initially set at 2, which is expected to have a limited amount of reduction in interactions based on the 2004-2018 simulation results showing a reduction of only 1 interaction over that time period. Based on the simulation results, 11% of trips with observed leatherback interactions during that period would have been affected by a trip limit of 2 interactions, of which 90% of the trips affected would not have contributed to additional reductions in interactions by returning to port due to only having 2 interactions total on those trips. However, the leatherback trip limits is expected to serve as a preventative measure if higher interaction rates are observed in the future, and may also reduce the likelihood of reaching the leatherback hard cap if vessels are able to avoid a second interaction after encountering the first leatherback on a given trip.

The individual trip limits are expected to provide an economic incentive for vessel operators to employ additional avoidance strategies if they encounter multiple interactions in a trip, such as moving away from the area and avoiding areas with higher potential for interactions using information from NMFS' TurtleWatch program. If vessels reach a trip limit once, that vessel is more likely to avoid fishing in the same area as the previous trip and employ additional avoidance strategies to prevent further economic loss. Thus conservation benefits to loggerhead and leatherback turtles may be greater than described above based on the 2004-2018 simulation results.

Under this alternative, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year). Sea turtle interactions are likely to fluctuate substantially between years, but would be expected to remain well below the hard cap in most years and not exceed the anticipated level of loggerhead and leatherback turtle interactions authorized in the BiOp. Compared to the No Action Alternative, the fishery is likely to have a lower likelihood of closing early in the calendar year from reaching the hard cap due to the combination of individual trip limits and a higher loggerhead hard cap limit.

2.5 Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp

Under Alternative 3, the Pelagic FEP would be amended to modify loggerhead and leatherback turtle mitigation measures for the Hawaii shallow-set longline fishery consistent with RPM T&C 1a and 1b in the 2019 BiOp, and modify the loggerhead turtle annual fleet-wide hard cap limit equivalent to the ITS in the current BiOp. Specifically, this alternative would:

1. Set an annual limit on the number of leatherback turtle interactions at 16, consistent with RPM T&C 1a under the 2019 BiOp. Once this interaction limit is reached, the fishery closes for the remainder of the calendar year.
2. Set an annual limit on the number of North Pacific loggerhead turtle interactions that the Council will recommend to NMFS consistent with the annual number of loggerhead turtles expected to be captured in the shallow-set longline fishery, as indicated in the ITS of the current valid BiOp. Once this interaction limit is reached, the fishery closes for the remainder of the calendar year. The annual limit would be set at 36 loggerhead turtles annually, based on the 2019 BiOp.
3. Establish individual trip interaction limits for loggerhead and leatherback turtles for the Hawaii limited entry permit vessels that declare their trips as a shallow-set trip, consistent with RPM T&C 1b under the 2019 BiOp as follows:
 - i. Set limits of 5 loggerhead turtles and 2 leatherback turtles per trip.
 - ii. Upon determining that a vessel has reached either the loggerhead or leatherback turtle trip interaction limit based on data from NMFS observers, shallow-set vessels will be required to return to port without making additional sets.
 - iii. The vessel will be prohibited from engaging in shallow-set longline fishing for 5 days after returning to port.

- iv. Vessels that reach the trip limit for either leatherback or loggerhead sea turtles twice in a calendar year shall be prohibited from shallow-set longline fishing for the remainder of the calendar year. Such vessels shall have an annual vessel limit equivalent to a single trip limit for the following calendar year.
- v. The Council may make recommendations to NMFS to revise the individual trip limits upon periodic review of the effectiveness of the limits and consistent with the RPM of the current valid BiOp.

Alternative 3 modifies Alternative 2 (based on the Council's recommended action from the 177th Meeting) for consistency with RPM T&C 1a and 1b. The primary difference between Alternative 2 and 3 is the implementation of additional restrictions on vessels that reach an individual trip limit twice in a calendar year as required under RPM T&C 1b. Additional action would not be required under this alternative to ensure consistency with ESA.

Alternative 3 also prohibits vessels that reach an individual trip limit from engaging in shallow-set longline fishing for 5 days after returning to port, during which time NMFS is required under T&C 1b to evaluate vessel and turtle interactions to identify any problems and determine if guidance can be provided to the vessel to reduce the interactions.

RPM 1a requires setting the leatherback turtle hard cap limit at 16, but does not require a hard cap limit for loggerhead turtles. Thus, under this Alternative, the Council would go beyond what is required by the RPM. Unless otherwise required under the BiOp, the hard cap is a measure under the Pelagic FEP that the Council may recommend modifications to the limits. Under this alternative, the Council would recommend that the loggerhead hard cap limits be modified from the current limit of 17 to 36, consistent with the annual number of loggerhead turtles expected to be captured in the shallow-set longline fishery, as indicated in the ITS of the 2019 BiOp.

Expected Fishery Outcomes

Under Alternative 3, the fishery would be managed under annual fleet-wide hard cap limits consistent with RPM T&C 1a, and the additional individual trip limits that would provide an early response mechanism to higher interaction rates when the fleet-wide interaction levels are below the hard cap limit. The fleet-wide hard cap limits help ensure that loggerhead and leatherback turtle interactions do not exceed a threshold that triggers reinitiation of ESA consultation. The individual trip limits are expected to help ensure year-round operations of the Hawaii shallow-set longline fishery.

The expected fishery outcomes of the fleet-wide hard cap limits and individual trip limits under Alternative 3 are similar to Alternative 2. The conservation benefits of the additional restrictions on vessels that reach an individual trip limit twice in a calendar year may be limited. Based on data from 2004-2019, no Hawaii shallow-set longline vessel has had 5 or more loggerhead turtles on two separate trips in a calendar year, or 2 or more leatherback turtles on two separate trips in a calendar year, indicating that the likelihood of a vessel reaching a trip limit twice in a calendar year is very low. However, should a vessel reach a trip limit twice in a calendar year, that vessel would be prohibited from fishing in the shallow-set fishery for the remainder of the calendar year, and would be required to adhere to a vessel interaction limit of 5 loggerhead or 2

leatherback turtles in the subsequent calendar year. Under such circumstance, the vessel limit of 2 leatherbacks may deter the vessel from participating in the shallow-set longline fishery in the year that the vessel limit would apply, as the low limit may pose a high risk for entering into the fishery for the year.

Under this alternative, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year). Sea turtle interactions are likely to fluctuate substantially between years, but would be expected to remain well below the hard cap in most years and not exceed the anticipated level of loggerhead and leatherback turtle interactions authorized in the BiOp. Compared to the No Action Alternative, the fishery is likely to have a lower likelihood of closing early in the calendar year from reaching the hard cap due to the combination of individual trip limits and a higher loggerhead hard cap limit.

2.6 Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit

Under Alternative 4, the Pelagic FEP would be amended to modify loggerhead and leatherback turtle mitigation measures for the Hawaii shallow-set longline fishery consistent with RPM T&C 1a and 1b in the 2019 BiOp, and would not set an annual fleet-wide hard cap limit for loggerhead turtles, which is not required under RPM T&C 1a. Specifically, this alternative would:

1. Set an annual limit on the number of leatherback turtle interactions at 16, consistent with RPMs and T&C 1a under the 2019 BiOp. Once this interaction limit is reached, the fishery closes for the remainder of the calendar year.
2. Do not set an annual limit on the number of North Pacific loggerhead turtle interactions. If the fishery exceeds the ITS in the current valid BiOp, ESA Section 7 consultation would be reinitiated. The measure for setting an annual limit on the number of North Pacific loggerhead turtle interactions would be retained in the Pelagic FEP.
3. Establish individual trip interaction limits for loggerhead and leatherback turtles for the Hawaii limited entry permit vessels that declare their trips as a shallow-set trip, consistent with RPMs and T&C 1b under the 2019 BiOp as follows:
 - i. Upon determining that a vessel has reached either the loggerhead or leatherback turtle trip interaction limit based on data from NMFS observers, shallow-set vessels will be required to return to port without making additional sets.
 - ii. The vessel will be prohibited from engaging in shallow-set longline fishing for 5 days.
 - iii. Vessels that reach the trip limit for either leatherback or loggerhead sea turtles twice in a calendar year shall be prohibited from shallow-set longline fishing for the remainder of the calendar year. Such vessels shall have an annual vessel limit equivalent to a single trip limit for the following calendar year.
 - iv. The Council may make recommendations to NMFS to revise the individual trip limits upon periodic review of the effectiveness of the limits and consistent with the RPM of the current valid BiOp.

Alternative 4 modifies Alternative 2 (based on the Council's recommended action from the 177th Meeting) for consistency with RPMs and T&C 1a and 1b, and thus additional action would not be required under this alternative to ensure consistency with ESA. As previously described, T&C 1a requires setting the leatherback turtle hard cap limit at 16, but does not require a hard cap limit for loggerhead turtles. This alternative would remove the current fleet-wide loggerhead hard cap limit of 17 from existing regulations and would not replace it with a new limit. As described in Section 2.2.2.1, the hard caps were first implemented as a measure to control sea turtle interactions on the model shallow-set longline fishery while information was being gathered on the effectiveness of using circle hooks and mackerel-type bait in the Hawaii fishery. At the time, the best available scientific information indicated that the North Pacific loggerhead turtle population was projected to decline (WPRFMC 2004). The current best available scientific information indicate that the North Pacific loggerhead population is increasing at an average rate of 2.4 percent, and the total population is estimated at approximately 340,000 turtles. The loggerhead hard cap would continue to be available as a management tool under the Pelagic FEP through future Council action if necessary to conserve the species.

In the absence of a hard cap limit for loggerhead turtles, the fishery would not close if the fleet-wide number of interactions exceeds the ITS in a calendar year. However, vessels would still be constrained by the individual trip limit of 5 loggerheads as well as additional restrictions if the trip limit is reached twice in a calendar year. Consistent with the requirements of ESA and the procedures followed for other sea turtle species and other species groups, NMFS would reinitiate consultation pursuant to ESA Section 7 if the ITS for loggerhead turtles are exceeded. The continuation of the fishery during reinitiated consultation would be evaluated under ESA Section 7(a)(2) and 7(d).

Expected Fishery Outcomes

Under Alternative 4, the fishery would be managed under an annual fleet-wide hard cap limit for leatherback turtles consistent with RPM T&C 1a, and individual trip limits for loggerhead and leatherback turtles. The fleet-wide hard cap limit for leatherback turtles help ensure that interactions do not exceed a threshold that triggers reinitiation of ESA consultation. The expected fishery outcomes of the fleet-wide hard cap limits for leatherback turtles under Alternative 3 are similar to Alternative 2.

The fishery would not have an annual fleet-wide hard cap limit for loggerhead turtles. If the fishery exceeds the loggerhead ITS of 36 in the current BiOp, NMFS would reinitiate consultation pursuant to ESA Section 7, and the fishery may continue to operate during reinitiated consultation, subject to compliance with ESA Section 7(a)(2) and 7(d). While the ESA requires reinitiation of Section 7 consultation when an ITS is exceeded, it does not necessarily require that the fishery suspend operations upon reaching an ITS, or require hard caps or other mechanisms to close the fishery. Based on the predicted distribution of the anticipated level of loggerhead turtle interactions in the Hawaii shallow-set longline fishery (McCracken 2018), the probability that the observed number of interactions in any given 1-year period would be greater than the ITS of 36 is less than 5 %. The predictions assumed that the fishery operated throughout the year for every year included in the analysis and did not truncate the predicted takes, indicating that they provide a reasonable prediction of future level of

interactions in the absence of a loggerhead hard cap. The implementation of individual trip limits is expected to further reduce the probability that the fishery would exceed the ITS of 36.

The individual trip limits for loggerhead and leatherback turtles provide an early response mechanism to higher interaction rates when the fleet-wide interaction levels. The expected fishery outcomes of individual trip limits and the additional restrictions if the trip limit is reached twice in a calendar year under Alternative 4 are similar to Alternative 3.

Under this alternative, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year). Sea turtle interactions are likely to fluctuate substantially between years, but would be expected to remain well below the hard cap in most years and not exceed the anticipated level of loggerhead and leatherback turtle interactions authorized in the BiOp. Compared to the No Action Alternative, the fishery is likely to have a lower likelihood of closing early in the calendar year from reaching the hard cap due to the combination of individual trip limits and the lack of a loggerhead hard cap limit.

2.7 Alternatives Considered, but Rejected from Further Analysis

In the development of this action, the Council considered a broader range of options for measures that may be included in the management measures. Alternatives considered by the Council but not analyzed further in this document are described below.

Multi-year Hard Cap Limits

This alternative would have modified the annual limits of loggerhead and leatherback turtles to a multi-year limit (2- or 3-year), consistent with the multi-year ITSs provided in the BiOp for the Hawaii shallow-set longline fishery. However, a multi-year limit, if implemented without an additional annual control, has the potential to close the fishery for more than one year if the fishery reaches the limit in the first year of the multi-year period. The alternative was rejected from further analysis due to the potential for an extended closure, which would be inconsistent with the purpose and need of the action to help ensure a continued supply of fresh swordfish to U.S. markets. An extended closure exceeding a period of one year also lacks legitimate conservation basis under the ESA.

In-season Temporary Closure upon Reaching a Specified Percentage of the Single-year Hard Cap

This alternative would have implemented an additional in-season closure to the loggerhead and leatherback hard cap measure, whereby a temporary fishery closure would be implemented when a certain percentage of the fleet-wide loggerhead or leatherback turtle hard cap limits are observed during the first three quarters of the calendar year (January through September). The fishery would reopen on October 1 of the same calendar year. The percentage of the hard cap limits at which the in-season closure would be triggered would be based on observed interaction data since 2004. The Council did not select this alternative for inclusion in the management measures because the additional biological benefits from such closures would be minimal if fleet-wide hard cap limits or individual trip limits were implemented. This alternative was also

rejected from further analysis as it could increase the number of closures in given year, which would be inconsistent with the purpose and need of the action to help ensure a continued supply of fresh swordfish to U.S. markets.

Individual Vessel Limits (as a Stand-alone Measure)

This alternative would have implemented individual vessel limits on the number of loggerhead and leatherback turtle interactions that a vessel operating under the Hawaii limited entry permit vessels may have in a calendar year while fishing on trips declared as shallow-set. Upon reaching either of the limit, the vessel would be required to return to port without making additional sets and would be prohibited from shallow-set fishing for the remainder of the calendar year. The individual vessel limit would apply equally to all vessels that fish using shallow-set gear under the Hawaii limited entry permit program and all interactions by individual vessels would also count toward the fleet-wide limit, if applicable. The Council did not select this alternative for inclusion in the management measures because prohibiting vessels from fishing shallow-set if vessels reached the individual vessel limits would not result in meaningful conservation gains compared to the individual trip limits. The alternative is also likely to discourage vessels from participating in the shallow-set sector of the Hawaii longline fishery, which would be inconsistent with the purpose and need of the action to help ensure a continued supply of fresh swordfish to U.S. markets.

Real-time Spatial Management Measures

This alternative would have established a process and mechanism to implement real-time spatial management measures to respond to unusually high loggerhead and leatherback interaction rates under anomalous oceanographic conditions or other unforeseen circumstances. The Council considered options at its 172nd and 173rd Meetings for establishing a monitoring mechanism utilizing observer data that would identify, on a real-time or near-real-time basis, interaction hotspots where interactions have exceeded a certain threshold. The identified hotspots would be closed to shallow-set longline fishing for a pre-determined period of time not exceeding 4 weeks.

The Council did not select real-time spatial management measures to be included in the management measures as the SSC found that information on real-time hotspots is not well known and that information is lacking on fishing behavior changes in response to sea turtle interactions. Although TurtleWatch provides useful information to fishermen on where interaction potential may be higher for loggerhead turtles based on near real-time sea surface temperature data, the tool does not identify real-time interaction hotspots and does not inform decision-makers of the duration or size of potential hotspot closures. Beyond TurtleWatch, data are lacking on the effective size and duration of hotspot closures, as well as the potential for dispersed effort from such closures to areas of potentially higher sea turtle concentrations. In other words, we have insufficient data to conclude that actions to disperse fishing effort from a particular location will positively impact sea turtle conservation. Therefore, effectiveness of hotspot closures for loggerhead and leatherback turtles remain speculative.

Furthermore, identifying sea turtle interaction hotspots for possible closure raises significant notice and enforcement concerns, since days if not weeks will elapse before an area closure can

be put in effect. In short, we cannot know that the area of concern continues to have a high concentration of sea turtles by the time the closure is noticed and effective.

For these reasons, there is insufficient data to support real-time spatial management measures as an effective responsive tool to mitigate fluctuations in sea turtle interactions, and thus the alternative was rejected from further analysis.

Time-Area Closures

This alternative would have considered static, pre-defined time-area closures for the Hawaii longline fishery to reduce loggerhead and leatherback turtle interactions, such as a January time-area closure previously considered in Amendment 18 to the Pelagic FMP. Observer data since 2004 indicate that there is considerable interannual variability in interactions even during peak interaction months for loggerhead and leatherback turtles. For example, January was previously selected for a time-area closure alternative in Amendment 18, but observer data indicate that eight of the years since 2004 had zero or one interaction in January, indicating that a closure in January would have provided little to no conservation benefit in those years. Pre-defined time-area closures do not meet the purpose and need for this action, which aims to develop measures intended to detect and respond to unusually high interaction rates and to minimize further interactions while helping to ensure year-round supply of swordfish to meet domestic demand. Static, pre-defined closures do not respond to current interaction data, and thus this alternative was rejected from further analysis.

Table 3. Comparison of Features of the Alternatives.

Topic	Alternative 1: No-action/Status Quo	Alternative 2: Implement the Council’s recommended action from the 177th Council Meeting	Alternative 3: Modify loggerhead and leatherback mitigation measures consistent with RPM T&C 1a and 1b in 2019 BiOp, and modify loggerhead fleet-wide hard cap limit equivalent to ITS	Alternative 4: Modify loggerhead and leatherback mitigation measures consistent with RPM T&C 1a and 1b, and do not set loggerhead fleet-wide hard cap limit
Measures included in the alternative	Status quo with hard cap limit of 17 loggerhead turtles (based on settlement agreement and court order) and 26 leatherback turtles	<ol style="list-style-type: none"> 1) Annual fleet-wide hard cap limits for loggerhead and leatherback turtles 2) Individual trip interaction limits for loggerhead and leatherback turtles 	<ol style="list-style-type: none"> 1) Annual fleet-wide hard cap limits for loggerhead and leatherback turtles 2) Individual trip interaction limits for loggerhead and leatherback turtles with additional requirements for vessels that reach a trip limit twice in a calendar year 	<ol style="list-style-type: none"> 1) Annual fleet-wide hard cap limit for leatherback turtles 2) Do not set loggerhead turtle hard cap limit (retain as management tool under Pelagic FEP) 3) Individual trip interaction limits for loggerhead and leatherback turtles with additional requirements for vessels that reach a trip limit twice in a calendar year
<i>Hard cap limits</i>	Loggerhead = 17 Leatherback = 26	Loggerhead = 36 Leatherback = 16	Loggerhead = 36 Leatherback = 16	Loggerhead = no hard cap limit Leatherback = 16
<i>Individual trip interaction limits</i>	None	Loggerhead = 5 Leatherback = 2	Loggerhead = 5 Leatherback = 2	Loggerhead = 5 Leatherback = 2
<i>Additional restrictions on vessels that reach trip limits twice in a calendar year</i>	N/A	None	Vessels that reach the trip limit for either leatherback or loggerhead sea turtles twice in a calendar year shall be prohibited from shallow-set longline fishing for the remainder of the calendar year. Such vessels shall have an annual vessel limit equivalent to a single trip limit for the following calendar year.	Vessels that reach the trip limit for either leatherback or loggerhead sea turtles twice in a calendar year shall be prohibited from shallow-set longline fishing for the remainder of the calendar year. Such vessels shall have an annual vessel limit equivalent to a single trip limit for the following calendar year.
Expected fishery outcomes	Expected to operate within effort range observed since the reopening of the fishery in 2004 (approx. 650-1,850 sets per year).	Expected to operate within effort range observed since the reopening of the fishery in 2004 (approx. 650-1,850 sets per year).	Expected to operate within effort range observed since the reopening of the fishery in 2004 (approx. 650-1,850 sets per year).	Expected to operate within effort range observed since the reopening of the fishery in 2004 (approx. 650-1,850 sets per year).

Mechanism for early response to higher interaction rates	None. Response (fishery closure) only occurs when limit is reached.	Individual trip limits for loggerheads provide mechanism for early response to high interactions. Individual trip limits for leatherbacks may serve as a preventative measure if higher interaction rates are observed in the future.	Individual trip limits for loggerheads provide mechanism for early response to high interactions. Individual trip limits for leatherbacks may serve as a preventative measure if higher interaction rates are observed in the future.	Individual trip limits for loggerheads provide mechanism for early response to high interactions. Individual trip limits for leatherbacks may serve as a preventative measure if higher interaction rates are observed in the future.
Likelihood of fleet-wide hard cap closure	Occasional fleet-wide closure expected from reaching the hard cap limit.	Individual trip limits expected to reduce likelihood of reaching hard cap limits, providing a greater likelihood that the fishery maintains year-round operations.	Individual trip limits expected to reduce likelihood of reaching hard cap limits, providing a greater likelihood that the fishery maintains year-round operations. Additional requirements for vessels that reach trip limits twice in a calendar year may further prevent the fishery from reaching hard cap limits, although likelihood of a vessel reaching trip limits twice is low based on past data.	Individual trip limits may reduce likelihood of reaching leatherback hard cap limit, providing a greater likelihood that the fishery maintains year-round operations. Additional requirements for vessels that reach trip limits twice in a calendar year may further prevent the fishery from reaching leatherback hard cap limit, although likelihood of a vessel reaching trip limits twice is low based on past data. Fleet-wide hard cap closure only applies to leatherback turtles. If the fishery exceeds the ITS of 36 loggerhead turtle interactions in the 2019 BiOp, NMFS would reinitiate consultation pursuant to ESA Section 7, and the fishery may continue to operate during reinitiated consultation, subject to compliance with ESA Section 7(a)(2) and 7(d).
Mechanism for addressing conservation needs of loggerhead and leatherback turtles	Hard cap limits help ensure that interactions remain below a fixed level analyzed in the BiOp.	Hard cap limits help ensure that interactions remain below a fixed level analyzed in the BiOp. Individual trip limits expected to reduce likelihood of reaching hard cap limits and consequently reduce the total fleet-wide number of interactions.	Hard cap limits help ensure that interactions remain below a fixed level analyzed in the BiOp. Individual trip limits expected to reduce likelihood of reaching hard cap limits and consequently reduce the total fleet-wide number of interactions.	Hard cap limit for leatherback turtles help ensure that interactions remain below a fixed level analyzed in the BiOp. Individual trip limits expected to reduce likelihood of reaching hard cap limits and consequently reduce the total fleet-wide number of interactions.
Consistency with RPM T&C 1a and 1b	Not consistent.	Partially consistent.	Fully consistent.	Fully consistent.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section describes the baseline condition of resources in the action area under recent fishery conditions. The environmental resources that are potentially affected include target and non-target species and protected resources. This section also describes the socioeconomic and management setting, as well resources eliminated from detailed study. NMFS derives the information in this section primarily from the 2018 SAFE report (WPRFMC 2019), 2019 BiOp (NMFS 2019), and other available information cited below.

3.1 Target and Non-Target Stocks

This section identifies the pelagic management unit species (PMUS) managed under the Pelagic FEP harvested in the shallow-set fishery. They include several species of tuna, billfish and sharks shown in Table 4. This section also briefly summarizes the overfishing and overfished status of PMUS where known. For a comprehensive discussion of the biology and life history of PMUS, see the Pelagic FEP (WPRFMC 2009a).

The Pelagic FEP also includes criteria for overfishing and overfished status determinations. Overfishing occurs when the fishing mortality rate (F) for one or more years is greater than the maximum fishing mortality threshold (MFMT), which is the fishing mortality rate that produces maximum sustainable yield (F_{MSY}). Thus, if the F/F_{MSY} ratio is greater than 1.0, overfishing is occurring.

A stock is considered overfished when its biomass (B) has declined below the minimum stock size threshold (MSST), or the level that jeopardizes the capacity of the stock to produce MSY on a continuing basis (B_{MSY}). Specifically, the $B_{MSST} = (1-M)B_{MSY}$, where M is the natural mortality rate of the stock, or one half of B_{MSY} , whichever is greater. For example, if the natural mortality rate of a stock is 0.35, $B_{MSST} = 0.65*B_{MSY}$. Thus, if the B/B_{MSY} ratio for the stock falls below 0.65, the stock is overfished. If a stock has a natural mortality rate greater than 0.6, MSST is set at the default of $0.5*B_{MSY}$ (because $1 - 0.6 = .4$, and 0.5 is greater than 0.4). For such a stock, the stock is overfished when the B/B_{MSY} ratio falls below 0.5. It is important to note that NMFS' National Standard 1 guidelines at 50 CFR 665.310(e)(1)(i)(C) defines B_{MSY} as the long-term average size of the stock measured in terms of spawning biomass (SB) or other appropriate measure of the stock's reproductive potential that would be achieved by fishing at B_{MSY} . Thus, whenever available, NMFS uses estimates of SB in determining the status of a stock. When estimates of SB are not available, NMFS may use estimates of total biomass (B), or other reasonable proxies for determining stock status.

The following table, Table 4, shows the stock status determinations of PMUS under the Pelagic FEP as described in the 2018 SAFE report (WPRFMC 2018) and other sources cited below. For a more comprehensive table of metrics, including the overfishing and overfished reference points respectively, natural mortality, and MSST, see the 2018 SAFE report (WPRFMC 2018). Additional information on the status of stocks, where known, are described thereafter. Because U.S. landings by stock are reported as the Hawaii longline fisheries, we use the combined deep-set and shallow-set fishery in our descriptions below.

Table 4. Stock status of PMUS under the Pelagic FEP.

PMUS Stock	Is overfishing occurring?	Is the stock overfished?	Assessment Results
Swordfish (WCNPO)	No	No	ISC 2018
Swordfish (EPO)	Yes, because $F > MFMT$	No	ISC 2014
Skipjack Tuna (WCPO)	No	No	McKechnie et al. 2016
Yellowfin Tuna (WCPO)	No	No	Tremblay-Boyer et al. 2017
Yellowfin Tuna (EPO)	Yes, because $F > MFMT$	No	Minte-Vera et al. 2018
Albacore (N. Pacific)	No	No	ISC 2017
Bigeye Tuna (WCPO)	No	No, because $SSB > MSST$	Vincent et al. 2018
Bigeye Tuna (EPO)	NA	NA	Maunder et al. 2018
Pacific Bluefin Tuna	Yes, because $F > MFMT$	Yes, because $SSB < MSST$	ISC 2018
Blue Marlin (Pacific)	No	No	ISC 2016
Striped Marlin WC (N. Pacific)	Yes, because $F > MFMT$	Yes, because $SSB_{2013} < MSST$	ISC 2015
Striped Marlin (NEPO)	No	No	Hinton and Maunder 2011
Blue Shark (N. Pacific)	No	No	ISC 2015
Oceanic White-tip Shark (WCPO) ¹	Yes	Yes	Rice and Harley 2012
Silky Shark (WCPO)	No	No	Clarke et al. 2018
Shortfin Mako Shark (N. Pacific)	No	No	ISC 2018
Common Thresher Shark (N. Pacific)	No	No	Teo et al. 2018
Other Billfishes ²	Unknown	Unknown	--
Other Pelagic Sharks ³	Unknown	Unknown	--
Other PMUS ⁴	Unknown	Unknown	--

¹Because the oceanic whitetip shark is listed as endangered under the ESA, this species is described in more detail in section 3.2 and 3.2.6.

²Black Marlin (Pacific), Shortbill Spearfish (Pacific), Sailfish (Pacific)

³Silky Shark (EPO), Longfin Mako Shark (N. Pacific), Bigeye Thresher Shark (N. Pacific), Pelagic Thresher Shark (N. Pacific), Salmon Shark (N. Pacific)

⁴Skipjack Tuna (EPO), Dolphinfish (Pacific), Wahoo (Pacific), Oprah (Pacific), Pomfret (family *Bramidae*, W. Pacific), Kawakawa (Pacific), Oilfish (family *Gempylidae*, Pacific), other tuna relatives (*Auxis spp.*, *Allothunnus spp.*, and *Scomber spp.*, Pacific), Squids (Pacific)

Swordfish (WCNPO)

Swordfish (*Xiphias gladius*) are the primary target species of the shallow-set fishery, typically comprising 90 percent of the landed catch. Swordfish are worldwide in distribution in all tropical, subtropical and temperate seas, ranging from around 50° N to 50° S (Nakamura 1985; Bartoo and Coan 1989). The adults can tolerate a wide range of water temperature, from 5°-27° C, but are normally found in areas with sea surface temperatures above 13° C (Nakamura 1985). Larvae and juveniles occur in warmer tropical and subtropical regions where spawning also occurs. Swordfish occur throughout the region and in the EEZs of neighboring countries and adjacent high seas.

In 2014, the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) completed a stock assessment for North Pacific swordfish using data through 2012 (ISC 2014). Based on the best scientific information available, the swordfish population in the North Pacific is comprised of two stocks, separated by a roughly diagonal boundary extending from Baja California, Mexico, to the Equator. These are the Western Central North Pacific Ocean (WCNPO) stock, distributed in the western and central Pacific Ocean, and the East Pacific Ocean (EPO) stock, distributed in the eastern Pacific Ocean (Figure 2). The shallow-set longline fishery predominately catches swordfish from the WCNPO stock.

The results of the most recent assessment (ISC 2018) support the conclusion that the WCNPO stock is not subject to overfishing because $F_{2013-2015}/F_{MSY} = 0.45$, and is not overfished because $SB_{2016}/SB_{MSY} = 1.87$. The 2018 stock assessment estimated MSY for the WCNPO stock at 14,941 t (ISC 2018b). In 2018, total landings of swordfish from the Hawaii longline fisheries (deep-set and shallow-set combined) in the NPO was 590 t (WPRFMC 2019), or nearly 4 percent of MSY.

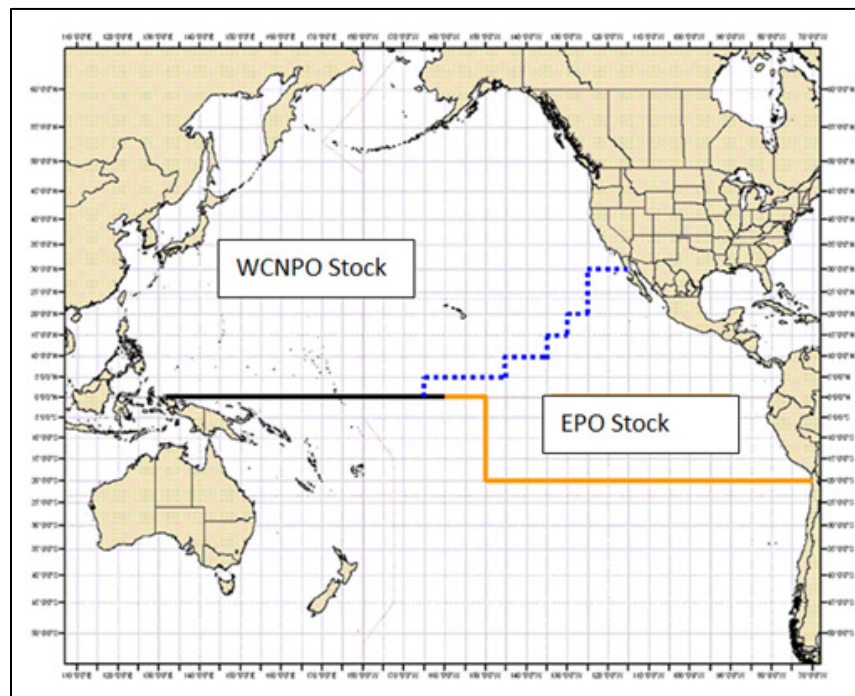


Figure 2. Geographic regions separating WCNPO and EPO swordfish stocks.

Swordfish (EPO)

The results of the most recent assessment (ISC 2014), using data through 2012, support a conclusion that the EPO stock is now subject to overfishing because $F_{2012}/F_{MSY} = 1.11$, but is not overfished because $B_{2012}/B_{MSY} = 1.87$. The 2014 stock assessment estimated MSY for the EPO stock at 5,490 t (ISC 2014). Based on federal logbook records, catch of swordfish by the U.S. longline vessels operating within the boundary of the EPO stock is less than 5 t annually in years 2004-2018 (NMFS unpublished data). This amount (< 5 t) is less than 1 percent of the estimated MSY; therefore, the relative impact of the U.S. longline fisheries on the stock is negligible.

Skipjack Tuna (WCPO)

McKechnie et al. (2016) conducted the most recent assessment of skipjack tuna in the WCPO using data up to 2015. The median estimates of the ratio of current fishing mortality to fishing mortality at MSY (F_{2011}/F_{MSY}) = 0.48 indicate that overfishing of skipjack is not occurring in the WCPO. Nor is the stock in an overfished state with spawning biomass to spawning biomass at MSY (SB_{2011}/SB_{MSY}) = 2.15. Fishing pressure and recruitment variability (influenced by environmental conditions) will continue to be the primary influences on stock size and fishery performance (McKechnie et al. 2016). McKechnie et al. (2016) estimate MSY at 1,875,600 t. In 2018, total skipjack tuna landings by Hawaii longline fisheries was 150 t (WPRFMC 2019), or 0.01 percent of the estimated MSY.

Yellowfin Tuna (WCPO)

Tremblay-Boyer et al. (2017) conducted the most recent stock assessment for yellowfin tuna in the WCPO. Yellowfin is not subject to overfishing or overfished. Similar to the bigeye assessment, the WCPFC Scientific Committee endorsed a weighted assessment model uncertainty grid to characterize stock status. Scientific Committee 13 noted that the central tendency of relative recent spawning biomass was median ($SB_{recent}/SB_{F=0}$) = 0.33 with a probable range of 0.20 to 0.41 (80 percent probable range), and that there was a roughly 8 percent probability (4 out of 48 models) that the recent spawning biomass had breached the WCPFC limit reference point. The central tendency of relative recent fishing mortality was median (F_{recent}/F_{MSY}) = 0.74 with an 80 percent probability interval of 0.62 to 0.97, and there was a roughly 4 percent probability (2 out of 48 models) that the recent fishing mortality was above F_{MSY} (WCPFC 2017b). In 2018, total yellowfin tuna landings by the Hawaii longline fisheries was 1,868 t (WPRFMC 2019) or less than 1 percent of the estimated MSY.

Yellowfin Tuna (EPO)

The IATTC assessed yellowfin tuna in the EPO in 2018 and found that the stock is subject to overfishing ($F/F_{MSY} = 1.01$) and is not overfished ($SB_{2015-2017}/SB_{MSY} = 1.08$) (Minte-Vera et al. 2018). In 2017, U.S. longline fisheries landed 530 t of yellowfin tuna in the EPO (WPRFMC 2008), or less than one percent of the estimated MSY of 264,283 t (Minte-Vera et al. 2018). The 2017 U.S. longline total is 0.25 percent of the 2017 total catch of yellowfin in the EPO (IATTC 2018).

Albacore (N. Pacific)

The ISC in 2017 completed the most recent stock assessment of North Pacific albacore, which uses data through 2015 (ISC 2017b). The assessment indicates that: a) the stock is likely not overfished relative to the limit reference point adopted by the WCPFC (20 percent $SSB_{current}$, $F=0$), and b) no F -based reference points have been adopted to evaluate overfishing, but stock status was evaluated against seven potential LMRs and current fishing intensity ($F_{2012-2014}$) is below six of the seven reference points except for $F_{50\%}$. In 2018, total albacore tuna landings in the North Pacific by the Hawaii longline fisheries was 59 t (WPRFMC 2019), or less than 1 percent of the estimated MSY. The shallow-set fishery fleet does not operate in the south Pacific Ocean, they do not catch the South Pacific Albacore stock.

Bigeye Tuna (WCPO)

The Secretariat of the Pacific Community (SPC) prepared the most recent stock assessment for WCPO bigeye tuna in July 2017, updated August 2018, which covers bigeye tuna from Indonesia in the far western Pacific, to 150° W in the central Pacific Ocean (McKechnie et al. 2017; Vincent et al. 2018). The 2017 and 2018 assessment reports update the 2014 stock assessment by incorporating additional bigeye catch data from 2013-2015, and investigating alternative regional bigeye tuna stock structure in combination with a new bigeye tuna growth curve. The new growth model suggests bigeye tuna is more productive than previously assumed.

Based on the uncertainty grid adopted by Scientific Committee 14, the WCPO bigeye tuna spawning biomass is likely above the MSST of the Pelagic FEP and the WCPFC's biomass LRP. Additionally, recent F is likely below F_{MSY} (MFMT). Therefore noting the level of uncertainties in the current assessment it appears that the stock is not experiencing overfishing (94 percent probability, 34 of 36 models) and it appears that the stock is not in an overfished condition (100 percent probability) with respect to WCPFC-adopted LRP in 2015 (SB_{latest}/SB_{MSY}). The central tendency of relative recent SB under the selected new and old growth curve model weightings in the absence of fishing was median ($SB_{recent}/SB_{F=0}$) = 0.42 with a range of 0.251 to 0.452 and (SB_{latest}/SB_{MSY} = 1.624) with a range of 1.146 and 2.187. There was a roughly 6 percent probability (2 out of 36 models) that the recent spawning biomass (SB_{recent} , 2012-2015) had breached the adopted LRP (WCPFC 2018b).

In 2018, total WCPO bigeye tuna landings by the Hawaii longline fisheries was 3,392 t, or less than 3 percent of the estimated median MSY of 159,020 t (Vincent et al. 2018). U.S. and U.S. participating territory longline catches make up 3 percent of the estimated total catch of WCPO bigeye tuna.

Bigeye Tuna (EPO)

The IATTC assessed bigeye tuna in the EPO in 2018 and the assessment results indicate F/F_{MSY} = 1.15 and $SB_{2014-2016}/SB_{MSY}$ = 1.02 (Xu et al. 2018). This substantial change in the reference points from the previous year's assessment, which were F/F_{MSY} = 0.87 and $SB_{2014-2016}/SB_{MSY}$ = 1.23 (Aires-da-Silva et al. 2017), triggered IATTC to investigate the cause of the change. The authors attribute the change in status to new data for the indices of relative abundance, based on longline catch-per-unit-effort (CPUE), which resulted in lower estimates of recent biomass. Such

changes caused by the addition of new data indicate that the model is mis-specified (Maunder et al. 2018b). There is substantial uncertainty in the estimate of current fishing mortality and in the model assumptions used (Xu et al. 2018) and the relative contribution of assessment uncertainty and variability in the relationship between fleet capacity and fishing mortality to the overfishing reference point are also unknown (Maunder et al. 2018b). NMFS has not accepted the Xu et al (2018) assessment as suitable for making stock status determinations for EPO bigeye tuna (NMFS 2018b).

NMFS has noted that the EPO bigeye tuna stock is under increasing fishing pressure, especially from the purse seine fish aggregating device (FAD) fishery. The report on indicators for bigeye stock status, however, does not provide the information required by the Pelagic FEP for making a status determination (NMFS 2018h). In 2018, total bigeye tuna landings in the EPO by all U.S. longline vessels was 2,389 t (WPRFMC 2019) or 2.8 percent of the estimated MSY of 95,491 t (Xu et al. 2018).

Pacific Bluefin Tuna

Scientists consider Pacific bluefin tuna as a single North Pacific-wide stock. The most recent assessment of the status of Pacific bluefin tuna used data through 2016, and concluded that the stock is still experiencing overfishing and is overfished (ISC 2018b). The ISC assessment estimated the $F/F_{MSY} = 1.17$ and $SB/MSST = 0.21$. Current spawning biomass is estimated at 21,000 t in 2016, up from near a near historical low in 2010 (ISC 2018a). The U.S. longline fleet rarely catches Pacific bluefin tuna (NMFS 2018a). In 2018, total North Pacific bluefin tuna landings by all U.S. longline fisheries was 0 t (WPRFMC 2019). The relative impact of the U.S. longline fisheries on the stock continues to be negligible, and overfishing of the stock is likely due to excessive international fishing pressure. NMFS continues to work with the Pacific and Western Pacific Councils and the State Department to ensure that WCPFC and IATTC adopt effective management measures to end overfishing and rebuild the stock.

Blue Marlin (Pacific)

The 2016 stock assessment by the ISC Billfish Working Group (ISC 2016) which uses data through 2014 indicates Pacific blue marlin is not experiencing overfishing ($F_{2014}/F_{MSY} = 0.88$).

Applying the 2014 spawning biomass estimates of 24,809 t, and the spawning biomass at MSY of 19,858 t, the ratio of SB/SB_{MSY} is 1.25 indicating the stock is not overfished. In 2018, total blue marlin landings by the Hawaii longline fisheries was 529 t (WPRFMC 2019), or less than 2 percent of the estimated MSY.

Striped Marlin WC (N. Pacific)

The results of a 2015 stock assessment (ISC 2015) indicate the WCNPO stock of striped marlin continues to be subject to overfishing ($F/F_{MSY} = 1.49$) and overfished ($SB/SB_{MSY} = 0.39$). The 2015 stock assessment estimated MSY at 5,657 t. CMM 2010-01 for North Pacific striped marlin adopted by the WCPFC requires members and cooperating non-members to limit striped marlin landings by all gears from their highest catches from 2000-2003, and then further reduce catches

by 10 percent in 2011, 15 percent in 2012, and 20 percent in 2013. The SIDS and PTs are exempt from catch limits under the measure. The highest striped marlin catch by U.S. fisheries between 2000 and 2003 was 571 t. Thus, a 20 percent reduction from 571 t is 457 t. The combined deep-set and shallow-set longline fisheries account for more than 90 percent of the total U.S. catch of this stock, with the remainder made by Hawaii small-scale troll fisheries. Since 2013, total landings of WCNPO striped marlin by all U.S. fisheries combined have never exceeded 425 t (NMFS 2018a).

In 2018, total WCNPO striped marlin (or striped marlin caught in the WCPO) landings by the Hawaii longline fisheries was 332 t, or about 6 percent of MSY. Thus, overfishing of the stock is likely due to excessive international fishing pressure and the IATTC and WCPFC have inadequate measures in place to address the issue. Nonetheless, NMFS continues to work with the Pacific and Western Pacific Fishery Management Councils, and the State Department to ensure that the WCPFC and IATTC adopt effective management measures to end overfishing.

Striped Marlin (NEPO)

The results of the 2011 stock assessment (Hinton and Maunder 2011) indicate that the NEPO striped marlin stock is not overfished or experiencing overfishing. The stock biomass has increased from a low of about 2,600 t in 2003, and was estimated to be about 5,100 t in 2009. There has been an increasing trend in the estimated ratio of the observed annual spawning biomasses to the spawning biomass (SB) in the unexploited stock, which has doubled from about 0.19 in 2003 to about 0.38 in 2009. The estimated ratio of spawning biomass in 2009 to that expected to provide catch at the level of MSY, SB_{2009}/SB_{MSY} , was about 1.5, which indicates that the spawning biomass was above the level expected to support MSY. The estimated recent levels of fishing effort (average 2007-2009) were below those expected at MSY (Hinton and Maunder 2011). Between 2014 and 2018, Hawaii longline catches of NEPO striped marlin (or striped marlin caught in the EPO) ranged between 69 and 90 t annually, which is no greater than 2 percent of the stock's biomass (WPRFMC 2019).

Blue Shark (N. Pacific)

The results of the 2017 assessment (ISC 2017b) indicate the North Pacific blue shark is not subject to overfishing ($F_{2012-2014}/F_{MSY} = 0.37$), and is not overfished ($SB_{2012-2014}/SB_{MSY} = 1.71$). The 2017 stock assessment estimated SB_{MSY} at 179,539 t. In 2018, total blue shark landings by the Hawaii longline fleet was 0 t (WPRFMC 2019). Nearly all blue sharks caught in US longline fisheries are returned to the sea alive, with some discarded dead as well.

Silky Shark (WCPO)

Silky sharks have a restricted habitat range compared to the other HMS but within this range, they dominate both longline and purse seine catches (Rice and Harley 2013). Research conflicts on stock boundaries of silky sharks, which complicates development of a pan-Pacific assessment model (Clarke et al. 2018). Additionally, CPUE indices from WCPO and EPO fisheries show correlations with oceanographic conditions, so may not represent reliable indices of abundance and may bias indicators of stock status (Clarke et al. 2018; Lennert-Cody et al. 2018). Based on

apparent declines and in the absence of better scientific information, both the WCPFC and the IATTC implemented precautionary measures to prohibit vessels from retaining any part or carcass of a silky shark, except to assist WCPFC observers in collection of samples. A pan-Pacific assessment was completed in 2018, but the authors cautioned that estimates of stock status reference points for determining whether the stock is experiencing overfishing or is overfished are unreliable and should not be used as the basis for management advice (Clarke et al. 2018).

The assessment by Rice and Harley (2013) for the WCPO concluded that catches at the time were higher than the MSY (5,331 t versus 1,994 t), and further catch at current levels of fishing mortality would continue to deplete the stock below MSY. Overfishing is occurring because $F/F_{MSY} = 4.32$ and stock is overfished because $SB/SB_{MSY} = 0.72$. Bycatch from the longline fishery accounts for the greatest impact to the stock, but there are also impacts from the associated purse seine fishery, which catches predominantly juvenile individuals. Given the bycatch nature of fishery impacts, mitigation measures provide the best opportunity to improve the status of the silky shark population (Rice and Harley 2013) and the Scientific Committee 9 recommended that the WCPFC also consider measures directed at targeted catch, such as from shark lines (WCPFC 2012). In 2018, total silky shark landings by the Hawaii longline fisheries in the WCPO was 0 t (WPRFMC 2019), demonstrating full compliance with requirements to discard silky sharks.

Clarke et al. (2018) assessed silky sharks in the WCPO in 2018, given the difficulty of assessing a pan-Pacific stock. The assessment results were that $F_{2016}/F_{MSY} = 1.607$ and $SB_{2016}/SB_0 = 0.469$, with a 72 percent probability that current biomass is above biomass at MSY (Clarke et al. 2018).

Shortfin Mako Shark (N. Pacific)

In 2018, ISC concluded the first full stock assessment of shortfin mako shark in the North Pacific Ocean (ISC 2018c). Previous abundance indices showed conflicting trends from which stock status could not be determined (ISC 2018c). The new assessment used data through 2016, and assumed a single stock in the NPO (ISC 2018c). The results indicate that the stock is likely (>50 percent) not subject to overfishing because $F_{2013-2015}/F_{MSY} = 0.62$, and is likely (>50 percent) not overfished because $SA_{2016}/SA_{MSY} = 1.36$. Spawning abundance (SA) was used instead of spawning biomass because the size of mature female sharks does not appear to affect the number of pups produced (ISC 2018c).

ISC estimated the MSY at 3,127 t (ISC 2018c). In 2018, total mako shark landings Hawaii longline fisheries in the North Pacific Ocean was 60 t (WPRFMC 2019), or less than 2 percent of the MSY.

Summary of Hawaii Shallow-set Longline Catch Statistics

The following table, Table 5, summarizes the released catch, retained catch, and total catch for the shallow-set fishery in 2018. These and other catch statistics for the shallow set fishery can be found in the 2019 SAFE report (WPRFMC 2019).

Table 5. Released catch, retained catch, and total catch for the Hawaii shallow- set longline fishery, 2018.

	Released Catch	Percent Released	Retained Catch	Total Catch
Tuna				
Albacore	1	0.7	136	137
Bigeye tuna	70	5.4	1,221	1,291
Bluefin tuna	0	0.0	2	2
Skipjack tuna	0	0.0	16	16
Yellowfin tuna	17	2.2	761	778
Other tuna	0	0.0	0	0
Total tunas	88	4.0	2,136	2,224
Billfish				
Swordfish	466	7.6	5,644	6,110
Blue marlin	3	60.0	2	5
Striped marlin	21	33.9	41	62
Spearfish	5	11.4	39	44
Other marlin	0	0.0	0	0
Total billfish	495	8.0	5,726	6,221
Other PMUS				
Dolphinfish	13	2.0	626	639
Wahoo	2	7.7	24	26
Moonfish	15	8.7	157	172
Oilfish	103	60.9	66	169
Pomfret	7	29.2	17	24
Total other	140	13.6	890	1,030
Non-PMUS fish	0	0.0	0	0
PMUS Sharks				
Blue shark	2,538	100.0	0	2,538
Mako shark	283	81.8	63	346
Thresher shark	24	96.0	1	25
Oceanic whitetip shark	0	0.0	0	0
Silky shark	0	0.0	0	0
Total PMUS sharks	2,845	97.8	64	2,909
Non-PMUS Sharks	1	100.0	0	1
Grand Total	3,569	28.8	8,816	12,385

Source: 2018 SAFE Report

3.2 Protected Resources

The shallow-set fishery has the potential to interact with a range of protected species (such as sea turtles, marine mammals, and seabirds). Section 3.2.1 describes those species listed as endangered or threatened under the Endangered Species Act (ESA) that have the potential to interact with the shallow-set fishery, as well as a summary of the analysis in the 2019 BiOp (NMFS 2019). Section 3.2.2 describes marine mammals protected under the Marine Mammal Protection Act (MMPA). Lastly, sections 3.2.3 to 3.2.7 will describe in more detail those protected species and critical habitat most likely to be affected by the shallow-set fishery (sea turtles, marine mammals, and seabirds, sharks and rays, and critical habitat respectively). We consider the analysis provided in the 2019 BiOp (NMFS 2019), along with recent interaction levels, to be the baseline condition for comparison of environmental effects of the alternatives in Section 4. NMFS monitors fishery interactions with protected species using at-sea observers, among other means, on 100 percent of shallow-set fishing trips.

3.2.1 Species Protected Under the Endangered Species Act

The ESA provides for the conservation of species that are endangered or threatened, and the conservation of the ecosystems on which they depend. Section 7(a)(2) of the ESA requires each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. To “jeopardize” means to reduce appreciably the likelihood of survival and recovery of a species in the wild by reducing its numbers, reproduction, or distribution. When a federal agency’s action “may affect” an ESA-listed species, that agency is required to consult formally with NMFS for marine species, some anadromous species, and their designated critical habitats, or the U.S. Fish and Wildlife Service (USFWS) for terrestrial and freshwater species or their designated critical habitat (collectively known as the “Service”). The product of formal consultation is the Service’s biological opinion. Federal agencies need not engage in formal consultation if they have concluded that an action “may affect, but is not likely to adversely affect” ESA-listed species or their designated critical habitat, and NMFS or USFWS concur with that conclusion (see ESA section 7 Formal Consultation; 50 CFR 402.14(b)).

The ESA also prohibits the taking⁹ of listed species except under limited circumstances. Western Pacific fisheries authorized under the Pelagic FEP operate in accordance with an ITS set by ESA consultations, including applicable T&C. The consultations consider the potential interactions of fisheries with listed species, the effects of interactions on the survival and recovery of listed species, and the protection of designated critical habitat.

As provided in 50 CFR 402.16, NMFS is required to reinstate formal consultation if:

1. The amount or extent of the incidental take is exceeded;
2. New information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in an opinion;
3. The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in the opinion; or
4. A new species is listed or critical habitat designated that may be affected by the action.

The following table, Table 6, provides a summary of ESA listed species, and critical habitat that overlap in the action area, and have the potential to interact with that the shallow-set fishery as described in the 2019 BiOp (NMFS 2019). The 2019 BiOp also discuss the potential for coastal exposure for listed fish, marine invertebrates, and other critical habitat in vessel transiting areas of the shallow-set fishery primarily in California. (Long Beach, San Francisco, and San Diego). However, NMFS has determined that for all the species in the category of potential coastal exposures, effects from all or any stressors related to vessel transiting to be highly unlikely and therefore discountable. For detailed information on these listed resources, see the 2019 BiOp.

⁹ The definition of “take” includes harassing, harm, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct (50 CFR 402.02).

Table 6. ESA-listed marine species and critical habitat with the potential to interact with the Hawaii shallow-set longline fishery.

Species Common Name	Species Scientific Name	Listing Status	Date Listed	Federal Register Citation
Sea Turtles				
East Indian-West Pacific Green Sea Turtle DPS	<i>Chelonia mydas</i>	Threatened	4/6/2016	81 FR 20058
Central West Pacific Green Sea Turtle DPS	<i>C. mydas</i>	Threatened	4/6/2016	81 FR 20058
Southwest Pacific Green Sea Turtle DPS	<i>C. mydas</i>	Threatened	4/6/2016	81 FR 20058
Central South Pacific Green Sea Turtle DPS	<i>C. mydas</i>	Threatened	4/6/2016	81 FR 20058
Central North Pacific Green Sea Turtle DPS	<i>C. mydas</i>	Endangered	4/6/2016	81 FR 20058
East Pacific Green Sea Turtle DPS	<i>C. mydas</i>	Endangered	4/6/2016	81 FR 20058
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	Endangered	7/28/1978	43 FR 32800
Leatherback Turtle Population	<i>Dermochelys coriacea</i>	Endangered	6/2/1970	35 FR 8491
Olive Ridley Sea Turtle Populations	<i>Lepidochelys olivacea</i>	Threatened ¹	7/28/1978	43 FR 32800
Loggerhead, North Pacific DPS	<i>Caretta caretta</i>	Endangered	9/22/2011	76 FR 58868
Marine Mammals				
Guadalupe Fur Seal	<i>Arctocephalus townsendi</i>	Threatened	12/16/1985	50 FR 51252
False Killer Whale, Main Hawaiian Island Insular DPS	<i>Pseudorca crassidens</i>	Endangered	11/28/2012	75 FR 70169
Humpback Whale, Mexico DPS	<i>Megaptera novaeangliae</i>	Threatened	9/8/2016	81 FR 62259
Fin Whale	<i>Balaenoptera physalus</i>	Endangered	12/2/2011	35 FR 18319
Blue Whale	<i>B. musculus</i>	Endangered	12/2/1970	35 FR 18319
North Pacific Right Whale	<i>Eubalaena japonica</i>	Endangered	3/6/2008	73 FR 12024
Sei Whale	<i>B. borealis</i>	Endangered	12/2/1970	35 FR 18319
Sperm Whale	<i>Physeter macrocephalus</i>	Endangered	12/2/1970	35 FR 18319
Hawaiian Monk Seal	<i>Neomonachus schauinslandi</i>	Endangered	11/23/1976	41 FR 51611
Sharks and Rays				
Scalloped Hammerhead Shark, Eastern Pacific DPS	<i>Sphyrna lewini</i>	Endangered	7/3/2014	79 FR 38213
Oceanic Whitetip Shark	<i>Carcharhinus longimanus</i>	Threatened	1/30/18	83 FR4153
Giant Manta Ray	<i>Manta birostris</i>	Threatened	1/22/18	83 FR 2916
Seabirds				
Hawaiian Dark-rumped Petrel	<i>Pterodroma phaeopygia sandwichensis</i>	Endangered	3/11/1967	32 FR 4001
Newell's Shearwater	<i>Puffinus auricularis newelli</i>	Threatened	10/28/1975	40 FR 44149
Short-tailed Albatross	<i>Phoebastria albatrus</i>	Endangered	6/2/1970	35 FR 8491
Critical Habitat				
Hawaiian Monk Seal	--	Designated	8/21/2015	80 FR 50926
False Killer Whale, MHI Insular DPS	--	Designated	7/24/2018	83 FR 35062

Species Common Name	Species Scientific Name	Listing Status	Date Listed	Federal Register Citation
Leatherback (West Coast)	--	Designated	1/26/2012	77 FR4170

¹The eastern Pacific population includes nesting aggregations on the coast of Mexico, which are listed under the ESA as endangered.

The following list identifies the valid BiOps under which the shallow-set fishery currently operates. This section summarizes much of the information contained in these documents to describe baseline conditions. For further information, contact NMFS using the contact information at the beginning of the document.

NMFS. 2019, Biological Opinion on the Continued Operations of the Hawaii Pelagic Shallow-set Longline Fishery.

USFWS. 2012, Biological Opinion of the U.S. Fish and Wildlife Service for the Operation of Hawaii-based Pelagic Longline Fisheries, Shallow-Set and Deep-Set, Hawaii.

3.2.1.1 Summary of the 2019 Biological Opinion on the Continued Operations of the Hawaii Shallow-set Longline Fishery

On April 20, 2018, NMFS PIRO SFD requested reinitiation of formal consultation under ESA Section 7 for the continued operation of the shallow-set fishery as currently managed under the existing regulatory framework of the Pelagic FEP and other applicable laws. Consistent with 50 CFR 402.16, SFD reinitiated consultation because the shallow-set fishery met three of the four possible reinitiation triggers. The Hawaii shallow-set longline fishery exceeded the amount of incidental take for olive ridley sea turtles; new information revealed effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; and several new species were listed that may be affected by the action. Specifically, the following conditions met the reinitiation trigger:

- In 2015, for the first time the shallow-set fishery interacted with a Guadalupe fur seal. Three additional interactions occurred between November and December 2017. The Guadalupe fur seal is listed as threatened throughout its range (50 FR 51252, December 16, 1985).
- On April 6, 2016, NMFS and USFWS issued a final rule to list 11 DPSs of the green sea turtle under the ESA (81 FR 20058). This final rule removed the previous range-wide listing and, in its place, listed eight as threatened and three as endangered. Six green sea turtle DPS occur in the Pacific Ocean and within range of the shallow-set fishery: the East Indian-West Pacific, Central West Pacific, Southwest Pacific, Central South Pacific, Central North Pacific, and the East Pacific green sea turtle. The shallow-set fishery interacted with nine green sea turtles between 2004 and 2017.
- In January 2018, NMFS listed two new species, the giant manta ray and the oceanic whitetip shark, as threatened under the ESA (83 FR 2196 and 83 FR 4153, respectively), and both of which interact with the shallow-set fishery.

- In July 2018, NMFS designated critical habitat for the Main Hawaiian Island insular false killer whale (MHI IFKW; 83 FR 35062). The designated area encompasses waters from the 45-meter (m) depth contour to the 3,200 m depth contour around the main Hawaiian Islands from Niihau east to Hawaii which is part of the action area for the shallow-set fishery.
- In 2018, NMFS exceeded the authorized take of olive ridley sea turtles as anticipated in the 2012 BiOp (NMFS 2012). NMFS anticipated and authorized a two-year ITS of four olive ridley sea turtles in the fishery. The ITS was effective on January 30, 2012. In 2017, fisheries observers documented four interactions with olive ridley sea turtles, and one interaction in 2018, for a total of five interactions in a two-year period.

Beyond the aforementioned reinitiation triggers, and to provide for a more comprehensive assessment, SFD reinitiated consultation on all listed resources that occur where the shallow-set fishery operates (Table 6). In total, 49 listed resources comprising of 40 listed species and nine critical habitat designations occur within the area the shallow-set fishery operates, and were analyzed in the 2019 BiOp. These also include listed fish, marine invertebrates, and other critical habitat in vessel transiting areas of the shallow-set fishery primarily in California. (Long Beach, San Francisco, and San Diego).

NMFS' approach to the assessment in the 2019 BiOp is divided into a series of sequential steps. The first step in the sequence was identifying those physical, chemical, or biotic aspects of the shallow-set fishery that are known or are likely to have individual, interactive, or cumulative direct and indirect effects on the environment (i.e. "potential stressors"). As part of this step, NMFS also identified the spatial, or geographic, extent of any potential stressors whilst recognizing that the spatial extent of those stressors may change with time (also known as the "action area"). The second step, the exposure analysis, identifies the listed species and designated critical habitat (collectively, listed resources) that are likely to co-occur with these potential stressors in space and time, as well as the intensity, duration, and frequency of those stressors on listed resources. The third step, the response analysis, NMFS examined the best scientific and commercial data available to determine whether and how those listed resources are likely to respond given their exposure. Lastly, step four, NMFS identified and analyzed the probable risks posed to listed individuals that are likely to be exposed to the shallow-set fishery's effects. Specifically, NMFS focused on three variables in the jeopardy definition that determine a species likelihood of survival and recovery in the wild: reductions in the species' reproduction, number of individuals in the population or distribution.

The exposure analysis for loggerhead sea turtle, leatherback sea turtle, green sea turtle, olive ridley sea turtle, Guadalupe fur seal, oceanic whitetip shark, and giant manta ray focuses on hooking and entanglements that have been observed and reported in the Hawaii shallow-set longline fishery. The 2019 BiOp analyzes impacts based on the anticipated level of interactions in the shallow-set longline fishery derived from predictions generated by PIFSC using a Bayesian inferential approach (McCracken 2018). The predictions are based on observer data from 2005 and included data through 2017 for all species except for loggerheads, for which data in early 2018 were taken into consideration to account for the higher number of interactions observed in that period.

The predictions assume that the characteristics of the fishery do not change in the future compared to the observed period (i.e., 2004 and onward). The model assumes that the annual number of interactions is independent between years, given that insufficient information exists at this time to make informed predictions of future patterns in interactions. While potential patterns in interactions (e.g., higher interactions tend to be observed in consecutive years) are seen for some species in the observed data since 2004, the data have not been assessed to evaluate the significance or to explore the underlying factors. The analysis also assumed that the fishery operated throughout the year for every year included in the analysis and did not truncate the predicted takes (i.e. the analysis did not include hard caps for either loggerheads or leatherbacks). For each species included in the analysis, PIFSC generated predicted interaction estimates associated with the 80th percentile, and 95th percentile values for the predicted distribution for 1-year and multi-year (i.e., 2 and 3 year) periods. The percentile values reflect the probability that the observed interactions for the predicted period (e.g., 1, 2 or 3 years) would be equal to or less than the value. PIFSC also provided predicted interaction estimates using the mean. NMFS used the 95th percentile values for the purpose of the exposure analysis.

The multi-year prediction of anticipated level of take generated by the Bayesian inferential approach takes into account the inter-annual variability in the number of observed interactions over time. Statistically, the probability that observed interactions would be at the upper end of the 1-year predicted range over several consecutive years is low. The multi-year predictions reflect a distribution of predicted values that incorporate the inter-annual variability in the observed data and smooth out the uncertainty associated with the predictions over a longer period. As a result, the 95th percentile values of the predicted 2-year and 3-year total interactions are lower than the 1-year predictions at the same percentile level multiplied by two or three years.

Based on the approach described above, the 2019 BiOp concluded that the shallow-set fishery may affect, but is not likely to adversely affect:

- The hawksbill sea turtle;
- The MHI IFWK;
- The humpback (Mexico DPS);
- The fin Whale;
- The blue whale;
- The North Pacific right whale;
- The sei whale;
- The sperm whale;
- The eastern Pacific scalloped hammerhead shark; or
- Listed fish and invertebrate species common to transiting areas off the coast of California (Central California coast coho salmon, Central Valley spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, Central California coast steelhead, California coast steelhead, Southern North American green sturgeon, Black abalone, and White abalone).

Additionally, after reviewing the current status, the environmental baseline for the action area, the effects of the fishery and the cumulative effects, NMFS concluded in the 2019 BiOp that the

continued operation of the shallow-set fishery is not likely to jeopardize the continued existence of:

- The endangered leatherback sea turtle;
- The endangered North Pacific loggerhead sea turtle;
- The threatened Eastern Pacific green sea turtle, threatened Central North Pacific green sea turtle, threatened East Indian-West Pacific green sea turtle, endangered Central West Pacific green sea turtle, threatened Southwest Pacific green sea turtle, endangered Central South Pacific green sea turtle;
- The endangered Mexico breeding population of olive ridley sea turtle, and threatened (other) populations of olive ridley sea turtle;
- The threatened oceanic whitetip shark;
- The threatened giant manta ray; and
- The threatened Guadalupe fur seal.

Lastly, the 2019 BiOp also concluded that the shallow-set fishery is not likely to adversely modify designated critical habitat for:

- The leatherback sea turtle;
- The Hawaiian Monk Seal;
- The MHI IFKW;
- Steller sea lion; and
- Listed fish and invertebrate species common to transiting areas off the coast of California (Central California coast coho salmon, Sacramento River winter-run Chinook salmon, California coast steelhead, Southern North American green sturgeon, and Black abalone).

3.2.2 Species Protected Under the Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) prohibits, with certain exceptions, the take of marine mammals in the U.S. EEZ and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The MMPA authorizes the Secretary of Commerce to protect and conserve all cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals and sea lions, except walruses). The MMPA requires NMFS to prepare and periodically review marine mammal stock assessments. See 16 U.S.C. § 1361, *et seq.*

Pursuant to the MMPA, NMFS has promulgated specific regulations that govern the incidental take of marine mammals during fishing operations (50 CFR 229). Under Section 118 of the MMPA, NMFS must publish, at least annually, a List of Fisheries that classifies U.S. commercial fisheries into three categories, based on relative frequency of incidental mortality and serious injury to marine mammals in each fishery:

- Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing. Annual mortality and serious injury of a stock in a given fishery is by itself responsible for the annual removal of greater than or equal to 50 percent or more of any stock's potential biological removal (PBR) level (i.e., frequent incidental mortality and serious injuries of marine mammals).

- Category II designates fisheries with occasional serious injuries and mortalities incidental to commercial fishing. Annual mortality and serious injury of a stock in a given fishery is, collectively with other fisheries, responsible for the annual removal of greater than 10 percent of any stock's PBR level, and is by itself responsible for the annual removal of between 1 and less than 50 percent, exclusive, of any stock's PBR level (i.e., occasional incidental mortality and serious injuries of marine mammals).
- Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities. A Category III fishery is, collectively with other fisheries, responsible for the annual removal of 10 percent or less of any stock's PBR level; or collectively with other fisheries, more than 10 percent of any stock's PBR level, but is by itself responsible for the annual removal of 1 percent or less of PBR level (i.e., a remote likelihood or no known incidental mortality and serious injuries of marine mammals).

According to the 2019 List of Fisheries (84 FR 22051, May 16, 2019), the Hawaii shallow-set longline fishery is a Category II fishery. Among other requirements, owners of vessels or gear engaging in a Category I or II fishery are required under 50 CFR 229.4 to obtain a marine mammal authorization to lawfully take incidentally, non-ESA listed marine mammals by registering with NMFS' marine mammal authorization program.

Section 101(a)(5)(E) of the MMPA authorizes the Secretary of Commerce to allow the incidental, but not intentional, taking of individuals from marine mammal stocks that are designated as depleted because of a listing as threatened or endangered under the ESA in the course of commercial fishing operations for up to a period of three years if it is determined that three criteria are met:

1. Incidental mortality and serious injury will have a negligible impact on the affected species or stock;
2. A recovery plan has been developed or is being developed; and
3. Where required under Section 118 of the MMPA, a monitoring program has been established, vessels engaged in such fisheries are registered in accordance with Section 118 of the MMPA, and a take reduction plan has been developed or is being developed for such species or stock.

Section 7(b)(4) of the ESA provides that the Secretary may only issue an ITS for ESA-listed marine mammals if such incidental take is authorized under MMPA Section 101(a)(5)(E). Accordingly, the terms of the ITS for any ESA-listed marine mammal become effective only upon issuance of the MMPA authorization for those mammals.

On October 16, 2014, NMFS authorized a permit under the MMPA section 101(a)(5)(E), addressing the shallow-set and deep-set fisheries' interactions with ESA-listed species or depleted stocks of marine mammals (79 FR 62106). The permit authorizes the incidental, but not intentional, taking of ESA-listed humpback whales (central North Pacific or CNP stock), sperm

whales (Hawaii stock), and MHI insular false killer whales to vessels registered in the Hawaii deep-set and shallow-set fisheries. In issuing this permit, NMFS determined that incidental taking by the Hawaii longline fisheries would have a negligible impact on the affected stocks of marine mammals. Since the issuance of this permit, the CNP humpback whale was designated a DPS and is not a listed species under the ESA (81 FR 62259, September 8, 2016).

NMFS has since determined that the shallow-set fishery adversely affects, but does not jeopardize, the Guadalupe fur seal, a marine mammal listed as threatened under the ESA. NMFS issued an ITS authorizing the incidental take of 11 Guadalupe fur seals (2019 BiOp). NMFS is currently evaluating whether the requirements of MMPA Section 101(a)(5)(E) have been met for this species as well as the MHI IFKW and sperm whale in order to issue an MMPA authorization.

3.2.3 Sea Turtles

All Pacific sea turtles are listed under the ESA as either threatened or endangered except for the flatback turtle (*Natator depressus*). This species is native to Australia and does not occur in the action area, and thus is not addressed in this document. The species which occur in the area of operation of shallow-set fishery are the North Pacific loggerhead, leatherback, green and olive ridley sea turtle. In addition to the BiOps listed in the previous section, more detailed information, including the range, abundance, status, and threats of the listed sea turtles, can be found in the status reviews, 5-year reviews, and recovery plans for each species on the NMFS species pages found at the following website:

http://www.fpir.noaa.gov/PRD/prd_esa_section_4.html.

All sea turtles, being air-breathers, are typically found closer to the surface, e.g., in the upper 100 m of the ocean’s surface; however, some turtles are also susceptible to deep-set longlining because of deeper foraging behavior. Therefore, sea turtles are vulnerable to longline fishing gear in the shallow-set fishery through hooking and entanglement.

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for turtle interactions and injury if interactions occur. These measures include training and handling requirements for reducing the severity of interactions, the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually. Additionally, federal regulations require closure of the shallow-set fishery once the fishery reaches loggerhead or leatherback annual limits, and requires the use of large circle hooks and mackerel-type fish bait when shallow-setting north of the Equator. The following table, Table 7, summarized the fleet-wide interactions for the shallow-set fishery from 2004-2019.

Table 7. Annual number of observed interactions (based on interaction date) of loggerhead, leatherback, green and olive ridley sea turtles in the Hawaii shallow-set longline fishery, 2004-2019.

Year	Loggerhead Sea Turtle	Leatherback Sea Turtle	Olive Ridley Sea Turtle	Green Sea Turtle
2004	1	1	0	0
2005	12	8	0	0

2006	17 ¹	2	0	0
2007	15	5	1	0
2008	0	2	2	1
2009	3	9	0	1
2010	7	8	0	0
2011	12	16 ²	0	4
2012	6	7	0	0
2013	6	11	0	0
2014	15	16	1	1
2015	13	5	1	0
2016	15	5	0	0
2017	21	4	4	2
2018	33 ³	6	1	1
2019 ⁴	20	0	1	0

¹ Fishery closed on March 20, 2006, as a result of reaching the loggerhead hard cap of 17.

² Fishery closed on November 18, 2011 as a result of reaching the leatherback hard cap of 16.

³ Fishery closed on May 8, 2018, pursuant to the stipulated settlement agreement and court order.

⁴ Showing interactions from January 1, 2019 through March 31, 2019; Fishery closed on March 19, 2019, as a result of reaching the loggerhead hard cap of 17.

Source: 2018 SAFE Report; NMFS Observer Program: <https://www.fisheries.noaa.gov/pacific-islands/fisheries-observers/pacific-islands-longline-quarterly-and-annual-reports>.

The 2019 BiOp analyzed the effects of the Hawaii shallow-set longline fishery on ESA-listed sea turtles using predictions of the anticipated level of interactions in the shallow-set longline fishery based on a Bayesian inferential approach (McCracken 2018). The 1-year and 3-year 95th percentile values of the predicted distributions are summarized in Table 8. The percentile values reflect the probability that the observed interactions for the predicted period will be equal to or less than the value for either a 1-year or 3-year period. For example, at 95 percent probability, the anticipated level of interactions for loggerhead turtles in any given year is expected to be equal to or less than 36 interactions, and equal to or less than 81 interactions over a three-year period.

Table 8. Anticipated level of sea turtle interactions in the Hawaii shallow-set longline fishery analyzed in the 2019 BiOp based on McCracken (2018).

Species	1-year prediction		3-year prediction	
	Mean	95 th Percentile	Mean	95 th Percentile
Loggerhead sea turtle	16	36	47	81
Leatherback sea turtle	10	21	30	48
Green sea turtle	1.4	5	4.1	10
Olive ridley sea turtle	1.4	5	4.3	11

After considering a range of potential effects to sea turtles, NMFS, in the 2019 BiOp, determined that the shallow-set fishery, operating in accordance with the Pelagic FEP and implementing regulations, would not jeopardize the survival or recovery of any listed sea turtles. The 2019 BiOp authorizes a certain level of interactions (incidental take) of species which the fishery may adversely affect through an ITS for the fishery. Table 8 shows the ITS from the 2019 BiOp for sea turtles.

Table 9. Estimated sea turtle interactions and mortalities in the Hawaii shallow-set fishery over one calendar year in NMFS 2019 biological opinion.

Species	1-Year	
	Number Captured	Number Killed
Leatherback Sea Turtle	21	3
Loggerhead Sea Turtle	36	6
Olive Ridley Sea Turtle ¹	5	1
Green Sea Turtle ¹	5	1

¹The total number of interactions for the species and populations can be any combination from the listed populations for olive ridley sea turtles or green sea turtles. The anticipated number killed for green turtles is 0-1 annually, which was rounded to one.

3.2.3.1 Loggerhead and Leatherback Sea Turtle Interactions in the Hawaii Shallow-set Fishery from 2004-2019

The average annual number of observed interactions in the Hawaii shallow-set longline fishery with loggerhead and leatherback sea turtles for the 2005-2018 period following the reopening of the fishery was 12.4 and 7.5 leatherback turtles per year respectively. Nearly all loggerhead turtles (99 percent) and all leatherback turtles observed hooked or entangled in the fishery have been released alive and in accordance with proper handling protocol to maximize post-hooking survival. For sea turtles released alive, a post-hooking mortality rate is estimated based on NMFS' established criteria (Ryder et al. 2006). NMFS estimates in the 2019 BiOp that the overall post-hooking mortality rate is 0.16 (95% CI = 0.11-0.22) for loggerhead turtles and 0.20 (95% CI = 0.14-0.29) for leatherback turtles. The higher mortality estimate for leatherback turtles can be attributed to the larger proportion of animals released alive with trailing gear compared to loggerhead turtles. Leatherback turtles that are incidentally captured in the Hawaii shallow-set longline fishery are typically estimated to be 4-6 feet long and cannot be brought on board, and thus attempts to remove gear are done vessel-side under varying ocean conditions while the animal is in the water. Whereas approximately 85 percent of observed loggerhead interactions (150 out of 177 total interactions from 2004-2018) resulted in removal of all gear, approximately 42 percent (44 out of 105 total interactions from 2004-2018) of leatherback interactions resulted in removal of all gear (NMFS 2019).

The fishery has reached the hard cap three times since its implementation in 2004:

1. In 2006 when the loggerhead hard cap of 17 turtles was reached (fishery closed on March 20, 2006);
2. In 2011 when the leatherback hard cap of 16 turtles was reached (fishery closed on November 18, 2011); and
3. In 2019 when the loggerhead hard cap of 17 turtles was reached (fishery closed on March 19, 2019).

In most years however, the annual observed interactions remained below 50 percent of the hard cap limit for both species (Figure 3).

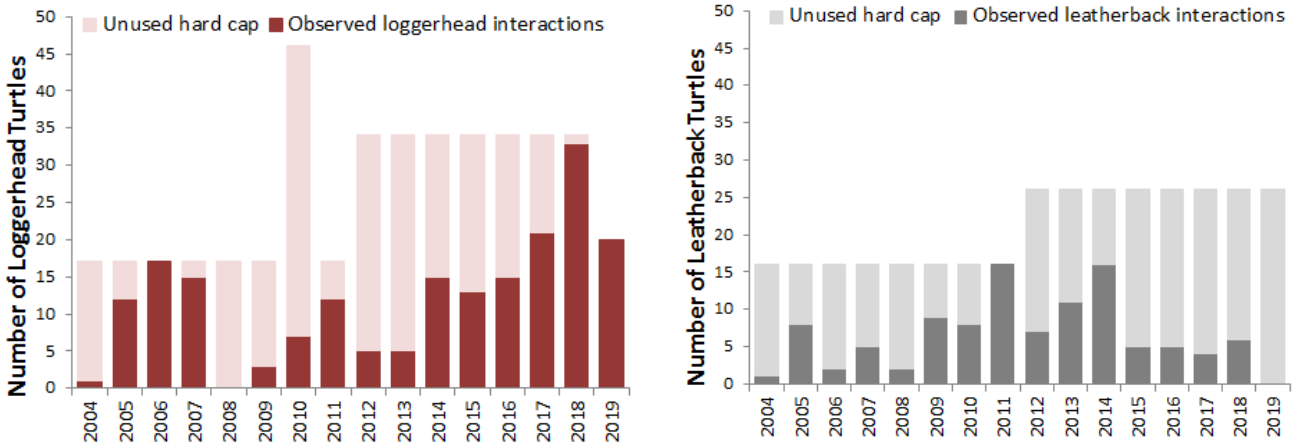


Figure 3. Annual number of observed loggerhead (left) and leatherback (right) and “unused” annual hard cap for each species. Dark colors in each figure indicate the observed interactions and light colors indicate the unused portion of the hard cap.

Loggerhead turtle interactions in the shallow-set fishery in 2017 and 2018 were higher than levels observed previously since the fishery reopened in 2004. The total number of loggerhead sea turtles interactions for 2017 was 21; and from January through May of 2018, 33 interactions with loggerhead sea turtles was observed. While these numbers were lower than the hard cap limit of 34 loggerhead turtles based on the 2012 BiOp, they demonstrated that the fishery has the potential to experience higher interaction levels than the long-term average (12.4 loggerhead turtles annually from 2005-2018) in a short period.

Juvenile loggerhead turtles are known to associate with fronts, eddies and geostrophic currents in the North Pacific Transition Zone (Polovina et al. 2004, Howell et al. 2008). Previous research has shown that over 50 percent of loggerhead turtle interactions in the Hawaii shallow-set longline fishery occur in a temperature band between 63.5°F and 65.5°F (Howell et al. 2008), which is an area tacked under NMFS’ experimental product called TurtleWatch to help avoid interactions with loggerhead turtles¹⁰.

Most of the recent loggerhead turtle interactions were observed in December of 2017 and January of 2018, during which time a small number of vessels interacted with majority of the observed loggerhead turtles, while a smaller proportion of the shallow-set fleet during the period also had at least one observed interaction.

NMFS PIFSC conducted a preliminary characterization of the recent loggerhead turtle interactions in the shallow-set fishery compared to the years prior (PIFSC unpublished data). The analysis indicated that the spatial distribution of the interactions in December 2017 and January 2018 when the interactions were highest were not anomalous for that time of the year. Approximately 50% of the loggerhead interactions occurred within the temperature band between 63.5-65.5°F, consistent with TurtleWatch. Fishing effort distribution inside and outside of the TurtleWatch temperature bands was also not anomalous in December 2017 and January 2018 compared to previous years. There was also no apparent change in other operational

¹⁰ <https://www.fisheries.noaa.gov/resource/map/turtlewatch>

characteristics within the fishery (e.g., gear configuration, bait, timing, duration) to explain the higher loggerhead interaction rates. Additionally, the average size of individual turtles observed in December 2017 and January 2018 was consistent with the average size observed in those months in previous years (approximately 51 cm straight carapace length (SCL)).

Loggerhead turtle reproductive output at their source nesting beaches in Japan has been high since 2008. Loggerhead turtle nest counts in Japan increased steadily from 2,064 nests in 1997 to 5,167 nests in 2005, then increased substantially to over 10,000 nests in 2008, after which high nesting years continued through 2014 with a record of 15,396 nests in 2013 (NMFS 2017). The higher level of nesting since 2008 likely resulted in a substantially higher hatchling production compared to the decade prior. Most of the loggerhead turtles observed interacting in the Hawaii shallow-set longline fishery in December 2017 and January 2018 were in the range of 40-60 cm SCL, which is estimated to be approximately 3-10 years in age based on skeletochronology (Tomaszewicz et al. 2015) and consistent with the period of high nesting in Japan. PIFSC continues to explore the linkage of loggerhead turtle interactions in the shallow-set fishery to hatchling production as well as additional examination of the oceanographic environment and fishing behavior.

3.2.3.2 Population Assessments for the North Pacific Loggerhead and Western Pacific Leatherback Turtles

PIFSC conducted population assessments of the North Pacific loggerhead and Western Pacific leatherback turtles to support the ESA Section 7 consultation for the shallow-set fishery (NMFS 2019). The assessment utilized a Bayesian state-space population viability analysis (PVA) using nest counts as index of abundance to estimate population growth rate and to generate population projections (Figure 4). More complex demographic models were determined to be not suitable due to the lack of population-specific demographic data.

Nest count data from three nesting beaches representing approximately 52 percent of loggerhead turtle nesting in Japan were used for the North Pacific loggerhead turtle PVA. Modeling results estimated that the current mean total reproductive female abundance for the portion of the population included in the assessment is 3,632 (95% CI range = 2,976 – 4,468), and the mean long-term population growth rate (r) was estimated at 2.4 percent (95% CI range = -10.8% – 15.6%). Projections show a low probability (less than 25% probability on average) that the North Pacific loggerhead turtle population would fall below 12.5 percent to 50 percent abundance thresholds within 100 years. Based on the estimates derived from the PVA model, NMFS estimates that the total number of nesting females in the population is 6,984 individuals, and the total estimated population of all age classes and both sexes is 341,071 individuals (NMFS 2019).

Nest count data from two nesting beaches representing approximately 85 percent of nesting for the Western Pacific leatherback population were used for the PVA. Due to missing count data, an auto-regressive time series model was used to fill in the missing data in the nest count time series prior to proceeding with the PVA model. Modeling results estimated that the current mean total reproductive female abundance for the portion of the population included in the assessment is 1,180 (95% CI range = 949 – 1,479), and the mean long-term population growth rate (r) was estimated at -5.3 percent (95% CI range = -16.4% – 5.9%). Projections show a high probability

(greater than 91% probability on average) that the Western Pacific leatherback turtle population would fall below 12.5 percent to 50 percent abundance thresholds within 100 years. While the long-term population trend is negative and the projections generated using an exponential growth equation show that the population is likely to continue a declining trend, the underlying leatherback population data show an increase in the last few years of the dataset, suggesting some rebound capacity. In the 2019 BiOp, NMFS estimates that the total number of adult leatherback turtles in the Western Pacific population is 1,851 (range 1,488-2,320), and the total estimated population of all age classes and both sexes is 175,000 (range 68,000-360,000) (NMFS 2019).

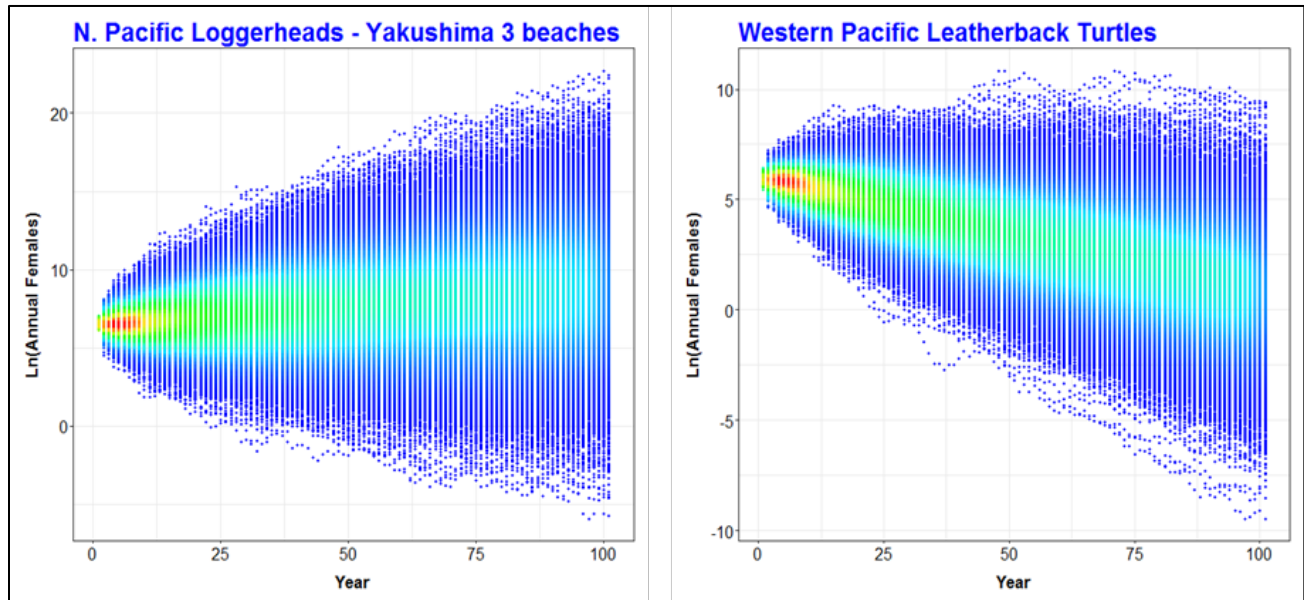


Figure 4. Population projection results for North Pacific loggerhead turtles (left) and Western Pacific leatherback turtles (right). Model projections are of annual females in natural log space. Figures show 10,000 model projection runs for 100 years into the future from the final data year.

3.2.4 Marine Mammals

Marine mammals are primarily vulnerable to shallow-set fishery through hooking and entanglement. Other potential impacts to marine mammals from the operation of fishery include collisions with vessels, exposure to waste and discharge, and disturbance from human activity and equipment. Although blue whales, North Pacific right whales, and sei whales occur within the action area and could potentially interact with the fishery, fishermen and observers have not reported any incidental hooking or entanglements of these species. NMFS has assigned prorated interactions to the population of MHI insular false killer whales (MHI IFKW) based on interactions with pelagic false killer whales, and on interactions with false killer whales from unknown populations and unidentified blackfish; however, no known interactions from the MHI IFKW stock have been reported or observed in the shallow-set fishery. NMFS has determined that the shallow-set fishery is not likely to adversely affect blue whale, N. Pacific right whale, sei whale, or MHI insular false killer whale (2019 BiOp).

There has not been an interaction with a Hawaii sperm whale in the shallow-set longline fishery since the deep-set and shallow-set longline fisheries were split in 2004 for management purposes (NMFS 2019). Prior to the separation of the fisheries, there was an interaction in 1999 with a vessel that was targeting swordfish, and one in 2002 with an experimental fishery that was testing sea turtle mitigation gear similar to what is used in the shallow-set longline fishery now. The interaction occurred on a control set and the sperm whale was entangled in the mainline; the mainline was cut and the animal escaped with no line attached (Boggs 2002). NMFS has determined that the shallow-set fishery is not likely to adversely affect the sperm whale. (2019 BiOp).

On February 27, 2015, gear from a Hawaii shallow-set longline vessel entangled a fin whale slightly more than 200 miles from the coast of California. The crew released the animal with no gear attached. NMFS determined that the Hawaii shallow-set longline fishery is not likely to adversely affect fin whales and documented its determination in a memorandum of concurrence dated September 16, 2015.

The Hawaii shallow-set longline fishery had observed interactions with ESA-listed Guadalupe fur seals in 2016 and 2017. This species was previously not known to interact with the shallow-set fishery and was not included in previous BiOps. All Guadalupe fur seal interactions occurred outside of the U.S. EEZ off the coast of California. NMFS has determined that the shallow-set fishery is likely to adversely affect, but not jeopardize, the continued existence of the Guadalupe fur seal. (2019 BiOp.)

On September 8, 2016 (81 FR 62259), NMFS published a final rule to reclassify the humpback whale into 14 DPS under the ESA, of which four DPSs were listed as threatened or endangered. The remaining ten DPSs were not listed under the ESA, including the Hawaii DPS and the Oceania DPS, which occur in areas where the Hawaii and American Samoa longline fisheries operate, respectively.

ESA-listed marine mammal species that have been observed or may occur in the area where Pelagics FEP fisheries operate include the following species:

- Blue whale (*Balaenoptera musculus*)
- Fin whale (*Balaenoptera physalus*)
- Guadalupe fur seal (*Arctocephalus townsendi*)
- Hawaiian monk seal (*Neomonachus schauinslandi*)
- Humpback whale (*Megaptera novaeangliae*), Mexico DPS (threatened)
- Main Hawaiian Islands insular false killer whale (MHI IFKW) DPS (*Pseudorca crassidens*)
- North Pacific right whale (*Eubalaena japonica*)
- Sei whale (*Balaenoptera borealis*)
- Sperm whale (*Physeter macrocephalus*)

Detailed information on these species' geographic range, abundance, bycatch estimates, and status can be found in the most recent stock assessment reports (SARs), available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock->

[assessment-reports-region](#). Additional, recent information may be found on the NMFS species pages found at the following website: http://www.fpir.noaa.gov/PRD/prd_esa_section_4.html.

Based on research, observer, and logbook data, marine mammals not listed under the ESA that may occur in the region and that may be affected by the fisheries managed under the Pelagic FEP include the following species:

- Blainville’s beaked whale (*Mesoplodon densirostris*)
- Bryde’s whale (*Balaenoptera edeni*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Common dolphin (*Delphinus delphis*)
- Cuvier’s beaked whale (*Ziphius cavirostris*)
- Dwarf sperm whale (*Kogia sima*)
- False killer whale (*Pseudorca crassidens*) other than the MHI Insular DPS
- Fraser’s dolphin (*Lagenodelphis hosei*)
- Killer whale (*Orcinus orca*)
- Longman’s beaked whale (*Indopacetus pacificus*)
- Melon-headed whale (*Peponocephala electra*)
- Minke whale (*Balaenoptera acutorostrata*)
- Northern fur seal (*Callorhinus ursinus*)
- Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)
- Pantropical spotted dolphin (*Stenella attenuata*)
- Pilot whale, short-finned (*Globicephala macrorhynchus*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*Kogia breviceps*)
- Risso’s dolphin (*Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Spinner dolphin (*Stenella longirostris*)
- Striped dolphin (*Stenella coeruleoalba*)

Detailed information on these species’ geographic range, abundance, bycatch estimates, and status can be found in the most recent SARs, available online at:

<https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>.

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for marine mammal interactions and injury if interactions occur. These measures include the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually. Additionally, longline closed areas generally within 30 to 75 nm of each U.S. island archipelago serve as de facto protection for island-associated stocks of marine mammals. The following table, Table 10, summarized the fleet-wide interactions for the shallow-set fishery over a 1-year span, 2010 to 2019.

Table 10. Observed annual marine mammal interactions (including mortalities, serious injuries, and non-serious injuries) with the Hawaii shallow-set longline fishery from 2010-2019.

Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Blackfish ¹	0	1	0	0	0	0	0	0	0	0
Short-beaked Common dolphin	0	1	0	0	1	0	0	0	0	0
Risso's dolphin	7	4	0	3	6	3	2	2	2	0
Blainville’s beaked whale	0	1	0	0	0	0	0	0	0	0
Humpback whale	0	1	0	0	0	1	0	0	0	0
False killer whale	0	1	1	0	1	0	0	0	0	0

Species	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Striped dolphin	2	0	1	0	2	0	1	3	0	0
Bottlenose dolphin	2	2	1	2	4	2	1	0	1	0
Rough-toothed dolphin	0	0	0	1	0	0	0	0	0	0
Fin whale	0	0	0	0	0	1	0	0	0	0
Unidentified cetacean	1	0	1	0	0	1	0	0	0	0
Pygmy or dwarf sperm whale	0	0	0	0	0	0	0	0	0	0
Beaked whale, Mesoplodont	0	1	0	0	0	0	0	0	0	0
Ginkgo-toothed beaked whale	0	0	0	0	0	1	0	0	0	0
Unidentified beaked whale	0	1	0	2	0	1	0	0	0	0
Northern elephant seal	0	0	0	1	1	0	0	0	0	0
Guadalupe fur seal	0	0	0	0	0	0	1	3	0	0
Unidentified pinniped	0	0	0	0	0	3	0	0	0	0
Unidentified sea lion	0	0	0	0	1	2	0	0	0	1

¹“Blackfish” include unidentified whales considered to be either false killer whales or short-finned pilot whales. Source: 2018 SAFE Report; NMFS Observer Program: <https://www.fisheries.noaa.gov/pacific-islands/fisheries-observers/pacific-islands-longline-quarterly-and-annual-reports>.

After considering a range of potential effects to marine mammals, NMFS, in the 2019 BiOp, determined that the shallow-set fishery, operating in accordance with the Pelagic FEP and implementing regulations, would not jeopardize the survival or recovery of any listed marine mammals. The 2019 BiOp authorizes 11 interactions and 9 mortalities for the Guadalupe fur seal through an ITS for the fishery. All other ESA listed marine mammals were found to not likely be adversely affected (NMS 2019) NMFS is currently evaluating whether to issue an MMPA section 101(a)(5)(E) permit to authorize the incidental take of Guadalupe fur seals by the Hawaii shallow-set fishery.

3.2.5 Seabirds

The endangered short-tailed albatross, threatened Newell’s shearwater, and endangered Hawaiian dark-rumped petrel have ranges that overlap the fishing grounds of the shallow-set fishery. A comprehensive description of the species’ distribution, population status, threats, and recovery strategy can be found in the species’ recovery plans.

On October 7, 2011, in response to a petition to list the black-footed albatross under the ESA, the USFWS found that the Hawaiian Islands breeding population and the Japanese Islands breeding population of the black-footed albatross are separate DPS, as defined by the DPS policy (76 FR 62503). However, the U.S. FWS also found that neither DPS of the black-footed albatross warranted listing under the ESA. The U.S. FWS observed that Hawaii-based longline fisheries should continue to minimize black-footed albatross bycatch through implementing effective bycatch minimization measures, and concluded that Hawaii-based longline fishing is not a significant threat to the black-footed albatross.

All seabirds are protected under the Migratory Bird Treaty Act (MBTA). In addition to the ESA-listed seabirds, the Hawaii longline fisheries occasionally interact with other seabirds such as black-footed and Laysan albatrosses, Northern fulmar, sooty shearwaters, and gulls.

Seabirds are vulnerable to fisheries through hooking and entanglement, which may result in injury or mortality. Albatrosses that forage by diving are some of the most vulnerable species to

bycatch in fisheries (Brothers et al. 1999). These species are long-lived, have delayed sexual maturity, small clutches and long generation times, resulting in populations that are highly sensitive to changes in adult mortality. Twenty of the world’s 21 albatross species are now at least near threatened with extinction according to the IUCN (IUCN 2017), and incidental catch in fisheries, especially longline fisheries, is considered one of the principal threats to many of these species (Veran et al. 2007).

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for seabird interactions and injury to seabirds if interactions occur. These measures include the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually. Shallow-set vessels must begin setting one hour after local sunset and complete setting one hour before local sunrise. Seabirds likely drown if the interaction occurs during gear deployment (setting), but during gear retrieval (hauling), seabirds may be released alive when fishermen promptly apply seabird handling and release techniques. These measures resulted in a reduction of over 90 percent in total seabird interactions by 2006 in the deep-set and shallow-set fisheries combined (Fossen 2007).

Table 11 contains the numbers of albatross that have interacted with the Hawaii shallow-set longline fisheries from 2005 through 2018 based on observed interactions by the NMFS Observer Program. In addition, from 2004 through 2018, based on observed sets, the shallow-set fishery interacted with one northern fulmar, four sooty shearwaters, and one unidentified gull (WPFMC 2019). Since NMFS initiated the observer programs in Hawaii in 1994, there have been no observed interactions between ESA-listed seabird species and the shallow-set fishery.

Table 11. Number of albatross interactions observed in the Hawaii shallow-set longline fishery, 2005- 2019.

Year	Laysan Albatross	Black-footed Albatross
2005	62	7
2006	8	3
2007	39	8
2008	33	6
2009	81	29
2010	40	39
2011	49	19
2012	61	37
2013	46	28
2014	36	29
2015	45	41
2016	26	40
2017	6	51
2018	2	9
2019	15	19

Source: 2018 SAFE Report; NMFS Observer Program: <https://www.fisheries.noaa.gov/pacific-islands/fisheries-observers/pacific-islands-longline-quarterly-and-annual-reports>.

NMFS consulted with the USFWS on effects to endangered species from the Hawaii longline fisheries in a 2012 BiOp (combined deep-set and shallow-set fisheries, USFWS 2012). USFWS considered that the shallow-set fishery may adversely affect the short-tailed albatross and authorized the take of one short-tailed albatross every five years, even though there were no documented interactions with this species. For purposes of analysis, USFWS used the same methods described for the deep-set fishery in section 3.3.3.1. USFWS estimated 13.1 annual injuries and mortalities of black-footed albatrosses in the shallow-set fleet, which results in an estimated take of 0.034 short-tailed albatross per year or less than one (0.17) albatross over five years (USFWS 2012). This is 0.001 percent of the population (proportion of the population = $0.034/3,181 = .00001$).

U.S. FWS conducted a population viability analysis in 1999, which found that an annual loss of about 82 subadults and 12 adults would lead to eventual extinction of the species based on a population size at that time of 1,362 birds. The population had increased to 3,181 birds at the time of the 2012 BiOp, and the current total annual estimated loss of reproductive contribution due to adverse effects by US fisheries fell short of 94 birds (three birds over five years in Hawaii fisheries and three per year in Alaska). Based on this information, USFWS concluded that the shallow-set longline fishery may slow population growth of short-tailed albatross, but is not anticipated to jeopardize the continued existence of the species (USFWS 2012). The shallow-set longline fishery has never caught a confirmed short-tailed albatross.

3.2.6 Sharks and Rays

ESA-listed shark or ray (elasmobranch) species that have been observed or may occur in the area where shallow-set fishery operates include the scalloped hammerhead shark, oceanic whitetip shark, and giant manta ray. Sharks and rays are vulnerable to longline fisheries through hooking and entanglement.

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for shark and ray interactions. These measures include the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually. Additionally, in accordance with 50 CFR § 300.226, U.S. vessels release all oceanic whitetip and silky sharks incidentally caught in the Convention Area of the WCPO. In the EPO, the IATTC has banned retention of oceanic whitetip shark and mobulid rays, including giant manta rays.

Table 12 shows the fleet-wide observed interactions of ESA-listed sharks and rays for the shallow-set fishery from 2004-2018. Interactions for 2019 are not yet available.

Table 12. Total ESA-listed shark and ray interactions with the Hawaii shallow-set longline fishery for 2004-2018.

Year	Scalloped Hammerhead	Oceanic Whitetip	Giant Manta Ray
2004	0	3	0
2005	0	348	0
2006	0	1	0

Year	Scalloped Hammerhead	Oceanic Whitetip	Giant Manta Ray
2007	0	98	5
2018	0	47	0
2009	0	54	0
2010	0	90	6
2011	0	78	3
2012	0	24	0
2013	0	27	0
2014	0	21	1
2015	0	22	0
2016	0	32	0
2017	0	29	2
2018	0	1	0

Source: 2018 SAFE Report

The shallow-set fishery generally occurs within the range of the Central Pacific DPS of scalloped hammerhead shark; this DPS was not listed under the ESA. The shallow-set fishery does not occur within the range of the Indo-West Pacific DPS; however a portion of the shallow-set fishery does fall within the range of the Eastern Pacific DPS. There have been no recorded or observed takes of hammerhead sharks in the shallow-set longline fishery in the area of the Eastern Pacific DPS. NMFS has determined that the shallow-set fishery is not likely to adversely affect the Eastern Pacific scalloped hammerhead shark (NMFS 2019).

After considering a range of potential effects to oceanic whitetip shark and giant manta ray, NMFS, in the 2019 BiOp, determined that the shallow-set fishery, operating in accordance with the Pelagic FEP and implementing regulations, would not jeopardize the survival or recovery of oceanic whitetip shark and giant manta ray. The 2019 BiOp authorizes a certain level of interactions (incidental take) of species which the fishery may adversely affect through an ITS for the fishery. Currently there are no take prohibitions for oceanic white tip sharks or giant manta ray, thus an ITS is not required to provide an exemption to the prohibition of take under section 9 of the ESA for these two species. However, consistent with the decision in *Center for Biological Diversity v. Salazar*, 695 F.3d 893 (9th Cir. 2012), NMFS included an ITS to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger if the level of take analyzed in the biological opinion is exceeded. Table 13 shows the ITS from the 2019 BiOp for these two species.

Table 13. Estimated oceanic whitetip shark and giant manta ray interactions and mortalities in the Hawaii shallow-set fishery over one calendar year in NMFS 2019 biological opinion.

Species	1-Year	
	Number Captured	Number Killed
Oceanic Whitetip Shark	102	32
Giant Manta Ray	13	4

3.2.7 Critical Habitats

Monk Seal Critical Habitat

On August 21, 2015, NMFS published a final rule (80 FR 50926) designating critical habitat for the Hawaiian monk seal (*Neomonachus schauinslandi*) in the MHI and expanding monk seal

critical habitat in the Northwestern Hawaiian Islands (NWHI). NMFS identified features that are essential for the conservation of monk seals, including areas preferred for pupping and nursing, areas that support adequate prey quality and quantity for foraging, and areas for hauling out, resting, or molting. Accordingly, NMFS identified critical habitat in certain areas in the MHI, and around designated islands in the NWHI, to include, generally, from the beach to the 200-m depth contour and the seafloor and the waters and habitat within 10 m of the seafloor. Specific critical habitat boundaries can be found in the final rule.

Because monk seals do not prey on species targeted by the shallow-set longline fisheries and longline vessels are prohibited from fishing within the footprint of monk seal critical habitat, NMFS determined that the shallow-set longline fishery may affect, but are not likely to adversely modify monk seal critical habitat. NMFS documented its determinations in 2019 BiOp (NMFS 2019).

Main Hawaiian Islands Insular False Killer Whale Critical Habitat

On July 24, 2018, NMFS designated critical habitat for the MHI IFKW DPS (83 FR 35062). The critical habitat area encompasses waters from 45 to 3,200 m deep around the MHI. Based on considerations of economic and national security impacts, NMFS excluded certain areas from designation because the benefits of exclusion outweigh the benefits of inclusion, and exclusion would not result in extinction of the species. NMFS identified a single essential feature with four characteristics that describe how island-associated marine habitat is essential to MHI IFKWs, as follows:

1. Adequate space for movement and use within shelf and slope habitat;
2. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth;
3. Waters free of pollutants of a type and amount harmful to insular false killer whales; and
4. Sound levels that will not significantly impair false killer whales' use or occupancy.

Additional details are available in the Biological Report (NMFS 2018c) and draft Economic Report (Cardno 2018) associated with the final rule.

Federal regulations prohibit longline fishing in the MHI longline prohibited area, which extends about 50 to 75 nm around the MHI, depending on the location (Figure 5). This results in an effective closure of the deep-set longline fishery in most of MHI IFKW range.

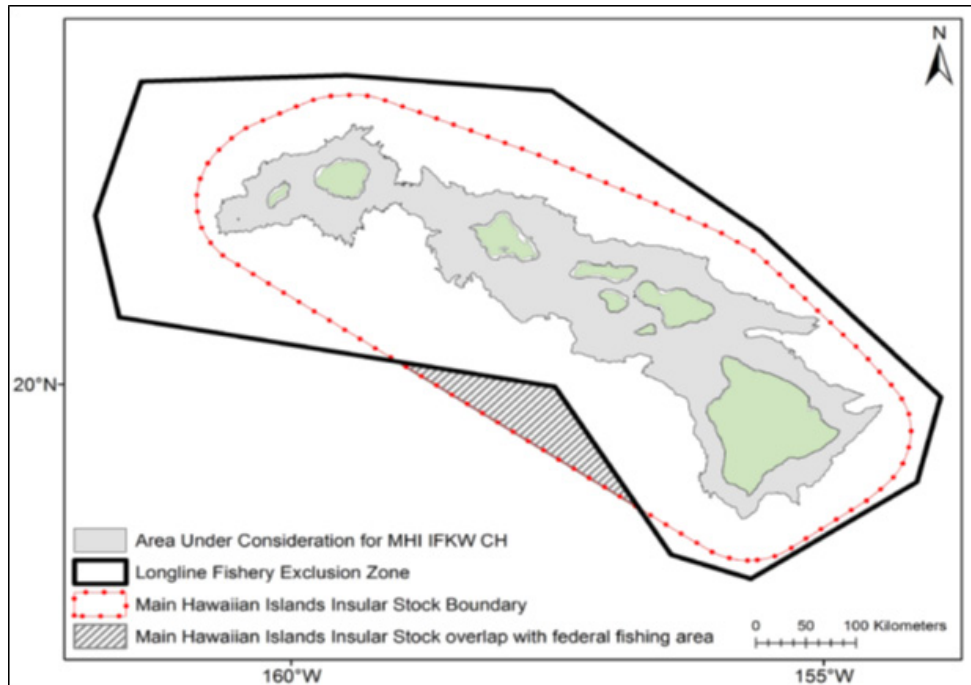


Figure 5. Map depicting the overlap of federal longline fishing area with the MHI IFKW range.

Fishing activities that may affect MHI IFKW DPS critical habitat include those that reduce the quantity, quality, or availability of MHI IFKW DPS prey species. The MHI IFKW DPS Status Review indicated that fisheries might affect MHI IFKW prey resources in two ways: (1) by removing potential prey in the immediate vicinity of false killer whales, and (2) by contributing to the long-term reduction of prey biomass over the range of the fish stocks that these whales encounter (Oleson et al. 2012).

Overlapping species in longline fishery catches and the MHI IFKW diet include opah, wahoo, dolphinfish, pomfrets, swordfish, blue marlin, and bigeye, skipjack, yellowfin, and albacore tuna. Available information on the stock status of pelagic fish species known to be part of MHI IFKW prey indicate that stocks are generally stable or improving. U.S. landings in the WCPO compared to each stock's total estimated biomass are less than one percent for prey species with estimated biomass (NMFS 2018a), and international and domestic management measures strive to ensure the sustainability of these stocks. Additionally, the diversity in IFKW diet likely indicates the whales shift to available prey items to meet their energetic needs. The longline fisheries do not harvest MHI IFKW prey in the area designated as critical habitat.

Based on this information, NMFS concluded in the 2019 BiOp (NMFS 2019), that the shallow set fishery was not likely to adversely affect designated critical habitat for the MHI IFW.

Leatherback Sea Turtle Critical Habitat

On January 26, 2012, NMFS designated critical habitat for leatherback sea turtles off the west coast of the U.S., including areas off Washington, Oregon, and California (77 FR 4170), and NMFS prohibits longline fishing within the EEZ off the west coast. Based on this information,

NMFS concluded in the 2019 BiOp (NMFS 2019), that the shallow set fishery was not likely to adversely affect designated critical habitat for the leatherback sea turtle.

3.3 Socioeconomic Setting

This section describes the socioeconomic setting for the shallow-set fishery. A detailed history and description of the fishery can be found in the Amendment 18 to the Pelagic FMP (WPRFMC 2009b) and the 2018 SAFE (WPRFMC 2018).

The discovery of a large swordfish resource around the Hawaiian archipelago in the 1980s prompted a revitalization of the Hawaii longline fishery. Catches grew from negligible amounts in the mid-1980s to 5.3 million pounds in 1990. Much of this fishery’s growth was from the entry of new longline vessels from other parts of the U.S., as well as the development of a new local longline fleet in Hawaii. By 1993, catches of swordfish peaked at about 13.0 million pounds (WPRFMC 2013), representing 30 percent of all the North Pacific swordfish production (19,672 mt or 43.6 million pounds) at the time. Subsequent catches declined after 1993 to around 6.4 million pounds until 2000, after which the fishery was closed due to litigation.

Since reopening of the shallow-set fishery in 2004, fishing effort peaked in 2010 at 114 trips and 1.8 million hooks set, and has since been on a declining trend. The number of vessels participating in the shallow-set fishery has declined over time from a high of 35 vessels in 2006 to a low of 11 vessels in 2018, whereas the numbers of trips and hooks have been more variable (Table 15). Total catch for the fishery has been on a declining trend since reaching a peak at 4.0 million pounds in 2009, and adjusted revenue has also declined since reaching a peak at \$9.5 million in 2011 (Figure 6). The average trip cost (excluding labor cost) for the Hawaii shallow-set longline fishery based on the PIFSC Economic Cost Data Collection Program was \$43,390 per vessel in 2018 with an average trip length of 32 days for the 2009-2018 period, and the net revenue (trip revenue minus trip cost) was \$66,473 per vessel in 2018 (WPRFMC 2018). Catch-per-unit-effort (CPUE) of swordfish declined from 19.1 fish per 1,000 hooks in 2006 to 9.3 in 2010, but has since remained relatively stable ranging from 9.8 to 12.4 fish per 1,000 hooks (Figure 7).

Table 14. Hawaii shallow-set longline fishery effort based on logbook data, 2004-2018.

Year	Active Vessels	Number of Trips	Number of Sets	Number of Hooks	1-Yr Percent Change
2009	28	112	1,762	1,721,346	▲ 15.04%
2010	28	108	1,833	1,803,432	▲ 4.77%
2011	20	82	1,468	1,489,243	▼ -17.42%
2012	18	81	1,355	1,453,234	▼ -2.42%
2013	15	58	962	1,060,341	▼ -27.04%
2014	20	81	1,338	1,483,809	▲ 39.94%
2015	22	65	1,110	1,235,703	▼ -16.72%
2016	13	40	670	719,385	▼ -41.78%
2017	18	61	949	1,027,013	▲ 42.76%
2018	11	30	420	500,000	▼ -51.32%

Source: 2018 SAFE Report

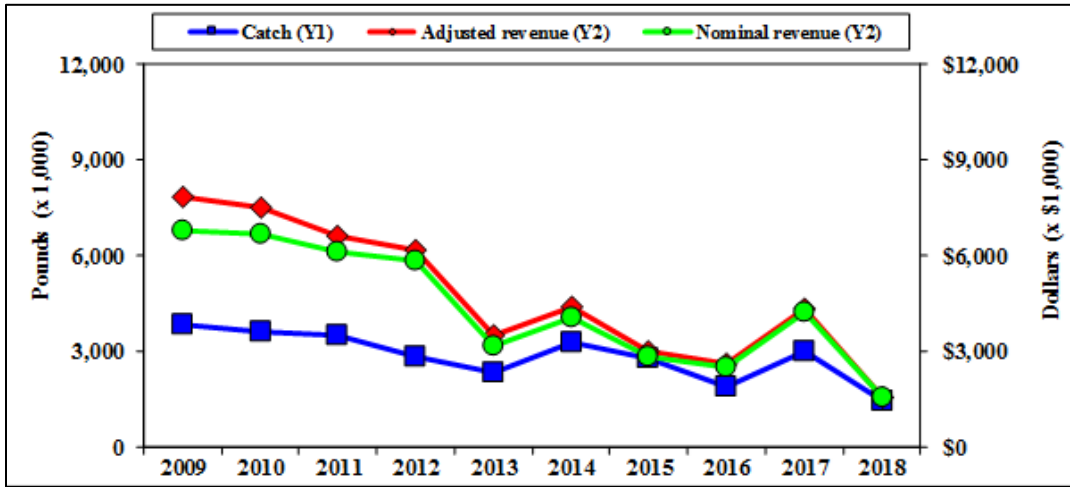


Figure 6. Catch and revenue for the Hawaii shallow-set longline fishery, 2005-2018.
Source: 2018 SAFE Report

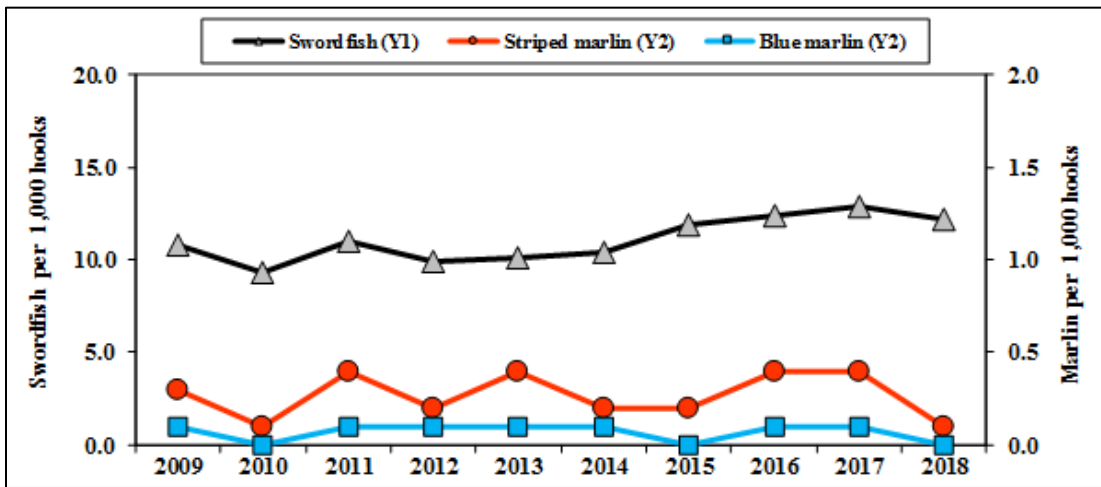


Figure 7. Billfish CPUE for the Hawaii shallow-set longline fishery, 2005-2018.
Source: 2018 SAFE Report

Available data shows that the removal of the effort limits in 2009, and the implementation of the higher sea turtle annual limit in 2012, did not result in increased shallow-set fishing effort approaching historical levels (1994-1999). This is likely attributed to the diminishing net returns for shallow-set vessels over the past decade, driven by a weakened swordfish market, CPUE declines in swordfish catch, fuel prices, and uncertainties associated with a sea turtle annual limit closure (WPRFMC 2017). In addition, many vessels have switched to year-round deep-set longlining targeting bigeye tuna, which generally results in higher profits as compared to shallow-set fishing for swordfish.

Despite the poor economic performance of this fishery in recent years, fishing effort in future years may reasonably range within levels seen since 2004, as high global swordfish demand in combination with fresh sustainable swordfish from Hawaii fisheries could rapidly change levels due to market demand. Additionally, the largest component of the Hawaii longline fleet is

comprised of Vietnamese-American ownership, which have a long-term history of targeting swordfish in the United States, and changes in bigeye tuna catch limits for the deep-set longline fishery could encourage more vessels to resume targeting swordfish as an alternative in the event of a bigeye tuna fishery closure.

The shallow-set fishery is highly seasonal due to peak market demand for Hawaii swordfish, with effort typically increasing in October and peaking in March, after which effort gradually declines through the summer months (Figure 8). The swordfish fishing season for the Hawaii shallow-set longline fishery corresponds to seasonally low levels of swordfish imports, indicating that the peak demand for Hawaii swordfish occurs in the winter months when swordfish imports are lowest (Figure 9). The swordfish catch in fishery accounts for nearly half of the U.S. commercial landings (Figure 10). In the five-year period of 2012-2016, the average swordfish catch in the combined Hawaii longline fisheries (shallow and deep) was approximately 3.1 million pounds, of which 2.3 million pounds were from the shallow-set fishery, and amounting to 44 percent and 33 percent, respectively, of the total US domestic commercial landing of swordfish during that same period (WPRFMC 2017, NMFS Commercial Fisheries Statistics).

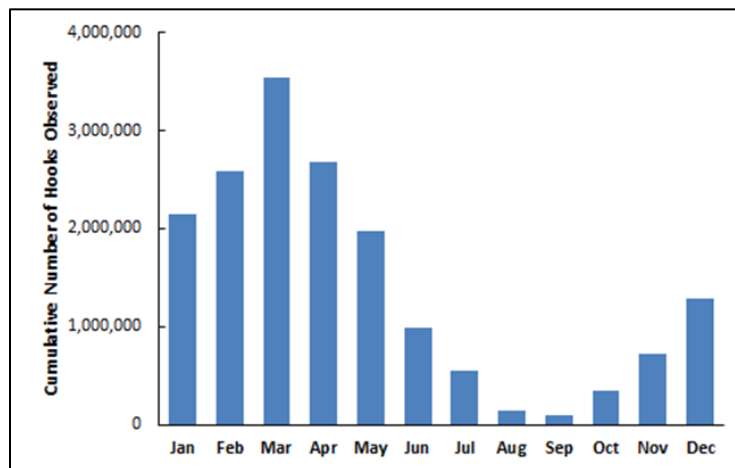


Figure 8. Cumulative observed monthly effort in hooks for the Hawaii shallow-set longline fishery (100% observer coverage), 2004-2017.

Data source: NMFS Pacific Islands Regional Office Observer Program

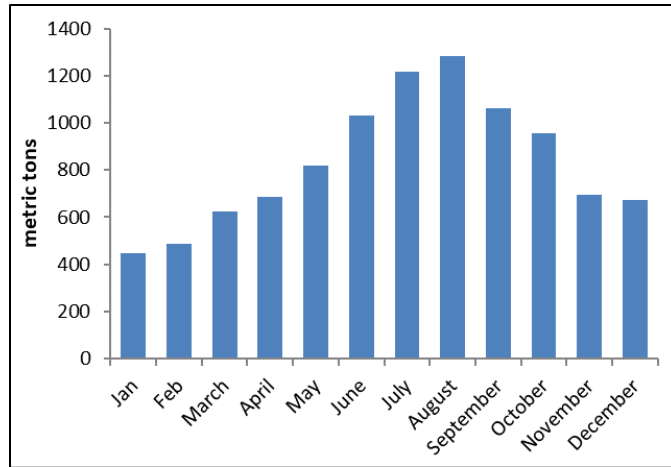


Figure 9. Average Monthly Swordfish Imports into the United States, 2013-2017

Source: Figure made from data available at: <https://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/raw-data/imports-exports-annual#1>

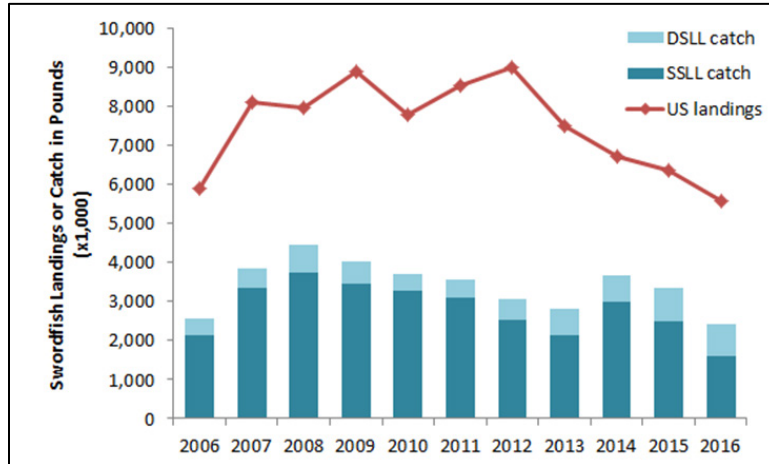


Figure 10. Hawaii shallow-set and deep-set longline fishery swordfish catch and total US domestic swordfish landings, 2006-2016.

Source: WPRFMC (2017) and NMFS Commercial Fisheries Statistics (<https://www.st.nmfs.noaa.gov/st1/commercial/index.html>)

The shallow-set fishery has had three annual limit closures since 2004: once in March 2006 from reaching the loggerhead limit of 17 turtles, another in November 2011 from reaching the leatherback limit of 16, and lastly in 2019 from reaching the loggerhead annual limit of 17¹¹. The closure in March of 2006 during the peak fishing season resulted in a substantial reduction in

¹¹ On December 27, 2017, a Ninth Circuit panel issued a split 2-1 opinion finding that NMFS’s 2012 BiOp’s no-jeopardy determination and associated ITS for the loggerhead turtle to be arbitrary and capricious. *Turtle Island Restoration Network, et al. v. U.S. Dep’t of Commerce, et al.*, 878 F.3d 725, 740 (9th Cir. 2017). On May 4, 2018, the District Court approved a settlement setting aside those portions of the 2012 biological opinion and ITS relating to North Pacific loggerheads, and the shallow-set fishery was closed through December 31, 2018 (see *Turtle Island Restoration Network et al. v. U.S. Dep’t of Commerce, et al.*, No. 1:12-cv-00594-SOM-RLP [D. Haw., May 4, 2018], Dkt. No. 80). The shallow-set fishery reopened on January 1, 2019, under an annual hard cap limit of 17 loggerheads (83 FR 49495), consistent with the ITS from the 2004 BiOp. On March 19, 2019, the shallow-set longline fishery closed (84 FR 11654, March 28, 2019) for the remainder of 2019 due to reaching an annual interaction limit of 17 loggerheads.

effort and catch and revenue compared to 1 year before and after (Table 15). The number of trips in 2006 was 42 percent lower than the average of the years before and after, and hooks set were 50 percent lower. Catch in 2006 was 37 percent lower than the average of the years before and after, and nominal revenue was 46 percent lower in the closure year. The impact of the leatherback annual limit closure in 2011 is less evident. This may be due to a November closure, and when compared with the average of 1 year before and after (Table 15), may be confounded by the overall declining trend in effort and catch since 2010. The effects of the recent 2019 closure are still being analyzed.

Table 15. Difference in fishery performance between hard cap closure years (2006, 2011) and the average of 1 year before and after each closure.

2006 Loggerhead Hard Cap Closure				
Performance measure	Closure year (2006)	Average of 1 year before and after	Difference	Percent Difference
Trips	57	98.5	-41.5	-42%
Hooks (million)	0.7	1.4	-0.7	-50%
Catch (1,000 lbs)	2,328	3,692	-1,364	-37%
Nominal Revenue (\$1,000)	\$3,985	\$7,353	-\$3,368	-46%
2011 Leatherback Hard Cap Closure				
Performance measure	Closure year (2011)	Average of 1 year before and after	Difference	%
Trips	82	98.5	-16.5	-17%
Hooks (million)	1.5	1.6	-0.1	-6%
Catch (1,000 lbs)	3,500	3,214	+286	+9%
Nominal Revenue (\$1,000)	\$6,086	\$6,232	-\$146	-2%

3.4 Management Setting

The shallow-set and deep-set longline fisheries are managed under a single limited access fishery with a maximum of 164 vessel permits. The shallow-set fishery is monitored under 100 percent observer coverage. All Hawaii permitted vessels are required to provide 72-hour advance notification prior to leaving port on a fishing trip to declare trip type (shallow-setting or deep-setting) and to receive observer placement. Vessels may not switch gear type during a trip once a trip is declared and underway. These regulations for all Hawaii permitted vessels are enforced by NOAA Office of Law Enforcement (NOAA OLE) and U.S. Coast Guard (USCG).

Swordfish is a highly migratory stock that is subject to management by WCPFC and IATTC. Current WCPFC measures for shallow-set longline fishing for swordfish include the use of large circle hooks or whole finish bait (CMM 2008-03).

A summary of current management requirements are as follows:

Fishing Permits and Certificates on board the vessel

- Hawaii Longline Limited Entry Permit.
- Marine Mammal Authorization Program Certificate.
- High Seas Fishing Compliance Act Permit (if fishing on the high seas).
- Western and Central Pacific Fisheries Convention (WCPFC) Area Endorsement (if fishing on the high seas in the convention area).
- Protected Species Workshop (PSW) Certificate.

- Western Pacific Receiving Vessel Permit, if applicable.
- State of Hawaii Commercial Marine License.

Reporting, Monitoring, and Gear Identification

- Logbook for recording effort, catch, and other data.
- Transshipping Logbook, if applicable.
- Marine Mammal Authorization Program Mortality/Injury Reporting Form.
- Vessel monitoring system.
- Vessel and fishing gear identification.

Notification Requirement and Observer Placement

- Notify NMFS before departure on a fishing trip to declare the trip type (shallow-set or deep-set).
- Each fishing trip is required to have a fishery observer on board if requested by NMFS; NMFS places observers on every shallow-set longline trip, resulting in 100 percent coverage.
- Fisheries observer guidelines are used.

Prohibited Areas in Hawaii

- Northwestern Hawaiian Islands (NWHI) Longline Protected Species Zone.
- Main Hawaiian Islands Longline Fishing Prohibited Area.
- Papahānaumokuākea Marine National Monument: Prohibited commercial in the Monument, which has boundaries that align with the NWHI Longline Protected Species Zone.

Protected Species Workshop (PSW)

- Each year, longline vessel owners and operators must complete a PSW and receive a certificate.
- The vessel owner must have a valid PSW certificate to renew a Hawaii longline limited entry permit.
- The vessel operator must have a valid PSW certificate on board the vessel while fishing.

Sea Turtle, Seabird, and Shark Handling and Mitigation Measures

- Vessel owners and operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.
- Vessel owners and operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Vessel owners and operators can choose between side setting and stern setting, with additional requirements to reduce seabird interactions.
- When shallow-set longline fishing north of the Equator:
 - Use 18/0 or larger circle hooks with no more than 10° offset.
 - Use mackerel-type bait.
 - Set at night for stern set vessels.
- Vessel owners, operators, and crew are required to release any oceanic whitetip shark or silky shark and take reasonable steps for its safe release.

Marine Mammal Handling and Release

- Vessel owners and operators must follow the marine mammal handling guidelines provided at the PSW.
- Vessel owners or operator must submit the Marine Mammal Authorization Program (MMAP) Mortality/Injury Reporting Form within 48 hours after the end of the fishing trip to NMFS to report injuries or mortalities of marine mammals (50 CFR 229.6).

Unless otherwise noted, most of the above regulations are at 50 CFR Part 665. A summary of regulations for Hawaii longline fisheries (shallow-set and deep-set combined) is provided by the Summary of Hawaii Longline Fishing Regulations (NMFS 2014b). A detailed description of the management setting for the shallow-set fishery can also be found in the Pelagic FEP (WPRFMC 2009a) and Amendment 18 to the Pelagic FEP (WPRFMC 2009b).

3.5 Resources Eliminated from Detailed Study

There are presently no known districts, sites, highways, cultural resources, structures or objects listed in or eligible for listing in the National Register of Historic Places in the EEZ around American Samoa, Guam, CNMI, and Hawaii, or in adjacent areas of the high seas in international waters where pelagic longline fishing activities are conducted. Additionally, longline fishing activities are not known to result in adverse effects to scientific, historic, archeological or cultural resources because fishing activities occur generally miles offshore. Therefore, the proposed action is not likely to affect historic resources.

The shallow-set fishery does not operate within estuarine waters or have the potential to affect wetlands. Because pelagic longline fishing activities authorized occur offshore and in deep oceanic waters away from land, populated areas, and marine protected areas such as marine national monuments, the alternatives considered would not have an effect on air/water quality, coral reefs, or benthic marine habitats.

Longline fishing is not known to be a potential vector for spreading alien species as most vessels fish far away from coastal areas offshore. The proposed action would not increase the potential for the spread of alien species into or within nearshore waters in Hawaii or any of the U.S. participating territories.

NMFS is not aware of studies that show effects from pelagic longline fisheries to species fecundity or negative predator/prey relationships that result in adverse changes to food web dynamics. Without management to ensure fishing is sustainable, the removal of top predator pelagic species such as swordfish and other billfish, as well as tuna species above natural mortality rates has the potential to cause major imbalances or wide-ranging change to ecosystem functions, biodiversity, and habitats. However, both international and domestic fishery managers are controlling catches throughout the Pacific. NMFS expects such control to improve stock status and prevent imbalances or wide-ranging changes to ecosystem function. Therefore, NMFS does not analyze effects on biodiversity and/or ecosystem function in this assessment.

4 ENVIRONMENTAL EFFECTS OF THE ALTERNATIVES

This section describes the potential effects of each alternative on the components of the affected environment or other socioeconomic elements identified in Section 3 above.

This chapter describes the potential environmental consequences that could result from the Alternatives considered. The analysis relies on the information described in Chapter 3 as the baseline to evaluate the impacts of the management alternatives considered herein. The environmental resources that are potentially affected include the following: target and non-target species (including bycatch), protected resources, socioeconomic setting and management setting. Climate change impacts are discussed in the cumulative effects section. A summary of potential effects are presented in Table 18.

4.1 Potential Effects on Target and Non-target Stocks

This section describes the potential effects of the alternatives for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery on target and non-target stocks identified in Section 3.1.

4.1.1 **Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813)**

Under Alternative 1, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year), and is not expected to result in changes in effects to target and non-target stocks described in Section 3.1 if the loggerhead or leatherback turtle interactions do not exceed the hard cap limit and the fishery remains open throughout the year. However, effort and catch by the Hawaii shallow-set longline vessel is expected to be in the lower end of the range when the fishery closes early in the calendar year due to reaching a hard cap limit. As described in Section 4.2.1, the loggerhead hard cap limit of 17 is based on the ITS in the 2004 BiOp and is approximately half of the anticipated level of interactions estimated for the 2019 BiOp. The fishery is therefore expected to reach the loggerhead hard cap limit in some years. Of the years since 2004 when the fishery operated under a loggerhead hard cap of 17 (2004-2009; 2011; 2019), the fishery reached the limit in 2006 and 2019, both during March. The early closure in 2006 resulted in a 37 percent reduction in total catch by Hawaii shallow-set longline vessels compared to the average of the years before and after (Table 15). Catch statistics for 2019 are not yet available.

4.1.2 **Alternative 2: Implement the Council's Recommended Action from the 177th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery)**

Under Alternative 2, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year) and is not expected to result in changes in effects to target and non-target stocks described in Section 3.1. The loggerhead hard cap limit of 36 interactions is based on the 95th percentile value of the predicted

distribution of the anticipated level of interactions in any given 1-year period (McCracken 2018), and thus there is a low likelihood that the fishery will reach the loggerhead hard cap limit. The leatherback hard cap limit of 16 interactions is approximately 25 percent lower than the ITS that is based on the 95th percentile value of the predicted distribution, and thus there is a slightly higher probability that the fishery will reach the leatherback turtle hard cap limit in any given year than that of the loggerhead turtle.

Implementation of individual trip limits is expected to reduce the likelihood of reaching the hard cap limit and increase the likelihood for maintaining fishing operations throughout the calendar year when higher interaction rates are observed. Consequently, target and non-target catch by the Hawaii shallow-set longline fishery may be higher than Alternative 1 in such years. However, increases in target and non-target catch as a result of the extended fishing year are likely to be within the range observed since 2004 and are not expected to result in adverse effects to target and non-target stocks.

4.1.3 Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp

Under Alternative 3, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year) and is not expected to result in changes in effects to target and non-target stocks described in Section 3.1.

Implementation of individual trip limits under Alternative 3 is expected to have similar outcomes to Alternative 2 in reducing the likelihood of reaching the hard cap limit and increasing the likelihood for maintaining fishing operations throughout the calendar year when higher interaction rates are observed. Consequently, target and non-target catch by the Hawaii shallow-set longline fishery may be higher than Alternative 1 in such years. However, increases in target and non-target catch as a result of the extended fishing year are likely to be within the range observed since 2004 and are not expected to result in adverse effects to target and non-target stocks. The additional restrictions on vessels that reach a trip limit twice in calendar year is not expected to substantially affect the overall effort and catch of the fleet.

4.1.4 Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit

Under Alternative 4, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year) and is not expected to result in changes in effects to target and non-target stocks described in Section 3.1. As described in Section 4.2.4, the likelihood of the fishery exceeding the loggerhead turtle ITS of 36 in the absence of a hard cap limit is small (less than 5 percent in any given year), and thus the fishery outcome is expected to be similar to that of Alternative 3.

4.2 Potential Effects on Protected Resources

This section describes the potential effects of the alternatives for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery on protected species identified in Section 3.2. Under all alternatives considered, the Hawaii shallow-set longline fishery will continue to be managed under existing gear and handling requirements to minimize impacts to sea turtles. These include the required use of 18/0 or larger circle hooks with no more than 10° offset and mackerel-type bait, adherence to regulations for safe handling and release of sea turtles, and possession on board the vessel required turtle handling and dehooking gear. These measures have successfully reduced loggerhead and leatherback turtle interactions by approximately 90% since their implementation in 2004 (Gilman and Kobayashi 2007, Swimmer et al. 2017). Under all alternatives considered, NMFS would continue to monitor the Hawaii shallow-set longline fishery under 100 percent observer coverage and provide near real-time data on loggerhead and leatherback turtle interactions. Current NMFS observer data collection protocols for the Hawaii longline fishery instruct observers to report sea turtle interactions using a satellite phone after each observation. These call-in reports are used to monitor the existing hard caps in near real-time.

Under all outcomes associated with the alternatives, the current and maximum foreseeable levels of fishing effort by longline fisheries managed under the FEP would continue to be subject to the level of take authorized under the ESA and regulations under other applicable laws. As noted in Section 3.2, NMFS is required to re-initiate consultation under ESA Section 7 if any ITS applicable to the Hawaii shallow-set longline fishery is exceeded or another criterion for reinitiation is triggered. To meet management mandates, the Council, NMFS, and international fishery management organizations such as the WCPFC and IATTC would continue to develop protected species mitigation measures as resource issues are identified through reporting and monitoring.

4.2.1 Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813)

Under Alternative 1, the fishery would continue to operate without any measures to provide early detection of and response to higher interaction rates that may indicate a potential for higher impacts to sea turtle populations. The existing hard cap measure help ensure that loggerhead and leatherback turtle interactions do not exceed a threshold that triggers reinitiation of ESA consultation. However, under this alternative, the Hawaii shallow-set longline fishery would not operate in compliance with the 2019 BiOp if the fleet-wide leatherback turtle interactions reach or exceed 16, as the 2019 BiOp has a leatherback ITS of 21 per year and RPM T&C 1h requires that the fishery operate under a leatherback hard cap limit of 16 leatherbacks and 17 loggerheads if RPM T&C 1a and 1b are not implemented by regulations.

Under Alternative 1, the fishery would operate under a loggerhead turtle hard cap limit of 17, pursuant to the final rule implementing the court order (83 FR 49495, October 2, 2018). The limit of 17 loggerhead turtles is based on the ITS in the 2004 BiOp. The ITS was based on predictive modeling of the anticipated level of interactions using 1994-1999 data (observer coverage of 3.3-5.8% annually for both shallow-set and deep-set longline fisheries) and applying

the interaction reduction rates associated with circle hooks and mackerel bait from experimental results in the Atlantic (Kobayashi 2003). Since the Hawaii shallow-set longline fishery's reopening in April 2004, the fishery has accumulated 14 additional years of operational data under the circle hook and mackerel-type bait measures under 100% observer coverage. Based on the observed interaction data since 2004, the future anticipated loggerhead turtle interactions in the Hawaii shallow-set longline fishery is expected to have a long-term average of 15.6 interactions per year, with an upper range (based on a 95th percentile value) of equal to or less than 36 interactions in a 1-year period, and equal to or less than 81 interactions in a 3-year period (McCracken 2018). In the 2019 BiOp, NMFS conservatively used the 1-year 95th percentile predicted value of 36 to analyze the effects of the Hawaii shallow-set longline fishery on loggerhead turtles, and concluded that the fishery is not likely to jeopardize the existence of the species. The loggerhead turtle hard cap limit under Alternative 1 is approximately half of the level analyzed in the 2019 BiOp, and thus this alternative is not expected to have substantial impacts on loggerhead turtles. Additionally, under the Alternative 1, the fishery would operate under a conservative loggerhead hard cap limit that does not reflect the best available scientific information for the species' conservation status or needs, and is expected to close in some years as a result of reaching the loggerhead hard cap.

The leatherback turtle hard cap limit would be retained at the current regulatory limit of 26 under Alternative 1, which was set based on the ITS in the 2012 BiOp and is higher than the level analyzed in the 2019 BiOp. NMFS conservatively analyzed the impacts of the Hawaii shallow-set longline fishery in the 2019 BiOp at 21 leatherback turtle interactions per year, based on the 95th percentile value of the predicted distribution of the anticipated level of interactions in any given 1-year period (McCracken 2018). The percentile values reflect the probability that the observed interactions for the 1-year period would be equal to or less than the value, meaning that there is a low probability that the observed interactions would be at the upper end of the 1-year predicated range. In the long-term, the fishery is expected to have an average of 10 leatherback turtle interactions per year (McCracken 2018), and the effects of Alternative 1 on leatherback turtles is expected to be within the range analyzed in the 2019 BiOp (see Section 3.2.3).

Effects to all other protected species are expected to be similar to the baseline conditions described in Section 3.2, which do not represent substantial effects on any species.

4.2.2 Alternative 2: Implement the Council's Recommended Action from the 177th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery)

Under Alternative 2, the annual fleet-wide hard caps provide assurance that the fishery's impacts to loggerhead and leatherback turtles remain below a fixed level of interactions analyzed in the 2019 BiOp. NMFS concluded in the 2019 BiOp that the analyzed level of incidental take would not jeopardize the continued existence of all ESA-listed species in the action area, including the loggerhead and leatherback turtles. Under this alternative, the loggerhead hard cap limit would be set at 36 per year consistent with the ITS in the 2019 BiOp, and the leatherback hard cap limit would be set at 16 per year (below the ITS of 21) consistent with RPM T&C 1a in the 2019 BiOp. The ITSs in the 2019 BiOp are based on the 95th percentile value of the predicted distribution of the anticipated level of interactions in any given 1-year period (McCracken 2018).

The percentile values reflect the probability that the observed interactions for the 1-year period would be equal to or less than the value, meaning that there is a low probability that the observed interactions would be at the upper end of the 1-year predicated range, especially over multiple years. The long-term average anticipated level of interactions is expected to be 15.6 loggerhead turtles and 10 leatherback turtles (McCracken 2018). Therefore, in most years the observed interactions is expected to be well below the ITS.

Furthermore, 99 percent of all observed loggerhead turtle interactions and all observed leatherback turtle interactions since 2004 have resulted in the animal being released alive following the required handling and gear removal procedures. For sea turtles released alive, a post-hooking mortality rate is estimated based on NMFS' established criteria (Ryder et al. 2006). NMFS estimates in the 2019 BiOp that the overall post-hooking mortality rate is 0.16 for loggerhead turtles and 0.20 for leatherback turtles. The estimated mortalities analyzed in the 2019 BiOp are based on applying these post-hooking mortality rates to the total number of anticipated level of interactions.

In the 2019 BiOp, NMFS conservatively analyzed the impacts in the Hawaii shallow-set longline fishery using the 1-year 95th percentile anticipated level of interactions of 36 loggerhead turtles (6 estimated mortalities) and 21 leatherback turtles (3 estimated mortalities). The current abundance estimate of the North Pacific loggerhead turtle population is approximately 341,071 individuals, of which an estimated 6,984 individuals are nesting females (NMFS 2019). PIFSC's PVA of the North Pacific loggerhead population using nest count data from three nesting beaches representing approximately 52 % of the entire nesting population indicate that the population is exhibiting a long-term increasing trend at a mean estimated population growth rate of 2.4 % (NMFS 2019; see Section 3.2.3). Projections from the PVA model show a low probability that the North Pacific loggerhead turtle population would fall below 12.5 to 50 % abundance thresholds within 100 years. An estimated mortality of up to 6 loggerhead turtles of any size or sex in any given year represents 0.0018% of the total population, and a proportional impact of 0.001-0.003% when evaluated against the three subpopulations (Yakushima subpopulation comprising 40% of total population, Mainland subpopulation comprising of 50% of total population, and Ryukyu subpopulation comprising of 9% of the total population). The 2019 BiOp concluded that this level of incidental take and resulting mortality associated with the continued authorization of the Hawaii shallow-set longline fishery would not be expected to appreciably reduce the North Pacific loggerhead turtle population's likelihood of surviving and recovering in the wild. NMFS expects that the overall population remain large enough to maintain genetic heterogeneity, broad demographic representation, and successful reproduction.

For Western Pacific leatherback turtles, the current abundance estimate of all age classes and both sexes is approximately 175,000 (range 68,000-360,000) and the adult portion of the population is estimated at approximately 1,851 (range 1,488-2,320). PIFSC's PVA of the Western Pacific leatherback turtle population using nest count data from two nesting beaches representing approximately 85 % of the total nesting in the Western Pacific indicate that the population is exhibiting a long-term declining trend at a mean estimated population growth rate of -5.3 % (NMFS 2019; see Section 3.2.3). Projections show a high probability (greater than 91% probability on average) that the Western Pacific leatherback turtle population would fall below 12.5 to 50 % abundance thresholds within 100 years. While the long-term population trend is

negative and the projections generated using an exponential growth equation show that the population is likely to continue a declining trend, the underlying leatherback population data show an increase in the last few years of the dataset, suggesting some rebound capacity. An estimated mortality of up to 3 leatherback turtles of any size or sex in any given year represents 0.004% of the total population based on the lower range of the abundance estimate. If the population falls to 12.5% of the current size, NMFS estimates that the estimated mortality of up to 3 leatherback turtles would represent less than 0.03 percent of the total population or 0.066 percent of the summer nester population. NMFS concluded in the 2019 BiOp that this level of impact would be inconsequential and that the impacts from the fishery are not likely to appreciably reduce the species’ chances of survival and recovery in the wild (NMFS 2019).

Implementation of the individual trip limits under Alternative 2 is expected to provide early detection of and response to higher interaction rates that may indicate a potential for higher impacts to sea turtle populations, and is expected to reduce loggerhead and leatherback turtle interactions in such years. Individual trip limits are intended to mitigate a large proportion of loggerhead and leatherback turtle interactions from occurring in a single trip. Observed sea turtle interaction data since 2004 indicate that trips with loggerhead turtle interactions typically have 1-2 interactions per trip in years with low fleet-wide loggerhead turtle interactions (Table 16). Conversely, trips with 3 or more loggerhead turtle interactions have been observed in years with high fleet-wide interactions. In 2018, when the highest number of loggerhead turtle interactions was observed, 16% of the trips contributed to 58% of the total fleet-wide interactions. Monitoring the number of loggerhead turtle interactions per trip would provide an early detection mechanism for higher fleet-wide interactions, and the individual trip limit is expected to provide a “dampening” response by minimizing further interactions on those trips.

Leatherback turtle interactions in the shallow-set fishery have been less variable than loggerhead turtle interactions, with most trips with leatherback turtle interactions having 1-2 interaction per trip and only one trip having 3 interactions since 2004 (Table 16). Individual trip limits for leatherback turtle interactions is expected to serve as a preventative measure if higher interaction rates are observed in the future, and may also reduce interactions if vessels are able to avoid additional interactions after encountering the first leatherback on a given trip.

Table 16. Number of loggerhead and leatherback turtle interactions per trip for trips with at least one interaction, 2004-2019.

Loggerhead turtles			Leatherback turtles		
Number of turtles per trip	Number of trips	Percent of trips with ≥1 turtle interaction	Number of turtles per trip	Number of trips	Percent of trips with ≥1 turtle interaction
1	100	74.1%	1	85	89.5%
2	24	17.8%	2	9	9.5%
3	6	4.4%	3	1	1.1%
4	2	1.5%	4	0	NA
≥5	3	2.2%	≥5	0	NA

Source: PIFSC unpublished data

Individual trip limits are expected to provide an individual vessel incentive to avoid sea turtle interactions because shallow-set vessels may fish 500-1,000 nm from port and require considerable up-front costs for each trip, and thus a shortened trip duration may result in net loss

for that trip. Given the economic disincentive of reaching the trip limit, vessel operators are more likely to employ additional avoidance strategies if they encounter multiple interactions in a trip, such as moving away from the area and avoiding areas with higher potential for interactions using information from NMFS' TurtleWatch program. If vessels reach a trip limit once, that vessel is more likely to avoid fishing in the same area as the previous trip and employ additional avoidance strategies to prevent further economic loss. Thus conservation benefits are expected even before the individual trip limit is triggered.

The individual trip limit also has an inherent cooling-off period due to the distance between fishing grounds and ports in Honolulu and California where vessels fishing shallow-set gear under the Hawaii longline limited entry permit land their catch. The travel distance from port to the areas where the shallow-set vessels typically operate is at minimum 2-3 days and may take as long as 5-6 days one-way. If a vessel reaches a trip limit, the travel time back to port, the required 72-hour notice prior to departure under 50 CFR 665.803, and travel time to return to fishing grounds would result in a minimum of 7-10 day days of no fishing by the applicable vessel. This time lag between the last set on the trip in which a vessel reaches a trip limit and the first set on the subsequent trip provides a cooling-off period that allows for the conditions contributing to the high interactions to dissipate and reduces the likelihood of additional interactions in that area in subsequent trips. The trip limit also places the accountability of interactions on individual vessels and ensures that the consequence burden remains with the vessel that reaches the individual trip limit.

In response to a recommendation from the Council's Pelagic Plan Team at its May 2018 meeting, PIFSC conducted a simple simulation using observer data since 2004 to evaluate the potential effects of the individual trip limits on the fleet-wide annual loggerhead and leatherback turtle interactions. A range of individual trip limits were applied to the historical interaction data and any trip that reached the limit were truncated at that point with the remaining turtle interactions from that trip removed. For trips spanning two calendar years, if the scenario limit was reached at the end of the first year, and the trip had additional interactions in the same trip after the year changed, the trip was removed from the second year to simulate the trip being terminated after reaching the limit. The results of this simulation are shown in Table 17. It should be noted that this simulation assumes all other factors contributing to the number of loggerhead or leatherback turtle interactions per trip remain the same. In other words, the simulation does not assume any voluntary sea turtle avoidance behaviors by vessel operators that may further reduce interactions, any changes to fishing behavior in vessels not affected by the limits, or any other changes to the fleet behavior that may result in no net reduction in the fleet-wide annual number of interactions. Such assumptions were not incorporated into the simulations because individual trip limits have not been previously implemented in the Hawaii longline fishery, and operational data are not available to inform potential changes in vessel behavior for the simulation.

The simulation results show that the total number of interactions could have been reduced by at least one interaction in five out of the 16 years since 2004 for loggerhead turtles and one out of the 14 years for leatherback turtles by applying an individual trip limit of 2 (Table 17). On the higher end of the simulated limits, 2.2% of trips since 2004 with at least one loggerhead turtle interaction had 5 or more interactions per trip (Table 16), but truncating those trips with a limit of

5 loggerhead interactions per trip contributed to 14% and 30% lower interactions in 2017 and 2018, respectively (Table 17).

For leatherback turtles, truncating trips after 2 or more interactions could have had an effect on 1 year only when a limit of 2 per trip was applied, given that only 1 trip since 2004 had more than 3 interactions per trip since 2004. The individual trip limit for leatherback turtles is expected to serve as a preventative measure in the event that higher interaction rates are observed and if more vessels experience multiple leatherback turtles in a trip, thereby preventing the increase in interactions from levels observed since 2004. Additionally, individual trip limits for leatherbacks may also help reduce interactions if vessels are able to avoid additional interactions after encountering the first leatherback on a given trip.

The years with the reductions based on the simulation results are the years with the higher number of observed interactions for each species, suggesting that the individual trip limit may effectively reduce the potential of reaching the hard cap while reducing impacts to loggerhead and leatherback populations by preventing a large number of interactions from occurring in a small portion of the fleet. This would in turn help maintain opportunities to fish for swordfish throughout the year.

Table 17. Simulation results applying a range of individual trip limits to observed interaction data from 2004-2019.

Year	Loggerhead					Leatherback				
	Obs.	lim=2	lim=3	lim=4	lim=5	Obs.	lim=2	lim=3	lim=4	lim=5
2004	1	1	1	1	1	1	1	1	1	1
2005	12	12	12	12	12	8	8	8	8	8
2006	17	14 (-18%)	16 (-6%)	17	17	2	2	2	2	2
2007	15	15	15	15	15	5	5	5	5	5
2008	0	0	0	0	0	2	2	2	2	2
2009	3	3	3	3	3	9	9	9	9	9
2010	7	7	7	7	7	8	8	8	8	8
2011	12	12	12	12	12	16	16	16	16	16
2012	6	6	6	6	6	7	7	7	7	7
2013	6	6	6	6	6	11	11	11	11	11
2014	15	15	15	15	15	16	15 (-6%)	16	16	16
2015	13	13	13	13	13	5	5	5	5	5
2016	15	13 (-13%)	15	15	15	5	5	5	5	5
2017	21	14 (-33%)	16 (-24%)	17 (-19%)	18 (-14%)	4	4	4	4	4
2018	33	15 (-55%)	18 (-45%)	21 (-36%)	23 (-30%)	6	6	6	6	6
2019	20	19 (-5%)	20	20	20	0	0	0	0	0

Note: First column for each species (Obs.) is the actual number of observed interactions, and subsequent columns (lim=x) apply individual trip limits ranging from 2-5 to the actual observed interactions. Colored cells denote results that reduced the total fleet-wide interactions when trips were truncated after reaching the limit and the remaining interactions from the trip removed from the total.

Source: PIFSC unpublished data.

Under Alternative 2, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004. As such, effects to other protected species are expected to be within the baseline level of interactions described in Section 3.2, which do not represent substantial effects on any species.

4.2.3 Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp

Under Alternative 3, the fishery is expected to operate in a similar manner to Alternative 2 under hard cap limits and individual trip limits for both loggerhead and leatherback turtles and to have similar effects and conservation benefits to Alternative 2 (see Section 4.2.2). The primary differences between Alternative 2 and 3 is the additional restrictions for the individual trip limit on vessels that reach trip limits twice in a calendar year, and the required time between trips after reaching an individual trip limit the first time.

The conservation benefits of the additional restrictions on vessels that reach an individual trip limit twice in a calendar year may be limited beyond the simple trip limit under Alternative 2. Based on data from 2004-2019, no Hawaii shallow-set longline vessel has had 5 or more loggerhead turtles on two separate trips in a calendar year, or 2 or more leatherback turtles on two separate trips in a calendar year, indicating that the likelihood of a vessel reaching a trip limit twice in a calendar year and triggering additional restrictions is very low. While the additional restrictions on vessels that reach a trip limit twice in a calendar year may provide some further economic incentives to avoid loggerhead and leatherback turtle interactions, there are no operational data to inform the extent to which vessels may respond differently compared to the simple trip limits under Alternative 2. Therefore, the potential reduction in fleet-wide loggerhead and leatherback turtle interactions resulting from individual trip limits with additional restrictions is expected to be similar to the simulation results shown in Table 17 and described in Section 4.3.2. The additional restrictions on individual trip limits may serve as a preventative measure to provide further “dampening” effect if higher loggerhead or leatherback interaction rates are observed in the future.

Alternative 3 also prohibits vessels that reach an individual trip limit from engaging in shallow-set longline fishing for 5 days after returning to port, during which time NMFS is required under T&C 1b to evaluate vessel and turtle interactions to identify any problems and determine if guidance can be provided to the vessel to reduce the interactions. This requirement may extend the cooling-off period between the last set on the trip in which a vessel reaches a trip limit and the first set on the subsequent trip by a few days compared to Alternative 2. The extent to which additional few days of the cooling-off period further reduces the potential for higher interactions is unknown. Interactions on subsequent trips may be reduced if NMFS is able to identify potential sources of the higher interactions and provide appropriate guidance prior to the vessel resuming shallow-set fishing.

Under Alternative 3, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004. As such, effects to other protected species are expected to be

within the baseline level of interactions described in Section 3.2, which do not represent substantial effects on any species.

4.2.4 Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit

Under Alternative 4, the fishery will operate under a hard cap limit for leatherback turtles, no hard cap limit for loggerhead turtles, and individual trip limits with additional restrictions on vessels that reach a trip limit twice in a calendar year for both loggerhead and leatherback turtles. The primary difference between Alternative 3 and 4 is the removal of the current fleet-wide loggerhead hard cap limit of 17 from existing regulations without replacing it with a new limit.

The hard caps were first implemented as a measure to control sea turtle interactions on the model shallow-set longline fishery while information was being gathered on the effectiveness of using circle hooks and mackerel-type bait in the Hawaii fishery. At the time, the best available scientific information indicated that the North Pacific loggerhead turtle population was projected to decline (WPRFMC 2004). The current best available scientific information indicate that the North Pacific loggerhead population is increasing at an average rate of 2.4 percent, and the total population is estimated at approximately 340,000 turtles. The loggerhead hard cap would continue to be available as a management tool under the Pelagic FEP through future Council action if necessary to conserve the species.

Under Alternative 4, if the fishery exceeds the loggerhead ITS of 36 in the current BiOp, NMFS would reinitiate consultation pursuant to ESA Section 7, and the fishery may continue to operate during reinitiated consultation, subject to compliance with ESA Section 7(a)(2) and 7(d). While the ESA requires reinitiation of Section 7 consultation when an ITS is exceeded, it does not necessarily require that the fishery suspend operations upon reaching an ITS, or require hard caps or other mechanisms to close the fishery. Based on the predicted distribution of the anticipated level of loggerhead turtle interactions in the Hawaii shallow-set longline fishery (McCracken 2018), the long-term average is expected to be 15.6 loggerhead interactions per year, and the probability that the observed number of interactions in any given 1-year period would be greater than the ITS of 36 is less than 5 percent. The predictions assumed that the fishery operated throughout the year for every year included in the analysis and did not truncate the predicted takes, indicating that they provide a reasonable prediction of future level of interactions in the absence of a loggerhead hard cap limit. In the absence of a hard cap limit for loggerhead turtles, vessels would still be constrained by the individual trip limit of 5 loggerheads as well as additional restrictions if the trip limit is reached twice in a calendar year.

The individual trip limits for loggerhead and leatherback turtles are expected to provide early detection of and response to higher interaction rates that may indicate a potential for higher impacts to sea turtle populations. The expected fishery outcomes of individual trip limits and the additional restrictions if the trip limit is reached twice in a calendar year under Alternative 4 are similar to Alternative 3. Furthermore, additional restrictions on the individual trip limits for vessels that reach the loggerhead trip limit twice in a calendar year provides an alternative backstop to hard cap limits in preventing the fishery from accumulating interactions beyond the range anticipated and analyzed within the 2019 BiOp. As previously described, regulations for

safe handling and release of sea turtles including requirements to have on board turtle handling and dehooking gear will remain in place and will ensure that the loggerhead and leatherback turtles captured in the shallow-set longline fishery are released alive and high probability of post-release survival.

Therefore, the impacts to loggerhead and leatherback turtles under Alternative 4 are expected to be within and likely less than the baseline level of interactions described in Section 3.2, which do not represent substantial effects on the species. Effects to all other protected species are expected to be similar to the baseline conditions described in Section 3.2, which do not represent substantial effects on any species.

4.3 Potential Effects on Socioeconomic Setting

This section describes the potential effects of the alternatives for managing loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery on the socioeconomic setting identified in Section 3.3.

4.3.1 Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813)

Under Alternative 1, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year). This alternative would not provide for additional measures to reduce the potential for reaching the hard cap limit. As described in Section 4.2.1, the loggerhead hard cap limit of 17 is based on the ITS in the 2004 BiOp and is approximately half of the anticipated level of interactions estimated for the 2019 BiOp. The fishery is therefore expected to reach the loggerhead hard cap limit in some years. When a hard cap is reached, the fishery remains closed until January 1 of the subsequent calendar year and delays the start of the fishing season that typically starts around October. Of the years since 2004 when the fishery operated under a loggerhead hard cap of 17 (2004-2009; 2011; 2019), the fishery reached the limit in 2006 and 2019, both during March. The early closure in 2006 resulted in a 46 percent reduction in nominal revenue by Hawaii shallow-set longline vessels compared to the average of the years before and after (Table 15). Catch statistics for 2019 are not yet available.

During a fleet-wide hard cap closure, most shallow-set vessels are expected to convert to deep-setting gear to target bigeye tuna and continue to fish under the Hawaii longline limited entry permit. In the absence of the swordfish supply from the Hawaii shallow-set longline fishery, fish vendors are likely to increase imports of foreign-caught swordfish to fill the market gap in meeting the demand for swordfish in the US (see Chan and Pan 2016; Rausser et al. 2009). Factors other than the absence of U.S. caught fish in the market may cause foreign fleets to increase catch of target species (Scorse et al. 2017).

4.3.2 Alternative 2: Implement the Council’s Recommended Action from the 177th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery)

Under Alternative 2, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year) and is not expected to result in substantial changes in effects to the baseline conditions described in Section 3.3. The loggerhead hard cap limit of 36 interactions is based on the 95th percentile value of the predicted distribution of the anticipated level of interactions in any given 1-year period (McCracken 2018), and thus there is a low likelihood that the fishery will reach the loggerhead hard cap limit. The leatherback hard cap limit of 16 interactions is approximately 25 percent lower than the ITS that is based on the 95th percentile value of the predicted distribution, and thus there is a slightly higher probability that the fishery will reach the leatherback turtle hard cap limit in any given year than that of the loggerhead turtle. Additionally, the individual trip limits are expected to prevent a large proportion of the loggerhead or leatherback limit to be taken in a single trip or by a single vessel. This would in turn allow the remaining vessels to continue fishing for swordfish throughout the peak season and continue to fish throughout the year, resulting in a minor to moderate positive benefits for most vessels and minimizing the fleet-wide impacts to catch and revenue from fleet-wide hard cap closures.

Any vessel that reach the individual trip limit will be required to return to port without making additional sets, but may resume shallow-set fishing operations after returning to port and providing the required 72-hour notification prior to departure. Based on available observer data from 2004-2018, the probability of a single vessel experiencing high number of observed interactions in consecutive trips is low.

4.3.3 Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Fleet-wide Turtle Hard Cap Limit Equivalent to the ITS in the Current BiOp

Under Alternative 3, the fishery is expected to operate in a similar manner to Alternative 2 under hard cap limits and individual trip limits for both loggerhead and leatherback turtles. The primary difference between Alternative 2 and 3 is the additional restrictions for the individual trip limit on vessels that reach trip limits twice in a calendar year. As described under Section 4.3.2, the fishery is likely to have a lower likelihood of closing early in the calendar year from reaching the hard cap due to the combination of individual trip limits and a higher loggerhead hard cap limit.

Based on data from 2004-2019, no Hawaii shallow-set longline vessel has had 5 or more loggerhead turtles on two separate trips in a calendar year, or 2 or more leatherback turtles on two separate trips in a calendar year, indicating that the likelihood of a vessel reaching a trip limit twice in a calendar year is very low. However, should a vessel reach a trip limit twice in a calendar year, that vessel would be prohibited from fishing in the shallow-set fishery for the remainder of the calendar year, and would be required to adhere to a vessel interaction limit of 5 loggerhead or 2 leatherback turtles in the subsequent calendar year. Under such circumstance, the vessel limit of 2 leatherbacks may deter the vessel from participating in the shallow-set

longline fishery in the year that the vessel limit would apply, as the low limit may pose a high risk for entering into the fishery for the year.

4.3.4 Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit

Under Alternative 4, the fishery is expected to operate within the effort range observed since the reopening of the fishery in 2004 (approximately 650-1,850 sets per year) and is not expected to result in changes in effects to target and non-target stocks described in Section 3.3. As described in Section 4.2.4, the likelihood of the fishery exceeding the loggerhead turtle ITS of 36 is small (less than 5 percent in any given year), and the absence of a loggerhead hard cap limit would help ensure that the fishery continues to operate throughout the calendar year in the event that loggerhead turtle interactions exceed the ITS. The effects of the individual trip limits with additional restrictions are expected to be similar to that of Alternative 3.

4.4 Potential Effects on Management Setting

None of the alternatives are anticipated to adversely impact the marine habitat, particularly critical habitat, EFH, HAPC, marine protected areas (MPAs), marine sanctuaries, or marine monuments. The Hawaii shallow-set longline fishery is not known to have large adverse impacts to habitats, thus none of the Alternatives are likely to lead to substantial physical, chemical, or biological alterations to the habitat. Fishing activity would not occur in identified critical habitat, so no critical habitat would be impacted by the alternatives considered. Longline fishing does not occur in MPAs, marine sanctuaries or marine monuments, so no marine protected areas would be impacted.

Effects of the alternatives on administration are discussed in the following sections.

4.4.1 Alternative 1: No Action/Status Quo (Fishery operates under current annual fleet-wide hard cap limits of 17 loggerheads and 26 leatherbacks, as required by 50 CFR 665.813)

Alternative 1 would not modify the administrative procedures for the Hawaii shallow-set longline fishery. The fishery will continue to operate under a hard cap, which requires NMFS to publish a Federal Register notice upon the fishery reaching the annual loggerhead or leatherback limit to close the fishery for the remainder of the calendar year.

RPM T&C 1h of the 2019 BiOp states that, if T&C 1a and 1b have not been implemented by regulation by January 1, 2020, the Hawaii shallow-set longline fishery may reopen under an annual interaction limit of 16 leatherback and 17 loggerhead sea turtles until such regulations are in place. Therefore, under Alternative 1, additional action would be necessary if the fleet-wide leatherback turtle interactions reach 16 to implement RPM T&C 1h of the 2019 BiOp and to ensure compliance with ESA.

4.4.2 Alternative 2: Implement the Council's Recommended Action from the 177th Council Meeting (Modify annual fleet-wide hard cap limits and establish individual

trip limits for loggerhead and leatherback turtle interactions in the Hawaii shallow-set longline fishery

Administrative burden of implementing fleet-wide hard cap limits for loggerhead and leatherback turtles under Alternative 2 would be similar to Alternative 1.

Implementation of the individual trip limits would result in additional administrative burden to track the number of interactions by individual vessels or trips and to provide notice to vessels that reach a trip limit. These changes are likely to be minor, as the existing monitoring data provided by the observer program can be tracked at the individual trip level without substantial changes to the monitoring protocol. If the individual trip limit reduces the likelihood of reaching the hard cap limit, there would be reduced administrative burden for implementing hard cap closures.

4.4.3 Alternative 3: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPM T&C 1a and 1b in the 2019 BiOp, and Modify Loggerhead Turtle Fleet-wide Hard Cap Limit Equivalent to the ITS in the Current BiOp

Administrative burden for Alternative 3 is expected to increase compared to Alternative 2, due to the notification and monitoring procedures needed to implement additional restrictions on vessels that reach a trip limit twice in a calendar year. In addition to tracking loggerhead and leatherback turtle interactions on a per trip basis, NMFS would track vessel performance throughout the calendar year to monitor the number of times a vessel reaches a trip limit, and for any vessel that reached a trip limit twice in the previous calendar year, the cumulative number of interactions for the applicable species. When a vessel reaches a trip limit or the conditional annual vessel limit, NMFS would provide notice to the applicable vessel to return to port without making additional sets and would notify the conditions upon which the vessel may resume shallow-set fishing. Additionally, under Alternative 3, NMFS would evaluate vessel performance for turtle interactions when an individual trip limit is reached, within five days of the vessel arriving into port to identify any problems and determine if guidance can be provided to the vessel to reduce interactions. If the individual trip limit reduces the likelihood of reaching the hard cap limit, there would be reduced administrative burden for implementing hard cap closures.

4.4.4 Alternative 4: Modify Loggerhead and Leatherback Turtle Mitigation Measures Consistent with RPMs and T&C 1a and 1b, and Do Not Set Loggerhead Turtle Fleet-wide Hard Cap Limit

Administrative burden under Alternative 4 in implementing the leatherback hard cap limit and individual trip limits with additional restrictions for loggerhead and leatherback turtles is expected to be similar to Alternative 3. Administrative burden will be reduced for loggerhead turtle hard caps, as the fleet-wide limit will not be set and the fishery would not be closed when interactions exceed the ITS of 36. However, if the fishery exceeds the ITS for loggerhead turtles, NMFS would be required to reinitiate ESA consultation.

4.5 Potential Cumulative Effects of the Alternatives

Cumulative effects refer to the combined effects on the human environment that result from the incremental impact of the proposed action, and its alternatives, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-federal) or person undertakes such other actions. Further, cumulative effects can result from individually minor but collectively significant actions taking place over a period of time. The cumulative effects analysis examines whether the direct and indirect effects of the alternatives considered on a given resource interacts with the direct and indirect effects of other past, present and reasonably foreseeable actions on that same resource to determine the overall, or cumulative effects on that resource.

The following cumulative effects analysis is organized by the following issues: target and non-target species, protected species, and fishery participants and communities. Because pelagic longline fishing activities authorized occur far offshore and in deep oceanic waters away from land, populated areas, and marine protected areas such as marine national monuments, none of the Alternatives considered would have an effect on air/water quality, coral reefs, benthic marine habitats. As such, these resources will not be considered in this cumulative effects analysis.

4.5.1 Cumulative Effects Related to Effects on Target and Non-Target Stocks

Past, Present and Reasonably Foreseeable Management Actions

The Council has recommended NMFS implement or authorize several actions, which are presently in various stages of development and/or review before approval by NMFS. These include the following actions:

- Modifications to the territorial catch and/or effort and allocation limits measure to allow for multi-year limits and establishing allocation limits without catch limits;
- American Samoa longline limited access permit program modifications to support fishery participation by small vessels (< 50ft) in the fishery and reduce program complexity;
- Exemption to the American Samoa LVPA;
- Establishing a framework for domestic catch and effort limits and specifying a striped marlin limit;
- Revising FEP management objectives and converting the FEPs to living documents;
- Modification to the American Samoa longline swordfish trip limit;
- Annual catch limits for American Samoa, Guam, and CNMI bottomfish and MHI Kona crab for fishing year 2019; and
- Annual catch limits for MHI non-deep seven bottomfish, deepwater shrimp, and precious corals for fishing years 2019-2021.

In general, the Alternatives considered would not have interactive effects with the proposed actions listed as they vary in management scope and impact, and the public will have an opportunity to review and comment on the actions at a later date.

Regardless of which alternative is selected and which fishery outcome occurs, both the WCPFC and IATTC will continue to review fishery performance, stock status, and adopt management

measures that are applicable to fisheries that catch bigeye tuna. To meet the conservation and management objectives of these RFMOs, international cooperation is required. The United States will continue to participate in these organizations and implement conservation and management measures that apply to U.S. fisheries.

Five major exogenous factors were identified as having the potential to contribute to cumulative effects on pelagic target and non-target stocks, which are described in further detail in the Amendment 18 to the Pelagic FEP (WPRFMC 2009b):

- Fluctuations in the pelagic ocean environment focusing on regime shifts;
- Ocean noise;
- Marine debris; and
- Ocean productivity related to global climate change.

Potential Cumulative Effects on Target and Non-Target Species

Given that North Pacific swordfish stocks are currently healthy, it is not anticipated that exogenous factors coupled with the impacts of the Alternatives considered would have significant cumulative impacts to target and non-target species. The Alternatives considered under this action are not expected to increase fishing effort beyond the range observed since 2004. Impacts to other target and non-target species that have been showing signs of overfishing such as yellowfin, and striped marlin are very small are not anticipated to exceed thresholds that would lead to overfished conditions. Stocks of other target and non-target species are not subject to overfishing and the cumulative impacts including the impacts of the Alternatives considered are not believed to result in overfishing of these fish stocks.

4.5.2 Cumulative Effects Related to Protected Resources

Past, Present and Reasonably Foreseeable Management Actions

Through data collected from observer programs and other sources, the Council and NMFS will continue to monitor interactions between managed fisheries and protected species. NMFS scientists in association with other researchers will continue to collect biological samples to refine stock definitions as well as conduct surveys to monitor populations. The Council and NMFS will continue to conduct workshops with participation from fishermen to develop mitigation methods as appropriate, and NMFS will continue to conduct mandatory annual protected species workshops for all longline permit holders that teach how to identify marine mammals and how to reduce and mitigate interactions. Due to the recent listing of oceanic white tip shark and giant manta ray, NMFS has reinitiated ESA consultation on pelagic longline fisheries managed under the Pelagic FEP and has completed its consultation regarding the effects of the shallow-set fishery on these species.

Spillover and transferred effects may result from the market replacement of domestic swordfish with imported swordfish from countries with higher bycatch rates, as well as from production displacement of U.S. vessels with foreign vessels in the same general fishing area. Studies have demonstrated that the 2001-2004 closure of the Hawaii shallow-set longline fishery resulted in an increase of 2,882 sea turtle interactions associated with swordfish consumed in the U.S.

(Rausser et al. 2009), and the subsequent reopening of the fishery contributed to 842 to 1,826 fewer sea turtle interactions over the period of 2005-2008 (Chan and Pan 2012). Temporary closure of the Hawaii shallow-set longline fishery, especially during the peak season, that results in displacement of U.S. swordfish production with foreign production is therefore likely to result in increased impacts to sea turtle populations for the U.S. swordfish market.

Other past and present management actions, as well as exogenous factors affecting protected resources, are described in further detail in the Amendment 18 to the Pelagic FEP (WPRFMC 2009b). These include interactions in US and foreign fisheries, sea turtle conservation projects, human use and consumption of sea turtles, marine debris, fluctuations in the ocean environment, and climate change.

Potential Cumulative Effects on Protected Resources

The Council and NMFS have taken significant steps to reduce sea turtle and seabird interactions in longline fisheries, and ongoing work is being conducted to further reduce interactions. Longline fisheries managed under the Pelagic FEP are held as the benchmark (WCPFC Science Committee 2009 Report) for successful sea turtle, and seabird interaction reductions, and the successes of the Council and NMFS' work are being transferred to other fleets in the region.

Alternatives under consideration that have the potential to reduce the frequency of reaching the loggerhead or leatherback hard cap limits is likely to minimize the potential for transferred and spillover effects, thereby minimizing the overall impacts to sea turtle populations from swordfish consumption in the U.S.

Under all alternatives, U.S. longline vessels will continue to be subject to strict measures to avoid and reduce protected species interactions and to reduce the severity of interactions when they do occur. Therefore, impacts to protected species will be similar. The levels of interactions that are authorized in each fishery do consider the estimated impacts on the same species by all fisheries where the domestic fishery operates, as well as cumulative effects. Cumulative impacts of the U.S. fleets have been considered and authorized in the BiOps, and determinations of impacts to MMPA-protected species to a lesser extent, that apply to the domestic longline and other pelagic fisheries in the western Pacific region.

4.5.3 Cumulative Effects Related to Effects on the Socio-economic Setting

In accordance with the Magnuson-Stevens Act, the Council and NMFS will continue to assess the impact of management actions on fishery participants and fishing communities, and where possible, minimize negative effects while developing appropriate measures for the conservation and management of fishery resources.

There are a number of wide-ranging factors (that change over time) that have the potential to affect fishing participants as well as fishing communities. Current factors may include, but are not limited to, high fuel costs, high costs of other equipment and supplies, increased seafood imports, and restricted access to traditional fishing grounds. High fuel and materials/supply costs affect fishing participants by increasing the costs to go fishing.

The amount of imported seafood is also increasing, where the U.S. now imports nearly 85 percent of consumed seafood.¹² Increased seafood imports are significant as the level of imports relates to market competition, where a glut of foreign fish products can flood the market and lower ex-vessel prices for U.S. fishermen. Once U.S. fish products lose market channels to imported seafood products, it may also be hard for U.S. fishermen to regain those channels.

In addition, a reliance on foreign imports in Hawaii is believed to impact local food security. At a broader level, a recent study by the Great Britain's Royal Institute of International Affairs (Ambler-Edwards et al. 2009) has identified seven fundamental issues, which affect food production and food security. These are as follows:

1. Rapidly rising world population (population growth rates in the western Pacific region range from 1-7%)
2. Nutrition transition, i.e., a shift from traditional staples to processed foods high in sugars, oils, and fats
3. The rising costs of energy (oil, gas, electricity)
4. Limited availability of agricultural land (especially critical on small islands)
5. Increasing demands for water for agricultural and food production
6. Climate change
7. Labor and urban drift

With regard to the Hawaii fishing communities, which face the issues such as rising operational costs and increasing seafood imports, alternatives that result in more frequent fleet-wide hard cap closures may lead to more foreign imports of swordfish and other pelagic species to fill any market gaps in the Hawaii and U.S. seafood market that depend on fish products provided by the Hawaii shallow-set longline fishery throughout the year. The Hawaii longline fishery contributes to nearly half of the U.S. commercial swordfish landing.

4.5.4 Climate Change

A climate change impact analysis is a difficult undertaking given its global nature and interrelationships among sources, causes, mechanisms of actions and impacts. We focus our analysis on whether climate change is expected to impact resources that are the focus of this analysis including target stocks, non-target stocks, and on protected species.

The impacts of climate change on these resources may be positive if climate change impacts benefit a species' prey base or otherwise enhance the species' ability to survive and reproduce, or impacts may be negative if the impacts reduce a species' ability to survive and reproduce. Impacts may also be neutral.

Climate change would have similar impacts to the resources regardless of which Alternative is selected. In the coming years, the Council and NMFS will continue to monitor domestic catches of all pelagic MUS, and continue to consider information from scientifically-derived stock status reports as future catch and allocation limits are made, and as changes to fishery management are contemplated and implemented. Ongoing and future monitoring and research will allow fishery

¹² http://www.fishwatch.gov/farmed_seafood/index.htm

managers and scientists to consider impacts of climate change, fishing, and other environmental factors that are directly or indirectly affecting the resources.

The alternatives under consideration are not expected to substantially affect the level of fishing effort beyond the range observed since 2004. Neither NMFS, nor the Council controls where fishing vessels fish beyond existing restricted fishing areas, how long a fishing trip lasts, or other decisions that are made by individual fishermen. Some changes in fishing behavior may occur as a result of sub-alternatives considering individual trip or vessel limits or real-time spatial management measures if vessels engage in sea turtle avoidance methods that involve moving away from hotspots. However, any changes are likely to be minor as the overall effort level is not expected to be affected as a result of the alternatives under consideration. For these reasons, none of the alternatives are expected to result in a large change to greenhouse gas emissions.

Table 18. Summary of Effects of the Alternatives.

Topic	Alternative 1: No-action/Status Quo	Alternative 2: Implement the Council’s recommended action from the 177th Council Meeting	Alternative 3: Modify loggerhead and leatherback mitigation measures consistent with RPM T&C 1a and 1b in 2019 BiOp, and modify loggerhead fleet-wide hard cap limit equivalent to ITS	Alternative 4: Modify loggerhead and leatherback mitigation measures consistent with RPM T&C 1a and 1b, and do not set loggerhead fleet-wide hard cap limit
Biological resource: target and non-target stocks	Baseline conditions as described in Section 3.	No additional or new impacts expected to target and non-target stocks.	No additional or new impacts expected to target and non-target stocks.	No additional or new impacts expected to target and non-target stocks.
Biological resource: protected resources	Loggerhead limit: 17 Leatherback limit: 26 Fishery would not operate in compliance with current BiOp if leatherback interactions exceed 16. Effects to all other protected species expected to be similar to baseline conditions as described in Section 3.	Fleet-wide loggerhead and leatherback turtle interactions will remain below levels analyzed in the current BiOp. Likely to have lower loggerhead and leatherback interactions in years with higher interaction rates. Effects to all other protected species likely to be similar to No Action.	Fleet-wide loggerhead and leatherback turtle interactions will remain below levels analyzed in the current BiOp. Likely to have lower loggerhead and leatherback interactions in years with higher interaction rates. Effects to all other protected species likely to be similar to No Action.	Fleet-wide loggerhead and leatherback turtle interactions likely to remain below levels analyzed in the current BiOp. Likely to have lower loggerhead and leatherback interactions in years with higher interaction rates. Effects to all other protected species likely to be similar to No Action.
Socio-economic setting	Fishery likely to occasionally close from reaching the loggerhead or leatherback hard cap limit. Frequency of reaching loggerhead limit likely to be higher than reaching leatherback limit. Catch and revenue likely to be lower in years with hard cap closure, and if closure occurs earlier in the calendar year.	Fleet-wide impacts to catch and revenue from reaching the hard cap limit will be lower, as the individual trip limit is expected to lower the likelihood of reaching the fleet-wide hard cap. Vessel that reach the trip limit will be required to return to port without making additional sets, and may resume shallow-set fishing after providing the required 72-hour notification under 50 CFR 665.803 prior to departure. Vessels that do not reach the limit will continue to operate.	Similar to Alternative 2. Vessel that reach the trip limit will be required to return to port without making additional sets, and may resume shallow-set fishing after 5 days. Vessels that do not reach the limit will continue to operate. Vessels that reach the trip limit twice in calendar will be subject to a vessel limit equivalent to the trip limits. The low leatherback limit may deter vessels from participating in the fishery during that year.	Similar to Alternative 3. Vessel that reach the trip limit will be required to return to port without making additional sets, and may resume shallow-set fishing after 5 days. Vessels that do not reach the limit will continue to operate. Vessels that reach the trip limit twice in calendar will be subject to a vessel limit equivalent to the trip limits. The low leatherback limit may deter vessels from participating in the fishery during that year.

<p>Management setting</p>	<p>Baseline conditions as described in Section 3.</p>	<p>Minor changes to monitoring interactions will be required to track number of interactions per trip. Administrative burden may be reduced if frequency of hard cap closure is reduced.</p>	<p>Administrative burden is expected to increase due to notification and monitoring procedures for implementing additional restrictions on individual trip limits.</p> <p>Administrative burden may be reduced if frequency of hard cap closure is reduced.</p>	<p>Administrative burden is expected to increase due to notification and monitoring procedures for implementing additional restrictions on individual trip limits.</p> <p>Administrative burden may be reduced due to no hard cap limit for loggerhead turtles, although NMFS would be required to reinitiate ESA consultation if the loggerhead ITS is exceeded.</p>
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