

1.1 PROTECTED SPECIES

This section of the report summarizes information on protected species interactions in fisheries managed under the Pelagic FEP. Protected species covered in this report include sea turtles, seabirds, marine mammals, sharks, and corals. Most of these species are protected under the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and/or the Migratory Bird Treaty Act (MBTA). A list of protected species found in or near waters where fisheries managed under the Pelagic FEP operate and a list of critical habitat designations in the Pacific Ocean are included in [Appendix B](#).

1.1.1 HAWAII SHALLOW-SET LONGLINE FISHERY

1.1.1.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

This report monitors the status of protected species interactions in the Hawai'i shallow-set longline fishery using the following indicators:

- General interaction trends over time
- Effectiveness of FEP conservation measures
- Take levels compared to the incidental take statement (ITS) levels under the ESA
- Take levels compared to marine mammal Potential Biological Removals (PBRs), where applicable

Details of these indicators are discussed below.

1.1.1.1.1 Conservation Measures

The Pelagic FEP includes a number of conservation measures to mitigate seabird and sea turtle interactions in the shallow-set longline fishery. These measures include the following:

- Longline vessel owners/operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.
- Longline vessel owners/operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Longline vessel owners/operators can choose between side-setting or stern-setting longline gear with additional regulatory specifications to reduce seabird interactions (e.g., blue-dyed bait, weighted branch lines, strategic offal discards, using a “bird curtain”).
- 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.
 - 100 percent observer coverage
 - Vessel owners and operators required to annually attend protected species workshop

- Closure for remainder of year when fishery reaches annual interaction limits (“hard caps”). In 2019, the fishery operated under hard caps of 26 leatherback and 17 loggerhead turtles

1.1.1.1.2 ESA Consultations

Two valid Biological Opinions document the effects of the shallow-set fishery on ESA listed species. On January 6, 2012, the U.S. Fish and Wildlife Service issued a Biological Opinion on the effects of the Hawaii deep-set and shallow-set longline fisheries on ESA-listed seabirds (USFWS 2012). The USFWS concluded that the shallow-set fishery would not jeopardize the short-tailed albatross, and included an incidental take statement of one short-tailed albatross interaction every five years. To date the fishery has not interacted with any short-tailed albatross.

On June 26, 2019, NMFS issued a biological opinion on the effects of the shallow-set fishery on ESA-listed marine species (NMFS 2019). In total, 49 listed resources comprised of 40 listed species and nine critical habitat designations occur within the area the shallow-set fishery operates, and were analyzed in the 2019 Biological Opinion. 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 concluded that the continued authorization of the fishery is not likely to jeopardize the continued existence of any of the following: endangered North Pacific loggerhead sea turtle distinct population segment (DPS); endangered leatherback sea turtle; endangered Mexico breeding population of olive ridley sea turtle, and threatened (other) populations of olive ridley sea turtle; threatened Eastern Pacific green sea turtle DPS; threatened Central North Pacific green sea turtle DPS; threatened East Indian-West Pacific green sea turtle DPS; endangered Central West Pacific green sea turtle DPS; threatened Southwest Pacific green sea turtle DPS; endangered Central South Pacific green sea turtle DPS; threatened oceanic whitetip shark; threatened giant manta ray; and threatened Guadalupe fur seal.

In its 2019 Biological Opinion, NMFS issued an ITS for the loggerhead, leatherback, green, olive ridley, Guadalupe fur seal, oceanic whitetip shark, and giant manta ray, which were derived from interaction predictions generated by McCracken (2018) using a Bayesian inferential approach (Table 2). These predictions are based on observer data from 2005-2017 for all species, except for loggerheads (2005-2018) where more recent data were available.

Additionally, the 2019 Biological Opinion concluded that the shallow-set fishery may affect, but is not likely to adversely affect the following: hawksbill sea turtle; MHI insular false killer whale DPS; Mexico and Central America humpback whale DPSs; fin whale; blue whale; North Pacific right whale; sei whale; sperm whale; Eastern Pacific scalloped hammerhead shark DPS; and 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).

The 2019 Biological Opinion also concluded that the shallow-set fishery is not likely to adversely modify designated critical habitat for the following: leatherback sea turtle; Hawaiian monk seal; MHI insular false killer whale; Steller sea lion; and critical habitat for 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).

Due to the shallow-set fishery closure in March 2019 (see Section 1.1.1.3.2, this report), the fishery in 2019 operated under the 2012 Biological Opinion dated January 30, 2012, and modified on May 22, 2012 (NMFS, 2012).

Table 1. Summary of ESA consultations for the Hawai`i shallow-set longline fishery

Species or DPS	Consultation Date	Consultation Type ^a	Outcome ^b
Loggerhead turtle, North Pacific DPS	2019-06-26	BiOp	LAA, non-jeopardy
Leatherback turtle	2019-06-26	BiOp	LAA, non-jeopardy
Olive ridley turtle	2019-06-26	BiOp	LAA, non-jeopardy
Green turtle	2019-06-26	BiOp	LAA, non-jeopardy
Hawksbill turtle	2019-06-26	BiOp	NLAA
False killer whale, MHI insular DPS	2019-06-26	BiOp	NLAA
Fin whale	2019-06-26	BiOp	NLAA
Blue whale	2019-06-26	BiOp	NLAA
North Pacific right whale	2019-06-26	BiOp	NLAA
Sei whale	2019-06-26	BiOp	NLAA
Sperm whale	2019-06-26	BiOp	NLAA
Hawaiian monk seal	2019-06-26	BiOp	NLAA
Guadalupe fur seal	2019-06-26	BiOp	LAA, non-jeopardy
Scalloped hammerhead shark, Eastern Pacific DPS	2019-06-26	BiOp	NLAA
Oceanic whitetip shark	2019-06-26	BiOp	LAA, non-jeopardy
Giant manta ray	2019-06-26	BiOp	LAA, non-jeopardy
Listed fish and invertebrate species ^c	2019-06-26	BiOp	NLAA
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat	Consultation Date	Consultation Type ^a	Outcome ^b
Hawaiian monk seal	2019-06-26	BiOp	NLAA
False killer whale, MHI insular DPS	2019-06-26	BiOp	NLAA
Leatherback turtle	2019-06-26	BiOp	NLAA
Steller sea lion	2019-06-26	BiOp	NLAA
Listed fish and invertebrate species ^d	2019-06-26	BiOp	NLAA

^a BiOp = Biological Opinion.

^b LAA = likely to adversely affect; NLAA = not likely to adversely affect .

^c Listed fish and invertebrate species = 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.

^d Listed fish and invertebrate species = Central California coast coho salmon, Sacramento River winter-run Chinook salmon, California coast steelhead, Southern North American green sturgeon, and Black abalone.

Table 2. Summary of Incidental Take Statements (ITS) for the Hawai`i shallow-set longline fishery^a

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle (North Pacific DPS)	1-year	36	6	NMFS 2019
Leatherback turtle	1-year	21	3	NMFS 2019
Olive ridley turtle	1-year	5	1	NMFS 2019
Green turtle	1-year	5	1	NMFS 2019
Oceanic whitetip shark	1-year	102	32	NMFS 2019
Giant manta ray	1-year	13	4	NMFS 2019
Guadalupe fur seal	1-year	11	9	NMFS 2019
Short-tailed albatross	5-year	1 injury or death		USFWS 2012a

^a Based on the 2019 BiOp dated June 26, 2019. The fishery operated under the 2012 BiOp for the duration that the fishery was open in 2019.

1.1.1.1.3 Non-ESA Marine Mammals

Fishery impacts to marine mammal stocks are primarily assessed and monitored through the Stock Assessment Reports (SARs) prepared pursuant to the MMPA. The SARs include detailed information on these species’ geographic range, abundance, potential biological removal (PBR) estimates, bycatch estimates, and status. The most recent SARs are available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>.

The Hawai`i shallow-set longline fishery is a Category II under the MMPA 2020 List of Fisheries (LOF; 85 FR 21079, April 16, 2020), meaning that this fishery has occasional incidental mortality and serious injuries of marine mammals. The 2020 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- Blainville’s beaked whale, HI stock
- Bottlenose dolphin, HI Pelagic stock
- False killer whale, HI Pelagic stock
- Fin whale, HI stock
- Guadalupe fur seal, Isla Guadalupe stock
- Humpback whale, Central North Pacific stock
- Mesoplodon sp., unknown stock
- Northern elephant seal, CA breeding stock
- Risso’s dolphin, HI stock
- Rough-toothed dolphin, HI stock
- Short-beaked common dolphin, CA/OR/WA stock
- Striped dolphin, HI stock

Most bycatch estimates in the SARs are based on the most recently available 5-year period, but there is a data lag of at least two years due to the SAR review process. This annual report focuses

on available long-term interaction trends and summarizes relevant information from the most recent SAR.

1.1.1.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Protected species interactions in the Hawai`i longline fishery have been monitored through mandatory observer coverage since 1994. Observer coverage in the Hawai`i longline fishery was between 3 and 5 percent from 1994 through 1999 and increased to 10 percent in 2000. Since 2004, the shallow-set component of the Hawai`i longline fishery has had 100 percent observer coverage.

NMFS uses the date of the interaction for tracking interactions against the ITS and the shallow-set longline sea turtle hard caps, while the PIRO Observer Program Quarterly and Annual Reports summarizes interaction data by vessel arrival dates. As a result, the annual number of interactions counting toward the ITS and hard caps may differ from the numbers reported on the Observer Program Quarterly and Annual Reports. This report presents sea turtle interactions summarized by vessel arrival date (Table 50) and by interaction date (Table 51) for the Hawai`i shallow-set longline fishery. For the remainder of species and fisheries, the annual observed interactions are based on vessel arrival date for consistency with the Observer Program Reports.

In 2006 and 2019, the shallow-set longline fishery closed in March, and in 2018 the fishery closed in May (see section 1.1.1.3.2, this report). Due to these early closures in first and second quarters, data for these years are not representative of typical fishing years and should be interpreted with caution.

1.1.1.3 SEA TURTLE INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Table 50 summarizes the incidental take data of sea turtles from 2004 to 2019 in the Hawai`i shallow-set longline fishery summarized by vessel arrival date in accordance with the Observer Program. Additionally, Table 51 summarizes the sea turtle interaction data based on interaction date to allow comparison with the hard caps. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports as well as unpublished observer data and are for monitoring purposes. Since there is full observer coverage for this fishery, all sea turtle interactions have been documented. Many of these interactions have been examined further by PIFSC, and updated information necessary for any data analyses is available from PIFSC. The incidental take data for the fourth quarter of 2007 were combined with 2008 data due to vessel confidentiality rules.

Based on the vessel arrival date (Table 51), nearly all sea turtles observed in the Hawai`i shallow-set longline fishery from 2004 to 2019 were released alive, with the exception of two loggerhead turtles released dead in 2018, and one olive ridley turtle released dead in 2019. Additionally, one loggerhead in 2013 was entangled in marine debris that was entangled with fishing gear and NMFS did not count this turtle towards the annual shallow-set interaction limit. One unidentified hard shell in 2013 was classified by NMFS as a loggerhead per protocol and

was counted towards the annual shallow-set interaction limit for loggerheads. The highest interaction rates involved both leatherback and loggerhead turtles, whereas interactions with greens, olive ridleys, and unidentified hard shell turtles were much less frequent.

The observed number of sea turtle takes per year has been variable for green, olive ridley, leatherback, and unidentified hard shell turtles. At the end of 2017, relatively higher numbers of interactions with loggerhead turtles were observed, with higher numbers continuing into 2018 and 2019. In total, 21, 33, and 20 loggerhead turtles were observed in 2017, 2018, 2019, respectively, based on interaction date summary (Table 51). The fishery was closed May-December 2018 due to a stipulated settlement, and March-December 2019 due to reaching the loggerhead hard cap, thus interaction rate data for these years are not directly comparable to other years in which the fishery operated throughout the year. Additional discussion regarding the higher number of loggerhead turtle interactions observed since 2017 is provided in Section 3.2.1.3.2.

Table 3. Observed takes, mortalities (M) and takes per fishing effort (1,000 hooks) for sea turtles in the Hawai'i shallow-set longline fishery based on vessel arrival date associated with Pacific Islands Regional Observer Program annual reports, 2004-2019^a

Year	Observer Coverage (%)	Sets	Hooks	Green		Leatherback		Loggerhead		Olive ridley		Unidentified hard shell	
				Takes	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks
2004	100	88	76,750	0	0.000	1	0.013	1	0.013	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	8	0.006	10	0.008	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	2	0.003	17 ^b	0.023	0	0.000	2 ^c	0.003
2007 ^d	100	1,496	1,292,036	0	0.000	5	0.004	15	0.012	1	0.001	0	0.000
2008	100	1,487	1,350,127	1	0.001	2	0.001	0	0.000	2	0.001	0	0.000
2009	100	1,833	1,767,128	1	0.001	9	0.005	3	0.002	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	7	0.004	5	0.003	0	0.000	0	0.000
2011	100	1,579	1,611,395	4	0.002	17	0.011	14	0.009	0	0.000	0	0.000
2012	100	1,307	1,418,843	0	0.000	7 ^e	0.005	5	0.004	0	0.000	0	0.000
2013	100	912	1,000,084	0	0.000	6	0.007	5 ^f	0.005	0	0.000	1 ^g	0.001
2014	100	1,349	1,509,727	1	0.001	19	0.013	13	0.009	1	0.001	1	0.001
2015	100	1,178	1,286,628	0	0.000	6	0.005	15	0.012	1	0.001	0	0.000
2016	100	778	849,681	0	0.000	5	0.006	16	0.019	0	0.000	0	0.000
2017	100	973	1,051,426	2	0.002	4	0.004	16	0.015	4	0.004	0	0.000
2018	100	476	546,371	1	0.002	6	0.011	38(2)	0.070	1	0.002	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	20	0.053	2(1)	0.006	0	0.000

^a Take data are based on vessel arrival dates

^b The released conditions of two loggerheads were unknown.

^c The released condition of one unidentified hard shell turtle was unknown.

^d Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

^e The released condition of one leatherback was unknown.

^f One injured loggerhead was entangled in marine debris, which became entangled with fishing gear. This loggerhead will not count toward the annual shallow-set interaction limit, but is included in this table.

^g One turtle listed as an unidentified hard shell sea turtle in the Observer Program Status Report is being classified as a loggerhead per protocol for the shallow-set interaction limit and will count toward the annual shallow-set limit.

Sources: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

Table 4. Observed takes and takes per fishing effort (1,000 hooks) for sea turtles in the Hawai'i shallow-set longline fishery based on interaction date for comparison with the shallow-set sea turtle hard caps, 2004-2018^a

Year	Observer Coverage (%)	Sets	Hooks	Green		Leatherback		Loggerhead		Olive ridley		Unidentified hard shell	
				Takes	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes	Takes/ 1,000 hooks
2004	100	135	115,718	0	0.000	1	0.009	1	0.009	0	0.000	0	0.000
2005	100	1646	1,358,247	0	0.000	8	0.006	10	0.009	0	0.000	0	0.000
2006	100	850	676,716	0	0.000	2	0.003	17 ^b	0.022	0	0.000	2 ^c	0.003
2007 ^d	100	1569	1,353,761	0	0.000	5	0.004	15	0.011	1	0.001	0	0.000
2008	100	1595	1,460,042	1	0.001	2	0.001	0	0.000	2	0.001	0	0.000
2009	100	1761	1,694,550	1	0.001	9	0.005	3	0.002	0	0.000	0	0.000
2010	100	1872	1,835,182	0	0.000	8	0.004	7	0.004	0	0.000	0	0.000
2011	100	1474	1,505,467	4	0.003	16	0.011	12	0.008	0	0.000	0	0.000
2012	100	1364	1,476,969	0	0.000	7 ^e	0.005	6	0.004	0	0.000	0	0.000
2013	100	962	1,074,909	0	0.000	10	0.009	6 ^f	0.006	0	0.000	1 ^g	0.001
2014	100	1338	1,470,683	1	0.001	16	0.011	14	0.010	1	0.001	1	0.001
2015	100	1156	1,274,805	0	0.000	5	0.004	13	0.011	1	0.001	0	0.000
2016	100	727	796,165	0	0.000	5	0.006	15	0.019	0	0.000	0	0.000
2017	100	1005	1,083,216	2	0.002	4	0.004	21(1)	0.019	4	0.004	0	0.000
2018	100	420	486,013	1	0.002	6	0.012	33(1)	0.068	1	0.002	0	0.000
2019	100	314	374,487	0	0.000	0	0.000	20	0.053	2(1)	0.005	0	0.000

^a Take data are based on interaction dates

^b The released conditions of two loggerheads were unknown.

^c The released condition of one unidentified hard shell turtle was unknown.

^d Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

^e The released condition of one leatherback was unknown.

^f One injured loggerhead was entangled in marine debris, which became entangled with fishing gear. This loggerhead will not count toward the annual shallow-set interaction limit, but is included in this table.

^g One turtle listed as an unidentified hard shell sea turtle in the Observer Program Status Report is being classified as a loggerhead per protocol for the shallow-set interaction limit and will count toward the annual shallow-set limit.

Sources: Unpublished observer data.

1.1.1.3.1 Comparison of Interactions with ITS

Due to a fishery closure in March 2019, the Hawai'i shallow-set longline fishery in 2019 operated solely under the ITSs in the 2012 Biological Opinion (NMFS 2012). The ITS from the 2019 Biological Opinion did not take effect until January 2020 when the fishery reopened.

Under the 2012 Biological Opinion, NMFS began monitoring the ITSs for the Hawai`i shallow-set longline fishery in Quarter 1 of 2012 and used a rolling 2-year period to track incidental take. NMFS uses the date of the interaction for tracking sea turtle interactions against the ITS (Table 52), regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS counts sea turtle interactions based on vessel arrival dates (Table 50). For this reason, the number of quarterly or annual sea turtle interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses the post-hooking mortality criteria (Ryder et al., 2006) to estimate sea turtle mortality rates. As of June 26, 2019, the ITS from the 2019 Biological Opinion supersedes that of the ITS in the 2012 Biological Opinion.

Table 5. Observed interactions and estimated total mortality (M) (using Ryder et al., 2006) of sea turtles in the Hawai`i shallow-set longline fishery compared to the 2-year ITS in the 2012 Biological Opinion^a

Species	2-year ITS Interactions (M)	2-year Monitoring Period Interactions (M)						
		2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019
Green turtle	6(2)	0	1(0.25)	1(0.25)	0	2(0.10)	3(0.11)	1 (0)
Leatherback turtle	52(12)	18(3.05)	27(4.27)	21(4.07)	10(2.5)	9(2.35)	10(2.50)	6 (1.1)
Loggerhead turtle	68(14)	12(0.95)	21(2.31)	28(2.95)	28(3)	36(5.85)	54(9.42)	53 (8.4)
Olive ridley turtle	4(2)	0	1(0.05)	2(0.15)	1(0.1)	4(0.25)	5(0.75)	3 (1.1)

^a Takes are counted based on interaction date

1.1.1.3.2 Effectiveness of FEP Conservation Measures

From 2012 to 2018, the fishery did not reach the annual hard cap for either leatherback or loggerhead turtles (26 and 34, respectively, based on the 2012 Biological Opinion ITSs). The Hawai`i shallow-set longline fishery was closed in May 2018 pursuant to a settlement agreement. At the time of the closure, the fishery had 33 loggerhead interactions (Table 51), thus the fishery was closed prior to reaching the annual hard cap limit of 34 turtles. From 2004 to 2012, the shallow-set fishery operated under hard caps of 17 loggerhead turtles and 16 leatherback turtles (except in 2010 when the loggerhead hard cap was 46 under Pelagic FEP Amendment 18; later returned to 17 loggerheads due to litigation). The fishery reached the loggerhead hard cap in 2006 and the leatherback hard cap in 2011 (Table 51). Due to the 2018 stipulated settlement agreement, the hard cap limit of 17 loggerhead turtles was reinstated based on the 2004 Biological Opinion when the fishery reopened on January 1, 2019, and will remain in place until NMFS completes a new Biological Opinion and a revised hard cap limit is implemented. In 2019, the fishery closed on March 19 due to reaching the loggerhead hard cap limit of 17, and the fishery reopened on January 1, 2020.

Management measures in the Hawai`i shallow-set longline fishery have been effective in reducing the number of sea turtle interactions. The introduction of sea turtle bycatch reduction measures for the fishery in 2004, such as switching from J-hooks to circle hooks, and from squid bait to mackerel bait, resulted in an 89% decrease in sea turtle interactions in 2004-2006 compared to interactions observed in 1994 through 2002 (Gilman et al. 2007). The rate of deeply

hooked sea turtles, which is thought to result in higher mortality levels, also declined after those measures were implemented (Gilman et al., 2007).

In 2017-2019, loggerhead turtle interactions in the Hawai`i shallow-set longline fishery were higher than levels previously observed since the fishery reopened in 2004. A total of 21 loggerhead interactions were observed in 2017, 33 loggerhead interactions observed from January 2018 to the fishery closure in May, and 20 loggerhead interactions observed from January 2019 to the fishery closure in March. The increase in loggerhead interactions may be explained by the high reproductive output at their source nesting beaches in Japan. Loggerhead turtle nest counts increased nearly an order of magnitude from 1997 to 2014. The high levels of nesting likely resulted in higher hatchling production. Most of the loggerhead turtles observed interacting with the Hawai`i shallow-set longline fishery in 2017 and 2018 were in the range of 40-60 cm straight carapace length, which is estimated to be approximately 3-10 years in age and consistent with the period of high nesting in Japan.

In response to the higher number of loggerhead turtle interactions in the shallow-set fishery, the Council in 2018 developed management measures to provide managers and fishery participants with the necessary tools to respond to and mitigate fluctuations in loggerhead and leatherback turtle interactions, and to ensure a continued supply of fresh swordfish to U.S. markets, consistent with the conservation needs of these sea turtles. At its 179th Meeting in August 2019, the Council took final action to amend the Pelagic FEP to modify sea turtle mitigation measures for the shallow-set fishery, incorporating provisions required under the 2019 Biological Opinion Reasonable and Prudent Measures (RPMs) and Terms and Conditions 1a and 1b. Specifically, the Council recommended 1) setting an annual fleet-wide hard cap limit on the number of leatherback turtle interactions at 16, consistent with RPMs and Terms and Conditions 1a under the 2019 Biological Opinion; 2) not setting an annual fleet-wide hard cap limit on the number of North Pacific loggerhead turtle interactions; and 3) establish individual trip interaction limits for loggerhead and leatherback turtles for the shallow-set fishery, consistent with RPMs and Terms and Conditions 1b under the 2019 Biological Opinion. NMFS published the Notice of Availability for Amendment 10 on January 23, 2020 (85 FR 3889) and the proposed rule on February 4, 2020 (85 FR 6131). The final rule was published on [insert date when published] with an effective date of [insert date when published]. As part of the final action for Amendment 10, the Council recommended an annual review of the fishery's performance under the trip interaction limits in the Annual SAFE Report. This recommendation will be implemented in future reports.

1.1.1.4 MARINE MAMMAL INTERACTIONS IN THE HAWAI`I SHALLOW-SET LONGLINE FISHERY

Table 53 through Table 57 summarize the incidental take data of marine mammals from 2004 to 2019 in the Hawai`i shallow-set longline fishery. Since there is full observer coverage for this fishery, all marine mammal interactions are documented. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Reported interactions listed in these tables reflect all observed interactions, including mortalities, serious injuries, and non-serious injuries. Refer to the most recent SARs for mortality and serious injury estimates and stock-specific estimates of interactions. Many of these

interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from PIFSC. The incidental take data for the fourth quarter of 2007 were combined with 2008 data due to vessel confidentiality rules.

The majority of observed interactions and all mortalities during this time period involved small dolphin species (Table 53), although no interactions were observed in 2019. Of these species, Risso's dolphins had the highest rate of interactions over time, followed by bottlenose dolphins, striped dolphins, common dolphins, and rough-toothed dolphins with a single take. Marine mammals grouped as small whales (Table 54) and large whales (Table 55) had comparatively lower rates of interactions than most small dolphin species. Small and large whales with observed interactions since 2004 include false killer whale, Blainville's beaked whale, pygmy sperm whale, unidentified *Kogia* species, ginkgo-tooth beaked whale, Bryde's whale, humpback whale, and fin whale, although none of these species have been observed since 2016. Observed interactions with unidentified cetacean groups are shown in Table 56.

Interactions with pinnipeds, including Northern elephant seals, Guadalupe fur seals, and unidentified pinnipeds and sea lions have been occasionally observed since 2013 (Table 57). A total of five interactions with unidentified pinnipeds and sea lions were observed in 2015, all of which were taken outside of the EEZ offshore of California, while fishing under the Hawai'i longline limited entry permit. One Guadalupe fur seal was released injured in 2016 (the interaction actually occurred in 2015), and three were released injured in 2017. There were no interactions with pinnipeds documented in 2018, and one unidentified seal interaction was documented in 2019.

Table 6. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for dolphins in the Hawai`i shallow-set longline fishery, 2004-2019^a

Year	Observer Coverage (%)	Sets	Hooks	Bottlenose dolphin		Risso's dolphin		Rough-toothed dolphin		Short-beaked common dolphin		Striped dolphin	
				Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
2006	100	939	745,125	1	0.001	2(1)	0.003	0	0.000	0	0.000	0	0.000
2007 ^b	100	1,496	1,292,036	3	0.002	3	0.002	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	4(1)	0.003	0	0.000	0	0.000	1	0.001
2009	100	1,833	1,767,128	0	0.000	3	0.002	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	2	0.001	7(1)	0.004	0	0.000	0	0.000	2(1)	0.001
2011	100	1,579	1,611,395	2	0.001	4	0.002	0	0.000	1 ^c	0.001	0	0.000
2012	100	1,307	1,418,843	1	0.001	0	0.000	0	0.000	0	0.000	1	0.001
2013	100	912	1,000,084	2(1)	0.002	3	0.003	1(1)	0.001	0	0.000	0	0.000
2014	100	1,349	1,509,727	4	0.003	6(2)	0.004	0	0.000	1	0.001	2	0.001
2015	100	1,178	1,286,628	2	0.002	3(2)	0.002	0	0.000	0	0.000	0	0.000
2016	100	778	849,681	1	0.001	2	0.002	0	0.000	0	0.000	1	0.001
2017	100	973	1,051,426	0	0.000	2	0.002	0	0.000	0	0.000	1	0.001
2018	100	476	546,371	1	0.002	2	0.004	0	0.000	0	0.000	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

^a Take data are based on vessel arrival dates.

^b Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

^c Animal is identified as only a common dolphin in the Observer Program Status Report.

Source: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

Table 7. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for small whales in the Hawai'i shallow-set longline fishery, 2004-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Blainville's beaked whale		False killer whale		<i>Kogia</i> spp.		Pygmy sperm whale		Ginkgo-toothed beaked whale	
				Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2007 ^b	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	1	0.001	1	0.001	1	0.001	0	0.000
2009	100	1,833	1,767,128	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	1	0.001	1	0.001	0	0.000	0	0.000	0	0.000
2012	100	1,307	1,418,843	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
2013	100	912	1,000,084	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2014	100	1,349	1,509,727	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
2015	100	1,178	1,286,628	0	0.000	0	0.000	0	0.000	0	0.000	1	0.001
2016	100	778	849,681	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2017	100	973	1,051,426	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2018	100	476	546,371	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000

^a Take data are based on vessel arrival dates.

^b Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

Source: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

Table 8. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for large whales in the Hawai'i shallow-set longline fishery, 2004-2019^a

Year	Observer Coverage (%)	Sets	Hooks	Bryde's whale		Humpback whale		Fin whale	
				Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	1	0.001	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	1	0.001	0	0.000
2007 ^b	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	1	0.001	0	0.000
2009	100	1,833	1,767,128	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	0	0.000	1	0.001	0	0.000
2012	100	1,307	1,418,843	0	0.000	0	0.000	0	0.000
2013	100	912	1,000,084	0	0.000	0	0.000	0	0.000
2014	100	1,349	1,509,727	0	0.000	0	0.000	0	0.000
2015	100	1,178	1,286,628	0	0.000	1	0.001	1	0.001
2016	100	778	849,681	0	0.000	0	0.000	0	0.000
2017	100	973	1,051,426	0	0.000	0	0.000	0	0.000
2018	100	476	546,371	0	0.000	0	0.000	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	0	0.000

^a Take data are based on vessel arrival dates.

^b Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

Source: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

Table 9. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for unidentified dolphins, beaked whales, whales, and cetaceans in the Hawai'i shallow-set longline fishery, 2004-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Unidentified dolphin ^b		Unidentified beaked whale		Unidentified whale ^b		Unidentified cetacean ^b	
				Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks	Takes (M)	Takes/1,000 hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	0	0.000	1	0.001	0	0.000
2006	100	939	745,125	0	0.000	0	0.000	0	0.000	0	0.000
2007 ^c	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	0	0.000	1	0.001	0	0.000
2009	100	1,833	1,767,128	0	0.000	0	0.000	1	0.001	0	0.000
2010	100	1,879	1,828,529	1	0.001	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	0	0.000	1	0.001	0	0.000	2	0.001
2012	100	1,307	1,418,843	0	0.000	0	0.000	0	0.000	1	0.001
2013	100	912	1,000,084	0	0.000	2	0.002	0	0.000	0	0.000
2014	100	1,349	1,509,727	0	0.000	0	0.000	0	0.000	0	0.000
2015	100	1,178	1,286,628	0	0.000	0	0.000	0	0.000	0	0.000
2016	100	778	849,681	0	0.000	0	0.000	0	0.000	0	0.000
2017	100	973	1,051,426	0	0.000	0	0.000	0	0.000	0	0.000
2018	100	476	546,371	0	0.000	0	0.000	0	0.000	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	0	0.000	0	0.000

^a Take data are based on vessel arrival dates.

^b Unidentified species identification based on PIRO Observer Program classifications. Unidentified cetacean refers to a marine mammal not including pinnipeds (seal or sea lion); unidentified whale refers to a large whale; unidentified dolphin refers to a small cetacean with a visible beak; and unidentified beaked whale refers to an animal in the Ziphiidae family. Further classifications based on observer description, sketches, photos and videos may be available from the PIFSC.

^c Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

Source: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

Table 10. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for pinnipeds in the Hawai`i shallow-set longline fishery, 2004-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Northern elephant seal		Guadalupe fur seal		Unidentified pinniped		Unidentified sea lion		Unidentified seal	
				Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2004	100	88	76,750	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2005	100	1,604	1,328,806	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2006	100	939	745,125	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2007 ^b	100	1,496	1,292,036	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2008	100	1,487	1,350,127	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2009	100	1,833	1,767,128	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2010	100	1,879	1,828,529	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2011	100	1,579	1,611,395	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2012	100	1,307	1,418,843	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2013	100	912	1,000,084	1	0.001	0	0.000	0	0.000	0	0.000	0	0.000
2014	100	1,349	1,509,727	1	0.001	0	0.000	0	0.000	1	0.001	0	0.000
2015	100	1,178	1,286,628	0	0.000	0	0.000	3 ^c	0.002	2 ^c	0.002	0	0.000
2016	100	778	849,681	0	0.000	1	0.001	0	0.000	0	0.000	0	0.000
2017	100	973	1,051,426	0	0.000	3 ^c	0.003	0	0.000	0	0.000	0	0.000
2018	100	476	446,371	0	0.000	0	0.000	0	0.000	0	0.000	0	0.000
2019	100	312	374,487	0	0.000	0	0.000	0	0.000	0	0.000	1	0.003

^a Take data are based on vessel arrival dates.

^b Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

^c The interactions with these pinnipeds and sea lions occurred off the California coast, outside the EEZ, while fishing under the Hawai`i Longline Permit.

Source: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

1.1.1.4.1 Comparison of Interactions with ITS

As of June 26, 2019, the ITS from the 2019 Biological Opinion supersedes that of the ITS in the 2012 Biological Opinion. This includes a 1-year ITS of 11 interactions and 9 mortalities with the Guadalupe fur seal. The shallow-set fishery was closed in March 2019 before the new ITS went into effect. Future reports will include a comparison of the Guadalupe fur seal ITS and the observed interactions.

On September 8, 2016, NMFS issued a final rule identifying 14 distinct population segments (DPS) of the humpback whale under the ESA (81 FR 62260). Under this final rule, the Hawai`i DPS is not listed, so interactions are no longer being monitored against the ITS. Humpback whale interactions in the shallow-set longline fishery will continue to be monitored against the PBR in this report.

1.1.1.4.2 Comparison of Interactions with PBR under the MMPA

Marine mammal takes against the PBR are monitored through the SARs. A summary of the current mean annual M&SI and the PBR for stocks relevant to the Hawai`i shallow-set longline fishery is presented in Table 58. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawai`i, with the exception of the Central North Pacific stock of humpback whales for which PBR applies to the entire stock. The mean annual M&SI specified in the SARs includes only interactions determined as mortalities and serious injuries; it does not include interactions classified as non-serious injuries. The shallow-set longline fishery has not had an observed interaction with a short-finned pilot whale, but a mean annual M&SI is estimated for the Hawai`i stock based on a proration of unidentified blackfish (*Globicephalinae* spp.) interactions.

For marine mammal stocks where the PBR is available, the mean annual M&SI for the shallow-set longline fishery inside the EEZ around Hawai`i is well below the corresponding PBR in the time period covered by the current SAR (Table 58).

Table 11. Summary of mean annual mortality and serious injury (M&SI) and potential biological removal (PBR) by marine mammal stocks with observed interactions in the Hawai`i shallow-set longline fishery

Stock	Years Included in 2018 SARs	Outside EEZ ^a	Inside EEZ	
		Mean Annual M&SI	Mean Annual M&SI	PBR (Inside EEZ only) ^c
Bottlenose dolphin, HI Pelagic	2011-2015	2	0	140
Risso's dolphin, HI	2011-2015	3.2	0	82
Rough-toothed dolphin, HI	2011-2015	0	1	423
Striped dolphin, HI	2011-2015	0.6	0	449
Blainville's beaked whale, HI	2011-2015	0	0	10
False killer whale, HI Pelagic	2011-2015	0.1	0.1	9.3
Short-finned pilot whale, HI	2011-2015	0.1	0	106
<i>Kogia</i> spp. whale (Pygmy or dwarf sperm whale), HI	2007-2011	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	undetermined
Humpback whale, Central North Pacific	2013-2017 ^d	0 ^b		83 ^b
Fin whale, HI	2011-2015	0	0	0.1
Guadalupe fur seal, CA	2013-2017 ^d	0.4		1,062

^a PBR estimates are not available for portions of the stock outside of the U.S EEZ around Hawai`i, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.

^b PBR and M&SI for the Central North Pacific stock for humpback whales apply to the entire stock.

^c PBR estimates for Hawai`i stocks are only available for portions of the stock within the U.S. EEZ around Hawai`i.

^d Draft 2019 SAR.

Source: [2018 Marine Mammal SARs](#), [Draft 2019 Marine Mammal SARs](#).

1.1.1.5 SEABIRD INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Table 59 summarizes the incidental take data of seabirds from 2004 to 2019 in the Hawai`i shallow-set longline fishery. Since there is full observer coverage for this fishery, the interactions in Table 59 represent fishery-wide totals.

Interaction data provided here may vary slightly from other sources depending on how interactions were reported (date of trip departure or arrival, set date, or haul date in any given year). The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from NMFS.

NMFS annually publishes the report Seabird Interactions and Mitigation Efforts in Hawai`i Longline Fisheries (Seabird Annual Report), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Recent reports are available at: <https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactions-pelagic-longline-fishery>.

The majority of observed interactions and all mortalities during this time period involved Laysan albatrosses and black-footed albatrosses. The fishery has also had a small number of interactions with shearwaters and a northern fulmar, all of which were released injured, and one interaction with an unidentified gull that was released dead. NMFS identified the shearwaters as sooty shearwaters (NMFS 2016). There have been no observed takes of short-tailed albatrosses by this fishery.

Table 12 shows an increase in takes of black-footed albatrosses after 2008, with the highest number observed in 2017. Black-footed albatross takes in 2018 and 2019 were lower, which may be explained by temporal patterns in interactions. In typical years, the majority of black-footed albatross interactions occur in the second quarter (April-June), but there was low or no fishing effort in that quarter in 2018 as the shallow-set longline fishery was closed May-December 2018 and March-December 2019. Laysan albatross interactions were also low in 2017-2018. Interaction rate data for 2018-2019 are not directly comparable to other years in which the fishery operated throughout the year.

Table 12. Observed takes, mortalities (M), and takes per fishing effort (1,000 hooks) for seabirds in the Hawai`i shallow-set longline fishery, 2004-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Laysan Albatross		Black-footed Albatross		Northern fulmar		Unidentified shearwater		Unidentified gull		Short-tailed Albatross
				Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks	Takes (M)
2004	100	88	76,750	1	0.013	0	0.000	0	0.000	0	0.000	0	0.000	0
2005	100	1,604	1,328,806	62(18)	0.047	7(4)	0.005	0	0.000	0	0.000	0	0.000	0
2006	100	939	745,125	8(3)	0.011	3(3)	0.004	0	0.000	0	0.000	0	0.000	0
2007 ^b	100	1,496	1,292,036	39(6)	0.030	8(2)	0.006	0	0.000	0	0.000	0	0.000	0
2008	100	1,487	1,350,127	33(11)	0.024	6(4)	0.004	0	0.000	0	0.000	0	0.000	0
2009	100	1,833	1,767,128	81(17)	0.046	29(7)	0.016	0	0.000	1 ^c	0.001	0	0.000	0
2010	100	1,879	1,828,529	40(7)	0.022	39(11)	0.021	1	0.001	0	0.000	0	0.000	0
2011	100	1,579	1,611,395	49(10)	0.030	19(5)	0.012	0	0.000	0	0.000	0	0.000	0
2012	100	1,307	1,418,843	61(11)	0.043	37(10)	0.026	0	0.000	0	0.000	0	0.000	0
2013	100	912	1,000,084	46(10)	0.046	28(17)	0.028	0	0.000	2 ^c	0.002	0	0.000	0
2014	100	1,349	1,509,727	36(2)	0.024	29(14)	0.019	0	0.000	1 ^c	0.001	0	0.000	0
2015	100	1,178	1,286,628	45(6)	0.035	41(10)	0.032	0	0.000	0	0.000	0	0.000	0
2016	100	778	849,681	26(3)	0.031	40(12)	0.047	0	0.000	0	0.000	0	0.000	0
2017	100	973	1,051,426	6(1)	0.007	51(20)	0.049	0	0.000	0	0.000	1	0.001	0
2018	100	476	546,371	2	0.004	9(2)	0.017	0	0.000	0	0.000	0	0.000	0
2019	100	312	374,487	15(3)	0.048	19(5)	0.051	0	0.000	0	0.000	0	0.000	0

^a Take data are based on vessel arrival dates.

^b Due to vessel confidentiality rules, data for the fourth quarter in 2007 are combined with data for 2008. Take data for 2007 reflect those from first, second and third quarters.

^c These birds were later identified as sooty shearwaters in the NMFS Seabird Annual Report.

Source: [2004-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

1.1.1.5.1 Comparison of Interactions with ITS

The short-tailed albatross ITS in the USFWS 2012 Biological Opinion for the Hawai`i longline fishery is 1 incidental take every 5 years in the shallow-set fishery. Exceeding this number will lead to reinitiating consultation of the impact of this fishery on the species. Since there have been no observed takes of short-tailed albatrosses in the fishery, the ITS has not been exceeded as of the end of 2019.

1.1.1.6 ELASMOBRANCH INTERACTIONS IN THE HAWAII SHALLOW-SET LONGLINE FISHERY

Table 60 summarizes the incidental take data of ESA-listed elasmobranchs from 2004 to 2019 in the Hawai`i shallow-set longline fishery. There were no observed interactions with ESA-listed elasmobranchs in 2019. Oceanic whitetip sharks constitute the majority of the interactions and the observed number of takes ranges between 1 and 348, although the observed number of takes have been less than 32 per year since 2012. Observed oceanic whitetip shark interactions were substantially lower in 2004, 2006, 2018, and 2019 likely due to fishery closures. Spatial distribution of shallow-set fishing effort typically overlaps with oceanic whitetip shark distribution (south of 30°N) in the summer months. Most of the oceanic whitetip sharks that are caught in the shallow-set fishery are released alive.

Giant manta ray interactions with this fishery are rare. There were no observed interactions with scalloped hammerheads in the shallow-set fishery since 2004. Furthermore, there have been no recorded or observed take of scalloped hammerhead sharks in the range of the Eastern Pacific DPS in the shallow-set fishery. Based on the known range and likely occurrence for the Eastern Pacific DPS, it is unlikely that these sharks occur in the area where shallow-set fishing occurs.

Table 13. Observed and estimated interactions with elasmobranchs in the Hawai`i shallow-set longline fishery, 2004-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead shark		Oceanic whitetip shark		Giant manta ray	
				Takes (M ^b)	Takes/ 1,000 hooks	Takes (M ^b)	Takes/ 1,000 hooks	Takes (M)	Takes/ 1,000 hooks
2004	100	88	76,750	0	0.0000	3	0.0391	0	0.0000
2005	100	1,604	1,328,806	0	0.0000	348(32)	0.2619	0	0.0000
2006	100	939	745,125	0	0.0000	1	0.0013	0	0.0000
2007	100	1,496	1,292,036	0	0.0000	98(7)	0.0758	5(2)	0.0039
2008	100	1,487	1,350,127	0	0.0000	47(8)	0.0348	0	0.0000
2009	100	1,833	1,767,128	0	0.0000	54(14)	0.0306	0	0.0000
2010	100	1,879	1,828,529	0	0.0000	90(17)	0.0492	6	0.0027
2011	100	1,579	1,611,395	0	0.0000	78(9)	0.0484	3(2)	0.0031
2012	100	1,307	1,418,843	0	0.0000	24(2)	0.0169	0	0.0000
2013	100	912	1,000,084	0	0.0000	27(2)	0.0270	0	0.0000
2014	100	1,349	1,509,727	0	0.0000	21(3)	0.0139	1	0.0033
2015	100	1,178	1,286,628	0	0.0000	22(2)	0.0171	0	0.0000
2016	100	778	849,681	0	0.0000	32(3)	0.0377	0	0.0000
2017	100	973	1,051,426	0	0.0000	29(1)	0.0276	2	0.0048
2018	100	476	546,371	0	0.0000	1	0.0018	0	0.0000
2019	100	312	374,487	0	0.0000	0	0.0000	0	0.0000

^aTake data are based on vessel arrival dates.

^bMortality numbers include sharks that were released dead, finned, and kept.

Source: NMFS unpublished (2004-2018 data)

1.1.2 HAWAI`I DEEP-SET LONGLINE FISHERY

1.1.2.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

In this annual report, the Council monitors protected species interactions in the Hawai`i deep-set longline fishery using the following indicators:

- General interaction trends over time
- Effectiveness of FEP conservation measures
- Take levels compared to the incidental take statement levels under ESA
- Take levels compared to marine mammal PBRs, where applicable

1.1.2.1.1 Conservation Measures

The Pelagic FEP includes a number of conservation measures to mitigate seabird and sea turtle interactions in the deep-set longline fishery. These measures include the following:

- Longline vessel owners/operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.
- Longline vessel owners/operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Deep-set fishing operations north of 23° N latitude are required to comply with seabird mitigation regulations, which include choosing between side-setting or stern-setting longline gear with additional regulatory specifications (e.g., blue-dyed bait, weighted branch lines, strategic offal discards, using a “bird curtain”).
- The fishery is observed at a minimum of 20 percent coverage.
- Vessel owners and operators are required to annually attend a protected species workshop.

1.1.2.1.2 ESA Consultations

The Hawai`i deep-set longline fishery is covered under a NMFS Biological Opinion dated September 19, 2014 (NMFS 2014). NMFS concluded that the fishery is not likely to jeopardize four sea turtle species (North Pacific DPS loggerhead, leatherback, olive ridley and green turtles), three marine mammal species (humpback whale, sperm whale and MHI insular DPS false killer whale) and the Indo-West Pacific DPS of scalloped hammerhead sharks, and not likely to adversely affect hawksbill turtles, four marine mammal species (blue, North Pacific right and sei whale, and Hawaiian monk seal) and the Eastern Pacific DPS of scalloped hammerhead sharks (Table 60). The humpback whale Hawai`i DPS was delisted under the ESA in 2016, so interactions are no longer monitored against the ITS. A USFWS Biological Opinion dated January 6, 2012, also concluded that the fishery is not likely to jeopardize short-tailed albatrosses (USFWS 2012a). An additional informal consultation dated September 16, 2015 concluded that the fishery is not likely to adversely affect fin whales or Hawaiian monk seal critical habitat. In 2017, NMFS completed a Supplement to the 2014 Biological Opinion for green, loggerhead, and olive ridley sea turtles due to exceedance of the ITS for these three species (NMFS 2017).

NMFS and USFWS have issued ITSs for species included in the Biological Opinions and determined not to jeopardize the species (Table 62). Exceedance of the 3-year or 5-year ITSs requires reinitiation of consultation on the fishery under the ESA. The ITSs for green turtle and loggerhead turtles were exceeded in 2015 and the ITS for olive ridley turtles was exceeded during the first quarter of 2016, and reconsultation was completed on March 24, 2017.

On October 4, 2018, NMFS reinitiated ESA Section 7 consultation for the deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area due to three re-initiation triggers: listing of the oceanic whitetip shark and giant manta ray; designation of MHI insular false killer whale critical habitat; and exceeding the ITS for East Pacific green

sea turtle DPS in mid-2018. On October 4, 2018, NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d) (updated [insert date]). Until NMFS completes the Section 7 consultation and issues a new biological opinion, the 2014 Biological Opinion as supplemented (2017) remains valid for all species and critical habitat considered in the 2014 BiOp as supplemented.

Table 14. Summary of ESA consultations for the Hawai`i deep-set longline fishery

Species	Consultation Date	Consultation Type ^a	Outcome ^b
Loggerhead turtle, North Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Leatherback turtle	2014-09-19	BiOp	LAA, non-jeopardy
Olive ridley turtle, Endangered Mexico and threatened eastern Pacific populations	2017-03-24	BiOp ^c	LAA, non-jeopardy
Olive ridley turtle, Threatened western Pacific population	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, East Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Central North Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, East Indian-West Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Southwest Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Central West Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Green turtle, Central South Pacific DPS	2017-03-24	BiOp ^c	LAA, non-jeopardy
Hawksbill turtle	2014-09-19	BiOp	NLAA
False killer whale, MHI insular DPS	2014-09-19	BiOp	LAA, non-jeopardy
Fin whale	2015-09-16	LOC	NLAA
Blue whale	2014-09-19	BiOp	NLAA
North Pacific right whale	2014-09-19	BiOp	NLAA
Sei whale	2014-09-19	BiOp	NLAA
Sperm whale	2014-09-19	BiOp	LAA, non-jeopardy
Hawaiian monk seal	2014-09-19	BiOp	NLAA
Scalloped hammerhead shark, Eastern Pacific DPS	2014-09-19	BiOp	NLAA
Scalloped hammerhead shark, Indo-West Pacific DPS	2014-09-19	BiOp	LAA, non-jeopardy
Short-tailed albatross	2012-01-06	BiOp (FWS)	LAA, non-jeopardy
Critical Habitat: Hawaiian monk seal	2015-09-16	LOC	NLAA

^a BiOp = Biological Opinion; LOC = Letter of Concurrence.

^b LAA = likely to adversely affect; NLAA = not likely to adversely affect.

^c Supplement to the 2014 BiOp.

Table 15. Summary of ITSs for the Hawai`i deep-set longline fishery

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle, North Pacific DPS	3-year	18	13	NMFS 2017
Leatherback turtle	3-year	72	27	NMFS 2014
Olive ridley turtle, Endangered Mexico and threatened eastern Pacific populations	3-year	144	134	NMFS 2017

Olive ridley turtle, Threatened western pacific population	3-year	42	40	NMFS 2017
Green turtle, East Pacific DPS	3-year	12	12	NMFS 2017
Green turtle, Central North Pacific DPS	3-year	6	6	NMFS 2017
Green turtle, East Indian-West Pacific DPS	3-year	6	6	NMFS 2017
Green turtle, Southwest Pacific DPS	3-year	6	6	NMFS 2017
Green turtle, Central West Pacific DPS	3-year	3	3	NMFS 2017
Green turtle, Central South Pacific DPS	3-year	3	3	NMFS 2017
Sperm whale	3-year	9	6	NMFS 2014
False killer whale (MHI insular DPS)	3-year	1	0.74	NMFS 2014
Scalloped hammerhead shark (Indo-West Pacific DPS) ^a	3-year	6	3	NMFS 2014
Short-tailed albatross	5-year	2 injuries or deaths		FWS 2012

^a An ITS is not required for the Indo-West Pacific DPS of scalloped hammerhead sharks due to the lack of take prohibition under ESA section 4(d), but NMFS included an ITS to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger.

1.1.2.1.3 Non-ESA Marine Mammals

Fishery impacts to marine mammal stocks are primarily assessed and monitored through the SARs prepared pursuant to the MMPA. The SARs include detailed information on these species’ geographic range, abundance, PBR estimates, bycatch estimates, and status. The most recent SARs are available online at: <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>.

The Hawai`i deep-set longline fishery is a Category I fishery under the MMPA 2020 LOF (85 FR 21079, April 16, 2020), meaning that NMFS has determined that this fishery has frequent incidental mortality and serious injuries of marine mammals. The 2020 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- Bottlenose dolphin, HI Pelagic stock
- False killer whale, MHI Insular stock (also ESA-listed)
- False killer whale, HI Pelagic stock
- False killer whale, NWHI stock
- Humpback whale, Central North Pacific stock
- *Kogia* spp. (Pygmy or dwarf sperm whale), HI stock
- Pygmy killer whale, HI stock
- Risso’s dolphin, HI stock
- Rough-toothed dolphin, HI stock
- Short-finned pilot whale, HI stock
- Striped dolphin, HI stock

Most bycatch estimates in the SARs are based on the most recently available 5-year period, but there is a data lag of approximately 2 years due to the SAR review process. This annual report focuses on available long-term interaction trends and summarizes relevant information from the most recent SAR.

1.1.2.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Protected species interactions in the Hawai'i longline fishery have been monitored through mandatory observer coverage since 1994. Observer coverage in the Hawai'i longline fishery was between 3 and 5 percent from 1994 through 1999, increased to 10 percent in 2000, then to 20 percent in 2001. This report summarizes protected species interactions in the Hawai'i deep-set longline fishery since 2002, when separate reporting by deep-set and shallow-set components of the longline fishery began. Annual observed interactions are tallied based on vessel arrival date (rather than interaction date) for the purposes of this report for consistency with the Observer Program reports, and to allow for comparison with historical yearly interaction data (e.g., Table 50). Comparison of annual incidental takes within a year to the ITSs are based on the interaction date rather than the vessel arrival date, consistent with the 2014 and 2017 Biological Opinions (e.g., Table 51).

1.1.2.3 SEA TURTLE INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Table 63 summarizes the incidental take data of sea turtles from 2002 to 2019 in the Hawai'i deep-set longline fishery. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from PIFSC. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (referred to in this document as "McCracken estimates (ME)"). When ME are not available, a standard expansion factor estimate is used ($EF\ Est. = 100 / \% \text{ observer coverage} * \# \text{ takes}$).

Observed sea turtle takes year to year were variable. The most commonly observed sea turtle species being olive ridley sea turtles, whereas interactions with leatherbacks, greens, and loggerheads were much less frequent.

Preliminary results from an analysis conducted by PIFSC and presented to the Scientific and Statistical Committee at its 122nd Meeting in March 2016 showed that leatherback interactions in 2014 were significantly higher than levels expected from previous years (2007-2013). The higher level of interactions in 2014 was considered in the 2014 Biological Opinion, which concluded that the fishery is not likely to jeopardize leatherback turtles. Leatherback interactions, since the 2014 Biological Opinion, remain below the ITS of 72 interactions over three years. The Council at its 165th Meeting in March 2016 recommended continued monitoring of the interactions and further analysis to evaluate patterns of leatherback interactions in the Hawai'i deep-set longline fishery. Leatherback turtle interactions in 2017-2019 were lower than 2014-2015.

The highest number of observed olive ridley interactions occurred in 2016 with 31 takes. This was followed by three years of high olive ridley interactions with 26, 18, and 29 interactions in 2017, 2018, and 2019, respectively. Due to the depth of the deep-set longline gear and the relatively smaller size of olive ridley turtles compared to leatherback turtles, most of the interactions result in mortalities. The higher level of olive ridley turtle interactions was considered in the 2017 Supplement to the 2014 Biological Opinion, which analyzed impacts with data through the second quarter of 2016 (25 of the 31 interactions occurred in the first two quarters). The 2017 Supplement to the 2014 Biological Opinion concluded that the fishery is not likely to jeopardize olive ridley turtles after considering this higher level of interactions. The Council’s Protected Species Advisory Committee at its March 2017 meeting discussed the olive ridley turtle interaction trend and recommended evaluation of the increasing trend in conjunction with the previously recommended effort to evaluate ecosystem factors influencing bycatch in the longline fishery.

Based on this recommendation, Council and NMFS implemented an ecosystem-based fisheries management project using an ensemble random forest model. This model utilizes a suite of environmental, effort and species data to predict the chance of an interaction with an olive ridley sea turtle. Preliminary results suggest the highest ranked variables predicting an olive ridley interaction in the Hawai`i deep-set longline fishery include temperature at the mixed layer, sea surface temperature, and current divergence. The next steps include modeling three case studies (olive ridley sea turtles, black-footed albatross and oceanic whitetip sharks) to evaluate the efficacy of management strategies in the Hawai`i and American Samoa longline fisheries. Additionally, the ensemble random forest model can be used to validate TurtleWatch. Furthermore, the model can incorporate multiple species as well as target species to determine if avoiding one protected species will result in greater interactions with others.

Table 16. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for sea turtles in the Hawai'i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Green				Leatherback				Loggerhead				Olive ridley				Unidentified hard shell		
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		ME
				Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks	
2002	24.6	3,523	6,786,303	1(1)	0.0001	-	3	2	0.0003	-	5	4(1)	0.0006	-	17	7(7)	0.0010	-	31	0	0.0000	-
2003	22.2	3,204	6,442,221	0	0.0000	-	0	1(1)	0.0002	-	4	0	0.0000	-	0	3(3)	0.0005	-	14	0	0.0000	-
2004	24.6	3,958	7,900,681	1(1)	0.0001	-	5	3	0.0004	-	15	0	0.0000	-	0	13(13)	0.0016	-	46	0	0.0000	-
2005	26.1	4,602	9,360,671	0	0.0000	-	0	1	0.0001	-	4	0	0.0000	-	0	4(4)	0.0004	-	16	0	0.0000	-
2006	21.2	3,605	7,540,286	2(2)	0.0003	-	6	2(2)	0.0003	-	9	0	0.0000	-	0	11(10)	0.0015	-	54	0	0.0000	-
2007	20.1	3,506	7,620,083	0	0.0000	-	0	2	0.0003	-	4	1(1)	0.0001	-	7	7(7)	0.0009	-	26	0	0.0000	-
2008	21.7	3,915	8,775,951	0	0.0000	-	0	1	0.0001	-	11	0	0.0000	-	0	3(3)	0.0003	-	18	0	0.0000	-
2009	20.6	3,520	7,877,861	0	0.0000	-	0	1(1)	0.0001	-	4	0	0.0000	-	0	4(4)	0.0005	-	18	0	0.0000	-
2010	21.1	3,580	8,184,127	1(1)	0.0001	-	1	1(1)	0.0001	-	6	1(1)	0.0001	-	6	4(3) ^b	0.0005	-	10	0	0.0000	-
2011	20.3	3,540	8,260,092	1(1)	0.0001	-	5	3	0.0004	-	14	0	0.0000	-	0	7(6)	0.0008	-	36	0	0.0000	-
2012	20.4	3,659	8,768,728	0	0.0000	-	0	1(1)	0.0001	-	6	0	0.0000	-	0	6(6)	0.0007	-	34	0	0.0000	-
2013	20.4	3,830	9,278,133	1(1)	0.0001	-	5	3	0.0003	-	15	2(2)	0.0002	-	11	9(9)	0.0010	-	42	0	0.0000	-
2014	20.8	3,831	9,608,244	3(3)	0.0003	-	16	7(2)	0.0007	-	38	0	0.0000	-	0	8(7)	0.0008	-	50	0	0.0000	-
2015	20.6	3,728	9,393,234	1(1)	0.0001	-	4	4(2)	0.0004	-	18	2(2)	0.0002	-	9	13(12)	0.0014	-	69	0	0.0000	-
2016	20.1	3,880	9,872,439	1(1)	0.0001	-	5	3(1)	0.0003	-	15	2(1)	0.0002	-	7	31(28)	0.0031	-	162	1(1)	0.0001	5
2017	20.4	3,832	10,148,195	3(1)	0.0003	-	18	0	0.0000	-	0	3	0.0003	-	12	26(23)	0.0026	-	118	0	0.0000	-
2018	20.4	4,332	11,751,144	3(3)	0.0003	15	-	2	0.0002	10	-	1(1)	0.0001	5	-	18(16)	0.0015	88	-	0	0.0000	-
2019	20.5	4,697	12,948,077	2(2)	0.0002	10	-	3	0.0002	15	-	0	0.0000	0	-	29(28)	0.0022	141	-	0	0.0000	-

^a Take data are based on vessel arrival dates.

^b One olive ridley turtle interaction (released injured) occurred inside the American Samoa EEZ. This interaction was included in the Observer Program Annual Report for the Hawai'i deep-set fishery because the vessel departed Honolulu under the Hawai'i longline permit.

Sources: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#). Expansion estimates for 2002-2003 — NMFS 2005.

ME—[McCracken, 2005](#); [McCracken, 2006](#); [McCracken, 2007](#); [McCracken, 2008](#); [McCracken, 2009](#); [McCracken, 2010](#); [McCracken, 2011b](#); [McCracken, 2012](#); [McCracken, 2013](#); [McCracken, 2014](#); [McCracken 2017c](#), [McCracken 2017d](#), [McCracken 2019b](#).

1.1.2.3.1 Comparison of Interactions with ITS

The Hawai`i deep-set longline fishery operates under the 3-year ITS in the 2014 Biological Opinion for leatherback sea turtles, and in the 2017 Supplement to the 2014 Biological Opinion for all other sea turtle species (Table 64; Table 65). NMFS began monitoring the 2014 Biological Opinion ITS in Quarter 3 of 2014 and the 2017 Supplement to the 2014 Biological Opinion ITS in Quarter 3 of 2016, and uses a rolling 3-year period to track incidental take. NMFS always uses the interaction date for tracking sea turtle interactions against the ITS, regardless of vessel arrival date. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures, and bases sea turtle interactions on vessel arrival dates. For this reason, the number of quarterly or annual sea turtle interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses post-hooking mortality criteria (Ryder et al., 2006) to calculate sea turtle mortality rates.

Unlike the Hawai`i shallow-set longline fishery, the deep-set fishery does not have hard caps and the ITS triggers reinitiation of consultation when exceeded. The ITSs for green and olive ridley turtles were exceeded in 2018. On October 4, 2018, NMFS reinitiated consultation for the deep-set fishery due in part to exceeding the ITS for the east Pacific green turtle DPS. Since the October 4, 2018, reinitiation, the deep-set fishery has also exceeded the ITS for the North Pacific loggerhead turtle and eastern and western Pacific populations of olive ridley turtle. NMFS has since updated its analysis under ESA Sections 7(a)(2) and 7(d). Until NMFS completes the Section 7 consultation and issues a new biological opinion, the 2014 Biological Opinion as supplemented (2017) remains valid for all species and critical habitat considered in the 2014 Biological Opinion as supplemented.

Table 17. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortalities (M) (using Ryder et al., 2006) of sea turtles in the Hawai`i deep-set longline fishery compared to the 3-year ITS in the 2014 Biological Opinion and in the 2017 Supplement to the 2014 Biological Opinion^a

2014 BiOp			
Species	3-year ITS Interactions (M)	Estimated Total Interactions and Mortalities Interactions (M)	
		2016-2018	2017-2019
Leatherback turtle	72(27)	21.12(8.6)	25.51 (4.43)
2017 Supp. BiOp			
Species	3-year ITS Interactions (M)	Estimated Total Interactions and Mortalities Interactions (M)	
		Q3 2016-Q4 2018	2017-2019
Green turtle	-	-	-
East Pacific DPS	12(12)	20.38(18.67)	21.63 (20.28)
Central North Pacific DPS	6(6)	3.49(3.19)	7.75 (7.27)
East Indian-west Pacific DPS	6(6)	2.33(2.13)	3.29 (3.09)
Southwest Pacific DPS	6(6)	2.04(1.87)	2.83 (2.65)

Central West Pacific DPS	3(3)	0.29(0.27)	1.09 (1.02)
Central South Pacific DPS	3(3)	0.29(0.27)	1.94 (1.82)
Loggerhead turtle	18(13)	15(9.5)	20 (12.64)
Olive ridley turtle	-	-	
Endangered Mexico and threatened eastern Pacific populations	141(134)	179(168.09)	256.12 (244.31)
Threatened western Pacific populations	42(40)	53(49.77)	88.59 (84.5)

^a Takes are counted based on interaction date.

1.1.2.4 MARINE MAMMAL INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Table 65 through Table 71 summarize the incidental take data of marine mammals from 2002 to 2019 in the Hawai'i deep-set longline fishery. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Reported interactions listed in these tables reflect all observed interactions, including mortalities, serious injuries, and non-serious injuries. Refer to the most recent SARs for mortality and serious injury estimates and stock-specific abundance estimates and geographic range. Many of these interactions have been further examined, and updated information necessary for any data analyses is available from PIFSC. Observed take data are expanded to represent the estimated number of annual incidental takes for the entire fishery by PIFSC (referred to in this document as “ME”). When ME are not available, a standard expansion factor estimate is listed in the table (EF Est. = 100 / % observer coverage * # takes).

The majority of observed interactions and all observed mortalities since 2002 involved dolphin and small whale species. Observed interactions with false killer whales were more frequent, with the highest number of observed interactions occurring in 2019. False killer whales also had the highest interaction rate over the entire 2002-2019 period, followed by short-finned pilot whales, bottlenose dolphins and Risso’s dolphins. Very few interactions were observed with striped dolphins, pantropical spotted dolphins, rough-toothed dolphins, Blainville’s beaked whales, pygmy killer whales, and *Kogia* spp. whales. Interactions with marine mammals grouped as large whales were also rare, with observed interactions recorded with humpback whales and one sperm whale in 2011 (Table 67). Observed interactions with unidentified cetacean groups are shown in Table 68. In 2019, there were three observed unidentified cetacean interactions and one unidentified beaked whale interactions.

Table 18. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for dolphins in the Hawai'i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Bottlenose dolphin				Pantropical spotted dolphin				Rough-toothed dolphin				Risso's dolphin				Striped dolphin			
				Observed		EF Est	ME	Observed		EF Est	ME	Observed		EF Est	ME	Observed		EF Est	ME	Observed		EF Est	ME
				Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks		
2002	24.6	3,523	6,786,303	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2003	22.2	3,204	6,442,221	1(1)	0.0002	5	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2004	24.6	3,958	7,900,681	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	0	-
2005	26.1	4,602	9,360,671	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	-	1	0.0001	-	3	0	0.0000	0	-
2006	21.2	3,605	7,540,286	1	0.0001	-	1	0	0.0000	-	0	0	0.0000	0	-	2	0.0003	-	5	1(1)	0.0001	-	6
2007	20.1	3,506	7,620,083	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	0	-	1(1)	0.0001	-	3	0	0.0000	-	0
2008	21.7	3,915	8,775,951	0	0.0000	-	0	1(1)	0.0001	-	3	0	0.0000	0	-	1	0.0001	-	2	0	0.0000	-	0
2009	20.6	3,520	7,877,861	1	0.0001	-	5	0	0.0000	-	0	0	0.0000	0	-	0	0.0000	-	0	0	0.0000	-	0
2010	21.1	3,580	8,184,127	1	0.0001	-	4	0	0.0000	-	0	0	0.0000	-	0	1	0.0001	-	3	0	0.0000	-	0
2011	20.3	3,540	8,260,092	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	1(1)	0.0001	-	4
2012	20.4	3,659	8,768,728	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2013	20.4	3,830	9,278,133	2(1)	0.0002	-	11	0	0.0000	-	0	1(1)	0.0001	-	5	0	0.0000	-	0	0	0.0000	-	0
2014	20.8	3,831	9,608,244	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2015	20.6	3,728	9,393,234	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0	2(1)	0.0002	-	10	0 ^b	0.0000	-	4 ^b
2016	20.1	3,880	9,872,439	1	0.0001	5	-	0	0.0000	0	-	1(1)	0.0001	5	-	0	0.0000	0	-	0	0.0000	0	-
2017	20.4	3,832	10,148,195	1	0.0001	5	-	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	5	-	0	0.0000	0	-
2018	20.4	4,332	11,751,144	1	0.0001	5	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2019	20.5	4,697	12,948,077	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	5	-	1(1)	0.0001	5	-	0	0.0000	0	-

^aTake data are based on vessel arrival dates.

^b One unidentified dolphin was later identified as a striped dolphin (), but is listed as an unidentified dolphin in the 2015 Annual Observer Report.

Source: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—[McCracken, 2005](#); [McCracken, 2006](#); [McCracken, 2011a](#); [McCracken, 2016](#); [McCracken, 2017b](#).

Table 19. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for small whales in the Hawai'i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Blainville's beaked whale				False killer whale				Kogia spp.				Pygmy killer whale				Short-finned pilot whale			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks						
2002	24.6	3,523	6,786,303	1(1)	0.0001	4	-	5	0.0007	20	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2003	22.2	3,204	6,442,221	0	0.0000	0	-	2	0.0003	9	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2004	24.6	3,958	7,900,681	0	0.0000	-	0	6(1)	0.0008	-	28	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	-	3
2005	26.1	4,602	9,360,671	1	0.0001	-	6	2(1)	0.0002	-	6	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	-	6
2006	21.2	3,605	7,540,286	0	0.0000	-	0	4	0.0005	-	17	0	0.0000	0	-	0	0.0000	0	-	2	0.0003	-	6
2007	20.1	3,506	7,620,083	0	0.0000	-	0	4	0.0005	-	15	0	0.0000	0	-	0	0.0000	0	-	1	0.0001	-	2
2008	21.7	3,915	8,775,951	0	0.0000	-	0	3	0.0003	-	11	0	0.0000	0	-	0	0.0000	0	-	3	0.0003	-	5
2009	20.6	3,520	7,877,861	0	0.0000	-	0	10(1)	0.0013	-	55	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	-	0
2010	21.1	3,580	8,184,127	0	0.0000	-	0	4	0.0005	-	19	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2011	20.3	3,540	8,260,092	0	0.0000	-	0	3	0.0004	-	10	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2012	20.4	3,659	8,768,728	0	0.0000	-	0	3	0.0003	-	15	0	0.0000	-	0	0	0.0000	-	0	0	0.0000	-	0
2013	20.4	3,830	9,278,133	0	0.0000	-	0	4	0.0004	-	22	0	0.0000	-	0	1(1)	0.0001	-	5	1(1)	0.0001	-	4
2014	20.8	3,831	9,608,244	0	0.0000	-	0	11	0.0011	-	55	1	0.0001	-	10	0	0.0000	-	0	0	0.0000	-	0
2015	20.6	3,728	9,393,234	0	0.0000	0	-	5(1)	0.0005	-	21	0	0.0000	-	0	0	0.0000	-	0	1	0.0001	-	4
2016	20.1	3,880	9,872,439	0	0.0000	0	-	7	0.0007	35	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2017	20.4	3,832	10,148,195	0	0.0000	0	-	8(2)	0.0008	39	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2018	20.4	4,332	11,751,144	0	0.0000	0	-	12	0.0010	59	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-
2019	20.5	4,697	12,948,077	0	0.0000	0	-	15(3)	0.0012	73	-	0	0.0000	0	-	0	0.0000	0	-	0	0.0000	0	-

^a Take data are based on vessel arrival dates.

Source: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—[McCracken, 2005](#); [McCracken, 2006](#); [McCracken, 2011a](#); [McCracken, 2016](#); [McCracken, 2017b](#).

Table 20. Observed takes, takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for large whales in the Hawai`i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Humpback whale				Sperm whale			
				Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes	Takes/1,000 hooks			Takes	Takes/1,000 hooks		
2002	24.6	3,523	6,786,303	1	0.0001	4	-	0	0.0000	0	-
2003	22.2	3,204	6,442,221	0	0.0000	0	-	0	0.0000	0	-
2004	24.6	3,958	7,900,681	1	0.0001	-	6	0	0.0000	-	0
2005	26.1	4,602	9,360,671	0	0.0000	-	0	0	0.0000	-	0
2006	21.2	3,605	7,540,286	0	0.0000	-	0	0	0.0000	0	-
2007	20.1	3,506	7,620,083	0	0.0000	-	0	0	0.0000	0	-
2008	21.7	3,915	8,775,951	0	0.0000	-	0	0	0.0000	0	-
2009	20.6	3,520	7,877,861	0	0.0000	-	0	0	0.0000	0	-
2010	21.1	3,580	8,184,127	0	0.0000	-	0	0	0.0000	-	0
2011	20.3	3,540	8,260,092	0	0.0000	-	0	1	0.0001	-	6
2012	20.4	3,659	8,768,728	0	0.0000	-	0	0	0.0000	-	0
2013	20.4	3,830	9,278,133	0	0.0000	-	0	0	0.0000	-	0
2014	20.8	3,831	9,608,244	1	0.0001	-	5	0	0.0000	-	0
2015	20.6	3,728	9,393,234	0	0.0000	-	0	0	0.0000	-	0
2016	20.1	3,880	9,872,439	0	0.0000	0	-	0	0.0000	0	-
2017	20.4	3,832	10,148,195	0	0.0000	0	-	0	0.0000	0	-
2018	20.4	4,332	11,751,144	0	0.0000	0	-	0	0.0000	0	-
2019	20.5	4,697	12,948,077	0	0.0000	0	-	0	0.0000	0	-

^a Take data are based on vessel arrival dates.

Source: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—[McCracken, 2005](#); [McCracken, 2006](#); [McCracken, 2011a](#); [McCracken, 2016](#); [McCracken, 2017b](#).

Table 21. Observed takes, takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates for unidentified species of cetaceans in the Hawai'i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Unidentified cetacean ^b			Unidentified whale ^b			Unidentified dolphin ^b			Unidentified beaked whale ^b		
				Observed		EF Est.	Observed		EF Est.	Observed		EF Est.	Observed		EF Est.
				Takes	Takes/1,000 hooks		Takes	Takes/1,000 hooks		Takes	Takes/1,000 hooks		Takes	Takes/1,000 hooks	
2002	24.6	3,523	6,786,303	2	0.0003	8	0	0.0000	0	0	0.0000	0	0	0.0000	0
2003	22.2	3,204	6,442,221	1	0.0002	5	1	0.0002	5	0	0.0000	0	0	0.0000	0
2004	24.6	3,958	7,900,681	0	0.0000	0	0	0.0000	0	0	0.0000	0	0	0.0000	0
2005	26.1	4,602	9,360,671	1	0.0001	4	0	0.0000	0	0	0.0000	0	0	0.0000	0
2006	21.2	3,605	7,540,286	0	0.0000	0	2	0.0003	9	2	0.0003	9	0	0.0000	0
2007	20.1	3,506	7,620,083	1	0.0001	5	0	0.0000	0	1	0.0001	5	0	0.0000	0
2008	21.7	3,915	8,775,951	2	0.0002	9	2	0.0002	9	0	0.0000	0	0	0.0000	0
2009	20.6	3,520	7,877,861	0	0.0000	0	3	0.0004	15	0	0.0000	0	0	0.0000	0
2010	21.1	3,580	8,184,127	0	0.0000	0	3	0.0004	14	0	0.0000	0	0	0.0000	0
2011	20.3	3,540	8,260,092	2	0.0002	10	0	0.0000	0	0	0.0000	0	0	0.0000	0
2012	20.4	3,659	8,768,728	2	0.0002	10	0	0.0000	0	0	0.0000	0	0	0.0000	0
2013	20.4	3,830	9,278,133	2	0.0002	10	0	0.0000	0	0	0.0000	0	0	0.0000	0
2014	20.8	3,831	9,608,244	2	0.0002	10	0	0.0000	0	0	0.0000	0	0	0.0000	0
2015	20.6	3,728	9,393,234	1	0.0001	5	0	0.0000	0	1 ^c	0.0001	5	0	0.0000	0
2016	20.1	3,880	9,872,439	2	0.0002	10	0	0.0000	0	0	0.0000	0	1	0.0001	5
2017	20.4	3,832	10,148,195	4	0.0004	20	0	0.0000	0	0	0.0000	0	0	0.0000	0
2018	20.4	4,332	11,751,144	4	0.0003	20	0	0.0000	0	0	0.0000	0	0	0.0000	0
2019	20.5	4,697	12,948,077	3	0.0002	15	0	0.0000	0	0	0.0000	0	1	0.0001	5

^a Take data are based on vessel arrival dates.

^b Unidentified species identification based on PIRO Observer Program classifications. Unidentified cetacean refers to a marine mammal not including pinnipeds (seal or sea lion); unidentified whale refers to a large whale; unidentified dolphin refers to a small cetacean with a visible beak; and unidentified beaked whale refers to an animal in the Ziphiidae family. Further classifications based on observer description, sketches, photos and videos may be available from the Pacific Islands Fisheries Science Center.

^c This dolphin was later identified as a striped dolphin but is listed as an unidentified dolphin in the 2015 Annual Observer Report.

Source: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

1.1.2.4.1 Comparison of Interactions with ITS

The Hawai'i deep-set longline fishery operates under the 3-year ITS in the 2014 Biological Opinion for all marine mammals protected under the ESA, which includes sperm whales and the MHI insular DPS of false killer whales (Table 69). MHI Insular False killer whale interactions are an estimate and subject to change when 2018 effort data for the overlap zone becomes available. NMFS began monitoring the Hawai'i deep-set longline fishery ITS in Quarter 3 of 2014 and uses a rolling 3-year period to track incidental take. NMFS always

uses the interaction date for tracking marine mammal interactions against the ITS, regardless of vessel arrival date. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures, and bases the marine mammal interactions on vessel arrival dates. For this reason, the number of quarterly or annual marine mammal interactions counted against an ITS may vary from those reported in the Observer Program's quarterly and annual reports. NMFS uses M&SI determinations under the MMPA to calculate marine mammal mortality rates. Takes for these species are still under the 3-year ITS at this time.

On September 8, 2016, NMFS issued a final rule identifying 14 distinct population segments (DPS) of the humpback whale under the ESA (81 FR 62260). Under this final rule, the Hawai'i DPS is not listed, so interactions are no longer being monitored against the ITS. Humpback whale interactions will continue to be monitored against the PBR in this report.

On October 4, 2018, NMFS reinitiated ESA Section 7 consultation for the deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area. NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d). Until NMFS completes the Section 7 consultation and issues a new biological opinion, the 2014 BiOp as supplemented (2017) remains valid for all species and critical habitat considered in the 2014 BiOp as supplemented. Since the October 4, 2018 reinitiation, the deep-set fishery has not exceeded the ITS for the sperm or MHI insular false killer whale.

Table 22. Estimated total interactions (extrapolated using quarterly observer coverage) and total mortalities (M) of cetaceans in the Hawai'i deep-set longline fishery compared to the 3-year ITS in the 2014 Biological Opinion^a

Species	3-year ITS Interactions (M)	3-year Monitoring Period Interactions (M)	
		2016-2018	2017-2019
Sperm whale	9(3)	0	0
MHI insular false killer whale	1(0.74)	0.25(0.2)	2017: 0.07 (0.05) 2018: 0.10 (0.09) 2019: Data not yet available.

^a Takes are counted based on interaction date.

1.1.2.4.2 Comparison of Interactions with PBR under the MMPA

Marine mammal takes against the PBR are monitored through the SARs. A summary of the current mean estimated annual M&SI and the PBR for stocks relevant to the Hawai'i deep-set longline fishery is presented in Table 70. The PBR of a stock reflects only marine mammals of that stock observed within the EEZ around Hawai'i, with the exception of the Central North Pacific stock of humpback whales for which PBR applies to the entire stock. The mean estimated annual M&SI specified in the SARs includes only interactions determined as mortalities and serious injuries; it does not include interactions classified as non-serious injuries.

For most marine mammal stocks where the PBR is available, the number of observed takes of marine mammal species in the deep-set longline fishery inside the EEZ around Hawai`i is well below the PBR in the time period covered by the most current SAR (Table 70).

The M&SI interactions inside the Hawai`i EEZ for the HI Pelagic stock of false killer whales previously exceeded the PBR for this stock. A False Killer Whale Take Reduction Team was formed in 2010 pursuant to the MMPA to address incidental takes of false killer whales in the Hawai`i-permitted longline fisheries. NMFS implemented the False Killer Whale Take Reduction Plan in 2012. The objective of the plan is to reduce mortality and serious injury of false killer whales in the Hawai`i-permitted longline fisheries.

Monitoring of false killer whale interactions in the MHI Insular and HI Pelagic stocks is ongoing under the False Killer Whale Take Reduction Plan. The M&SI interactions inside the Hawai`i EEZ for the HI Pelagic stock for 2011 to 2015 was 7.5, which is below this stock’s PBR (Table 23). On July 24, 2018, the Southern Exclusion Zone (SEZ) was closed pursuant to the False Killer Whale Take Reduction Plan following two false killer whale interactions within the EEZ resulting in a M&SI. The SEZ was closed for the remainder of the year and was reopened on January 1, 2019. On February 22, 2019, the SEZ closed from reaching the closure trigger, and will remain closed until one of the reopening criteria pursuant to the Take Reduction Plan implementing regulations is met.

Table 23. Mean estimated annual M&SI and PBR by marine mammal stocks with observed or prorated interactions in the Hawai`i deep-set longline fishery

Stock	Years Included in 2018 SAR	Outside EEZ ^a	Inside EEZ ^b	
		Mean Estimated Annual M&SI	Mean Estimated Annual M&SI	PBR (Inside EEZ only)
Bottlenose dolphin, HI Pelagic	2011-2015	2.2	0	140
Pantropical spotted dolphin, HI Pelagic	2011-2015	0	0	403
Rough-toothed dolphin, HI	2011-2015	0	1.1	423
Risso’s dolphin, HI	2011-2015	1.9	0	82
Striped dolphin, HI	2011-2015	1.1	0	449
Blainville’s beaked whale, HI	2011-2015	0	0	10
False killer whale, MHI Insular	2013-2015	N/A	0.0	0.3
False killer whale, HI Pelagic	2011-2015	15.2	7.5	9.3
False killer whale, NWHI	2011-2015	N/A	0.4	2.3
False killer whale, Palmyra Atoll	2006-2010	N/A	0.3	6.4
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2007-2011	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	undetermined
Pygmy killer whale, HI	2011-2015	0	1.1	56
Short-finned pilot whale, HI	2011-2015	1.4	0.9	106
Humpback whale, Central North Pacific	2013-2017 ^d	0.9		83 ^c
Sperm whale, HI	2011-2015	0	0.7	14

^a PBR estimates are not available for portions of the stock outside of the U.S. EEZ around Hawai`i, except for the Central North Pacific stock of humpback whales for which PBR applies to the entire stock.

^b PBR estimates are only available for portions of the stock within the U.S. EEZ around Hawai`i.

^c PBR for the Central North Pacific stock for humpback whales apply to the entire stock.

^d Draft 2019 SAR.

Source: [2018 Marine Mammal SARs](#), [Draft 2019 Marine Mammal SARs](#).

1.1.2.5 SEABIRD INTERACTIONS IN THE HAWAI`I DEEP-SET LONGLINE FISHERY

The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from NMFS. Observed take data are expanded to represent the estimated number of annual incidental takes for the entire fishery by PIFSC (hereafter “ME”). When ME are not available, a standard expansion factor estimate is listed in the table (EF Est. = 100 / % observer coverage * # takes).

Interaction data provided here may vary slightly from other sources depending on how interactions were reported (date of trip departure or arrival, set date, or haul date in a given year). NMFS annually publishes the report *Seabird Interactions and Mitigation Efforts in Hawai`i Longline Fisheries* (Seabird Annual Report), which includes verified numbers of seabird interactions and information on fishing regulations and effort, interaction rates, and band recovery data for seabirds caught in the shallow-set and deep-set fisheries. Recent reports are available at: <https://www.fisheries.noaa.gov/pacific-islands/bycatch/seabird-interactions-pelagic-longline-fishery>.

Table 72 and Table 73 summarize the incidental take data of seabirds from 2002 to 2019 in the Hawai`i deep-set longline fishery. The most common observed interactions during this time period involved black-footed albatrosses and Laysan albatrosses. Additional takes of unidentified shearwaters, sooty shearwaters, brown boobies, red-footed boobies, unidentified gulls, unidentified albatross, and unidentified seabirds have been observed. Most of the unidentified shearwaters have been identified as sooty shearwaters (NMFS, 2016). There have been no observed takes of short-tailed albatrosses by this fishery.

Interactions with black-footed albatrosses since 2015 have been substantially higher compared to previous years with the highest number observed in 2018. Expanded annual estimated takes for other seabird species suggested a high degree of variability from year to year. Interactions with sooty shearwaters and boobies are relatively infrequent.

Results from an analysis of seabird interaction rates in the Hawai`i deep-set longline fishery (Gilman et al., 2016) was presented to the Protected Species Advisory Committee and Pelagic Plan Team in 2016. The analysis included data from October 2004 to May 2014. Results indicate that seabird interaction rates significantly increased as annual mean multivariate ENSO index values increased, meaning that decreasing ocean productivity may have contributed to the increasing trend in seabird catch rates. The analysis also showed a significant increasing trend in the number of albatrosses attending vessels, which may also be

contributing to the increasing seabird catch rates. Both side setting and blue-dyed bait significantly reduced the seabird catch rate compared to stern setting and untreated bait, respectively. Of two options for meeting regulatory requirements, side setting had a significantly lower seabird catch rate than blue-dyed bait.

The Council, at its 166th Meeting in June 2016, directed the Plan Team and the Protected Species Advisory Committee to continue monitoring interactions through the SAFE to detect any future changes in albatross interactions that may be attributed to fishing operations. The Council noted that current seabird measures implemented in the Hawaii longline fishery are effective and recent increase in seabird captures are driven by non-fishery factors at this time. The Council additionally recommended research to be conducted, as appropriate, on at-sea foraging behavior of albatross species to improve understanding of interaction rates in the Hawaii longline fisheries.

In response to the Council recommendation, a seabird workshop was convened in November 2017. The objectives of the workshop were to: 1) review recent increased albatross interactions in the Hawaii longline fishery; 2) explore possible factors responsible for this increase; 3) evaluate albatross population impacts; and 4) provide input for future data collection, analysis, and models. Information presented at the workshop strongly suggested that El Niño Southern Oscillation (ENSO) and Pacific Decadal Oscillation (PDO) influence albatross distribution by affecting wind patterns and ocean productivity. In years of positive ENSO and PDO, albatross distributions and longline fishing effort overlap more closely, resulting in increased albatross interaction rates. The workshop also identified albatross population dynamics, mesoscale oceanographic processes, and increased albatross attraction to vessels as other factors that may influence interaction rates. A black-footed albatross population model indicated that the recent increase in albatross interactions is unlikely to significantly affect population growth as long as the increase is limited to the Hawai`i longline fishery or is episodic. Next steps include filling a variety of data gaps in order to build an Integrated Population Model (IPM). The full workshop report will be published as a NOAA Technical Memorandum.

At its 173rd Meeting, the Council directed staff to conduct a seabird workshop to review seabird mitigation requirements and the best scientific information available for Hawaii's pelagic longline fisheries, considering operational aspects of the fisheries, seasonal and spatial distributions of seabird interactions, alternative bycatch mitigation measures and findings from cost-benefit analyses. identified priority mitigation measures suitable for the Hawai`i longline fishery, potential changes to seabird measures, and research needs to inform future changes to seabird measures (Gilman and Ishizaki, 2018). Specifically, workshop participants identified deterrents such as tori lines (also called streamer lines or bird scaring lines) and towed buoys, which are currently not required in the Hawai`i longline fishery, to be a high priority for further research and development. Conversely, workshop participants identified blue-dyed bait as a candidate for removal from Hawaii's seabird requirements because of concerns with efficacy and practicality. Participants discussed that the requirement for using blue-dyed bait was intended to be used for squid bait but currently only fish are used for bait in both Hawai`i longline fisheries, and that blue-dyed fish bait may also be less effective at mitigating seabird catch risk than blue-dyed squid bait. Industry members

who participated in the workshop indicated that blue-dyed bait is not favored by fishermen as the dye is messy and thawing of bait reduces retention on hooks. Additionally, recent analysis of observer data indicate that side-setting is more effective than blue-dyed bait in the Hawaii deep-set longline fishery. The workshop also identified the importance of training and outreach, in light of possible captain effects showing higher interactions by a smaller number of captains in the fleet.

The Council at its 174th Meeting in October 2018 received a report of the September 2018 Workshop and recommended: 1) enhancing outreach and training efforts to ensure proper application of existing seabird mitigation measure requirements; 2) NMFS provide support for research and development for alternative measures with potential to replace blue-dyed bait, with high priority placed on identifying suitable designs for tori lines; and 3) encourage submission of Experimental Fishing Permit applications for testing alternative measures without the use of blue-dyed bait to allow comparison of measure effectiveness with and without blue-dyed bait. The Council additionally directed staff to prepare a discussion paper for the March 2019 Council Meeting to evaluate the effect of potential removal of blue-dyed bait without additional replacement measures on seabird interaction rates.

The Council, at its 176th meeting held in March 2019, endorsed additional strategies for identifying alternative measures and improving seabird measure effectiveness for the Hawai`i deep-set longline fishery including addressing captain effects through strategic outreach, identifying tori line designs suitable for the Hawai`i fishery, encouraging trials for making minor modifications to existing required measures, and progressing international bycatch assessments for North Pacific albatross species. In 2019, a cooperative research project by the Council, NMFS and the Hawaii Longline Association was initiated to conduct 1) demonstration and trial of tori lines in the Hawaii longline fishery to inform minimum standards specific to this fishery, 2) field trials of tori lines to collect data on operational practicality and effectiveness in using tori lines under commercial fishing operations. Results of the project will be presented to the Council in 2020 to inform future modifications to seabird mitigation measure requirements.

Additional discussion on the factors influencing seabird interaction trends is included in Section 3.6 of this report.

Table 24. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for albatross species in the Hawai'i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Laysan albatross				Black-footed albatross				Unidentified albatross				Short-tailed albatross
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)
2002	24.6	3,523	6,786,303	16(13)	0.002	65	-	18(17)	0.003	73	-	0	0.000	-	-	0
2003	22.2	3,204	6,442,221	44(44)	0.007	198	-	24(23)	0.004	108	-	0	0.000	-	-	0
2004	24.6	3,958	7,900,681	2(2)	0.000	-	10	4(4)	0.001	-	16	0	0.000	-	-	0
2005	26.1	4,602	9,360,671	6(6)	0.001	-	43	12(12)	0.001	-	82	0	0.000	-	-	0
2006	21.2	3,605	7,540,286	1(1)	0.000	-	7	17(17)	0.002	-	70	0	0.000	-	-	0
2007	20.1	3,506	7,620,083	7(7)	0.001	-	44	14(14)	0.002	-	77	0	0.000	-	-	0
2008 ^d	21.7	3,915	8,775,951	14(13)	0.002	-	55	34(33)	0.004	-	118	0	0.000	-	-	0
2009	20.6	3,520	7,877,861	18(18)	0.002	-	60	23(23)	0.003	-	110	0	0.000	-	-	0
2010	21.1	3,580	8,184,127	39(38)	0.005	-	155	17(17)	0.002	-	65	0	0.000	-	-	0
2011	20.3	3,540	8,260,092	32(31)	0.004	-	187	13(12)	0.002	-	73	0	0.000	-	-	0
2012	20.4	3,659	8,768,728	30(25)	0.003	-	136	35(35)	0.004	-	167	0	0.000	-	-	0
2013	20.4	3,830	9,278,133	48(46)	0.005	-	236	50(47)	0.005	-	257	0	0.000	-	-	0
2014	20.8	3,831	9,608,244	13(10)	0.001	-	77	32(29)	0.003	-	175	0	0.000	-	-	0
2015	20.6	3,728	9,393,234	24(22)	0.003	-	119	107(92)	0.011	-	541	0	0.000	-	-	0
2016	20.1	3,880	9,872,439	34(32)	0.003	-	166	104(99)	0.011	-	485	1(1)	0.001	-	7	0
2017	20.4	3,832	10,148,195	38(38)	0.004	186	-	97(85)	0.010	475	-	0	0.000	0	-	0
2018	20.4	4,332	11,751,144	33(29)	0.003	162	-	194(168)	0.017	951	-	0	0.000	0	-	0
2019	20.5	4,697	12,948,077	45(44)	0.004	220	-	146(139)	0.011	712	-	0	0.000	0	-	0

^a Take data are based on vessel arrival dates.

Source: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—[McCracken, 2005](#); [McCracken, 2006](#); [McCracken, 2007](#); [McCracken, 2008](#); [McCracken, 2009](#); [McCracken, 2010](#); [McCracken, 2011b](#); [McCracken, 2012](#); [McCracken, 2013](#); [McCracken, 2014](#); [McCracken, 2017c](#); [McCracken, 2017d](#).

Table 25. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for other seabird species in the Hawai`i deep-set longline fishery, 2002-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Booby species				Sooty shearwater			Unidentified shearwater				Unidentified gull			
				Observed		EF Est.	ME	Observed		EF Est.	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		Takes (M)	Takes/ 1,000 hooks			Takes (M)	Takes/ 1,000 hooks		
2002	24.6	3,523	6,786,303	0	0.000	0	-	0	0.000	0	0	0.000	0	-	0	0.000	-	-
2003	22.2	3,204	6,442,221	0	0.000	0	-	0	0.000	0	0	0.000	0	-	0	0.000	-	-
2004	24.6	3,958	7,900,681	0	0.000	0	-	0	0.000	0	2(2)	0.000	8	-	0	0.000	-	-
2005	26.1	4,602	9,360,671	1(1) ^b	0.000	4	-	0	0.000	0	0	0.000	0	-	0	0.000	-	-
2006	21.2	3,605	7,540,286	0	0.000	0	-	3(3)	0.000	14	2(2) ^c	0.000	9	-	0	0.000	-	-
2007	20.1	3,506	7,620,083	0	0.000	0	-	0	0.000	0	0	0.000	0	-	0	0.000	-	-
2008 ^d	21.7	3,915	8,775,951	1 ^e	0.000	-	4	0	0.000	0	14(14) ^c	0.002	-	62	0	0.000	-	-
2009	20.6	3,520	7,877,861	0	0.000	-	0	0	0.000	0	4(4) ^c	0.001	-	24	0	0.000	-	-
2010	21.1	3,580	8,184,127	0	0.000	-	0	0	0.000	0	1(1) ^c	0.000	-	0	0	0.000	-	-
2011	20.3	3,540	8,260,092	0	0.000	-	0	0	0.000	0	3(3) ^c	0.000	-	19	0	0.000	-	-
2012	20.4	3,659	8,768,728	0	0.000	-	0	1(1)	0.000	5	6(6) ^c	0.001	-	36	0	0.000	-	-
2013	20.4	3,830	9,278,133	0	0.000	-	0	0	0.000	0	8(8) ^c	0.001	-	43	0	0.000	-	-
2014	20.8	3,831	9,608,244	0	0.000	-	0	0	0.000	0	1(1) ^c	0.000	-	7	0	0.000	-	-
2015	20.6	3,728	9,393,234	1(1) ^g	0.000	-	6	5(4)	0.001	5	0	0.000	-	21 ^f	0	0.000	-	-
2016	20.1	3,880	9,872,439	2(1) ^g	0.000	-	12	4(4)	0.000	20	0	0.000	0	-	0	0.000	-	-
2017	20.4	3,832	10,148,195	0	0.000	0	-	0	0.000	0	0	0.000	0	-	1	0.001	5	-
2018	20.4	4,332	11,751,144	2(2) ^h	0.000	10	-	0	0.000	0	10(10)	0.001	49	-	0	0.000	0	-
2019	20.5	4,697	12,948,077	1(1) ⁱ	0.000	5	-	0	0.000	0	0	0.000	0	-	0	0.000	0	-

^a Take data are based on vessel arrival dates.

^b This animal was identified as a brown booby on the 2005 PIRO Observer Program Annual and Quarterly Status reports.

^c These were later identified as sooty shearwaters in NMFS Seabird Interactions and Mitigation Efforts in Hawai`i Longline Fisheries (Seabird Annual Report).

^d One *unidentified seabird* was released injured in the second quarter of 2008 (takes/1,000 hooks < 0.001, ME = 2).

^e This animal was identified as a red-footed booby on the 2008 PIRO Observer Program Annual and Quarterly Status reports.

^f These birds were identified as sooty shearwaters in the 2015 PIRO Observer Program Annual and Quarterly Status reports.

^g These birds were identified as red-footed boobies in the 2015 and 2016 PIRO Observer Program Annual and Quarterly Status reports.

^hOne of the booby species was identified as a red-footed booby and one was identified as a brown booby on the 2018 PIRO Observer Program Annual and Quarterly Status reports.

ⁱThis animal was identified as a brown booby in the 2019 PIRO Observer Program Annual and Quarterly Status reports.

Source: Take data—[2002-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—[McCracken, 2005](#); [McCracken, 2006](#); [McCracken, 2007](#); [McCracken, 2008](#); [McCracken, 2009](#); [McCracken, 2010](#); [McCracken, 2011b](#); [McCracken, 2012](#); [McCracken, 2013](#); [McCracken, 2014](#); [McCracken, 2017c](#); [McCracken, 2017d](#).

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1.1.2.5.1 Comparison of Interactions with ITS

The short-tailed albatross ITS in the USFWS 2012 Biological Opinion for the Hawai'i longline fishery is two incidental takes every five years in the deep-set fishery. Exceeding this number will lead to reinitiating consultation of the impact of this fishery on the species. Since there have been no observed takes of short-tailed albatrosses in the fishery, the ITS has not been exceeded as of the end of 2019.

1.1.2.6 ELASMOBRANCH INTERACTIONS IN THE HAWAII DEEP-SET LONGLINE FISHERY

Table 74 summarizes the incidental take data for the Indo-west Pacific DPS of scalloped hammerhead sharks, oceanic whitetip sharks, and giant manta rays in the Hawai'i deep-set longline fishery. The most common observed interactions from 2004 to 2019 were of oceanic whitetip sharks, with giant manta rays observed infrequently. Three observed interactions with the Indo-west Pacific DPS of scalloped hammerhead shark have been recorded since 2004.

Total interaction for the fleet are estimated using the expansion factor calculations (EF Est. = $100 / \% \text{ observer coverage} * \# \text{ takes}$). The annual expanded interaction estimates range between 741 and 2,938 for oceanic whitetips, 0 and 95 for giant manta rays, and 0 and 7 for scalloped hammerhead sharks.

The scalloped hammerhead shark data only include interactions that occurred within the range of the Indo-west Pacific DPS of scalloped hammerhead sharks, and do not include interactions occurred within the range of the Central Pacific DPS, which is not listed under the ESA. Giant manta rays were listed under the ESA on January 22, 2018 (83 FR 2916), and oceanic whitetip sharks were listed on January 30, 2018 (83 FR 4153). On October 4, 2018, NMFS reinitiated consultation for the deep-set fishery and determined that the conduct of the deep-set fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d).

An ITS is not required to provide protective coverage for the Indo-west Pacific scalloped hammerhead shark DPS because there are no take prohibitions under ESA section 4(d) for the DPS. However, NMFS included an ITS of 6 interactions over a three-year period in the 2014 Biological Opinion to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger. NMFS uses a rolling three-year period to track incidental take. NMFS counts takes for the Indo-west Pacific DPS of scalloped hammerhead shark based on the end of haul incidental take date. NMFS uses data from condition at time of release to calculate shark mortality rates. Interactions since 2017 are monitored against this ITS, and there has been no observed interaction with this DPS through the end of 2019.

Table 26. Observed takes, mortalities (M), takes per fishing effort (sets and 1,000 hooks), and estimated annual takes using expansion factor estimates and ME for ESA-listed elasmobranch species in the Hawai'i deep-set longline fishery, 2004-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead shark				Oceanic whitetip shark				Giant manta ray			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M ^b)	Takes/1,000 hooks			Takes (M ^b)	Takes/1,000 hooks			Takes (M ^b)	Takes/1,000 hooks		
2004	24.6	3,958	7,900,681	2	0.0003	-	6	434(101)	0.0549	-	2,938	1	0.0001	-	3
2005	26.1	4,602	9,360,671	0	0.0000	-	0	341(80)	0.0364	-	1,282	2	0.0002	-	7
2006	21.2	3,605	7,540,286	0	0.0000	-	0	331(78)	0.0439	-	1,346	2(1)	0.0003	-	11
2007	20.1	3,506	7,620,083	1	0.0001	-	7	262(72)	0.0344	-	1,341	2	0.0003	-	5
2008	21.7	3,915	8,775,951	0	0.0000	-	0	144(36)	0.0164	-	741	2	0.0002	-	10
2009	20.6	3,520	7,877,861	0	0.0000	-	0	244(55)	0.0310	-	1,236	4	0.0005	-	23
2010	21.1	3,580	8,184,127	0	0.0000	-	0	253(44)	0.0309	-	1,198	17(1)	0.0021	-	95
2011	20.3	3,540	8,260,092	0	0.0000	-	0	225(43)	0.0272	-	1,176	1	0.0001	-	5
2012	20.4	3,659	8,768,728	0	0.0000	-	0	172(38)	0.0196	-	878	2	0.0002	-	11
2013	20.4	3,830	9,278,133	0	0.0000	-	0	196(36)	0.0211	-	973	1	0.0001	-	5
2014	20.8	3,831	9,608,244	0	0.0000	-	0	374(68)	0.0389	-	1,670	3	0.0003	-	11
2015	20.6	3,728	9,393,234	0	0.0000	-	0	531(139)	0.0565	-	2,654	2	0.0002	-	10
2016	20.1	3,880	9,872,439	0	0.0000	-	0	423(123)	0.0428	-	2,188	4	0.0004	-	22
2017	20.4	3,832	10,148,195	0	0.0000	-	0	242(57)	0.0238	-	1,257	0	0.0000	-	0
2018	20.4	4,332	11,751,144	0	0.0000	0		224(62)	0.0191	1,098		1	0.0001	5	
2019	20.5	4,697	12,948,077	0	0.0000	0		435(99)	0.0336	2,122		0	0.0000	0	

^a Take data are based on vessel arrival dates.

^b Mortality numbers include animals that were released dead, finned (prior to passage of the Shark Conservation Act of 2010), and kept.

Source: [NMFS 2014 \(2004-2013 data\)](#), NMFS unpublished (2014-2018 data), [McCracken 2019b](#).

1.1.3 AMERICAN SAMOA LONGLINE FISHERY

1.1.3.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS AND EFFECTIVENESS OF MANAGEMENT MEASURES IN THE AMERICAN SAMOA LONGLINE FISHERY

In this annual report, the Council monitors protected species interactions in the American Samoa longline fishery using the following indicators:

- General interaction trends over time
- Effectiveness of FEP conservation measures
- Take levels compared to the incidental take statement levels under ESA
- Take levels compared to marine mammal PBRs, where applicable

Details of these indicators are discussed below.

1.1.3.1.1 FEP Conservation Measures

The Pelagic FEP includes conservation measures to mitigate sea turtle interactions in the American Samoa longline fishery. These measures include the following:

- Longline vessel owners/operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.
- Longline vessel owners/operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Longline vessel owners/operators are required to annually complete a protected species workshop.
- Owners and operators of vessels longer than 40 ft (12.2 m) must use longline gear that meet the following requirements:
 - Each float line must be at least 30 m long.
 - At least 15 branch lines must be attached to the mainline between any two float lines attached to the mainline.
 - Each branch line must be at least 10 m long.
 - No branch line may be attached to the mainline closer than 70 m to any float line.
 - No more than 10 swordfish may be possessed or landed during a single fishing trip.

Additionally, the American Samoa longline fishery has had observer coverage since 2006, with coverage rate of approximately 20 percent or higher since 2010.

1.1.3.1.2 ESA Consultations

The American Samoa longline fishery is covered under a NMFS Biological Opinion dated October 30, 2015 (NMFS, 2015). NMFS concluded that the fishery is not likely to jeopardize five sea turtle species (South Pacific DPS loggerhead, leatherback, olive ridley, green and hawksbill turtles) and the Indo-West Pacific DPS of scalloped hammerhead sharks, and not likely to adversely affect six species of reef-building corals (Table 75). The 2015 Biological Opinion also included a Conference Opinion for the green turtle DPSs and an ITS, which became effective at the time of the final listing in 2016 (81 FR 20058, April 5, 2016). Several informal consultations conducted by NMFS and USFWS have concluded that the fishery is not likely to adversely affect two marine mammal species (humpback and sperm whale) or the Newell's shearwater. NMFS has also determined that the fishery has no effect on three marine mammal species (fin, blue, and sei whale) or three petrel species (Chatham, Fiji, and magenta petrel).

NMFS and USFWS have issued ITSs for species with a non-jeopardy determination in the Biological Opinions (Table 76). Exceeding the three-year ITSs requires reinitiation of consultation on the fishery under the ESA.

On April 3, 2019, NMFS reinitiated ESA Section 7 consultation for the American Samoa deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area due to several re-initiation triggers: listing of the oceanic whitetip shark, giant manta

ray, and chambered nautilus; and exceeding the ITS for the east Indian west Pacific, southwest Pacific, central South Pacific, and east Pacific green sea turtle DPS; hawksbill; and olive ridley sea turtles in 2018. On April 3, 2019, NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d). Until NMFS completes the consultation process and issues a new biological opinion, the 2015 BiOp remains valid for all species considered in the 2015 BiOp.

Table 27. Summary of ESA consultations for the American Samoa longline fishery

Species	Consultation Date	Consultation Type ^a	Outcome ^b
Loggerhead turtle, South Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Leatherback turtle	2015-10-30	BiOp	LAA, non-jeopardy
Olive ridley turtle	2015-10-30	BiOp	LAA, non-jeopardy
Green turtle, Central South Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Green turtle, Southwest Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Green turtle, East Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Green turtle, Central West Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Green turtle, East Indian-West Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Hawksbill turtle	2015-10-30	BiOp	LAA, non-jeopardy
Humpback whale	2010-07-27	LOC	NLAA
Fin whale	2010-05-12	No Effects Memo	No effect
Blue whale	2010-05-12	No Effects Memo	No effect
Sei whale	2010-05-12	No Effects Memo	No effect
Sperm whale	2010-07-27	LOC	NLAA
Scalloped hammerhead shark, Indo-West Pacific DPS	2015-10-30	BiOp	LAA, non-jeopardy
Reef-building corals	2015-10-30	BiOp	NLAA
Newell's shearwater	2011-05-19	LOC (FWS)	NLAA
Chatham petrel	2011-07-29	No Effects Memo	No effect
Fiji petrel	2011-07-29	No Effects Memo	No effect
Magenta petrel	2011-07-29	No Effects Memo	No effect

^a BiOp = Biological Opinion; LOC = Letter of Concurrence.

^b LAA = likely to adversely affect; NLAA = not likely to adversely affect.

Table 28. Summary of ITSs for the American Samoa longline fishery

Species	ITS Time Period	Takes	Mortalities	Source BiOp
Loggerhead turtle, South Pacific DPS	3-year	6	3	NMFS 2015
Leatherback turtle	3-year	69	49	NMFS 2015
Olive ridley turtle	3-year	33	10	NMFS 2015
Green turtle, Central South Pacific DPS ^a	3-year	30	27	NMFS 2015
Green turtle, Southwest Pacific DPS ^a	3-year	20	17.82	NMFS 2015
Green turtle, East Pacific DPS ^a	3-year	7	6.48	NMFS 2015
Green turtle, Central West Pacific DPS ^a	3-year	2	1.62	NMFS 2015
Green turtle, East Indian-West Pacific DPS ^a	3-year	1	1.08	NMFS 2015
Hawksbill turtle	3-year	6	3	NMFS 2015
Scalloped hammerhead shark, Indo-West Pacific DPS ^b	3-year	36	12	NMFS 2015

^a The green turtle DPS-specific ITSs became effective in May 2016 when the DPS listings were finalized.

^b An ITS is not required for the Indo-West Pacific DPS of scalloped hammerhead sharks due to the lack of take prohibition under ESA section 4(d), but NMFS included an ITS to serve as a check on the no-jeopardy conclusion by providing a re-initiation trigger.

1.1.3.1.3 Non-ESA Marine Mammals

Fishery impacts to marine mammal stocks are primarily assessed and monitored through the SARs prepared pursuant to the MMPA. The SARs include detailed information on these species' geographic range, abundance, PBR estimates, bycatch estimates, and status. The most recent SARs are available online at <https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region>.

The American Samoa longline fishery is a Category II under the MMPA 2020 LOF (85 FR 21079, April 16, 2020), meaning that this fishery has occasional incidental mortality and serious injuries of marine mammals. The 2020 LOF lists the following marine mammal stocks that are incidentally killed or injured in this fishery:

- False killer whale, American Samoa stock
- Rough-toothed dolphin, American Samoa stock
- Short-finned pilot whale, unknown stock

Most bycatch estimates in the SARs are based on the most recently available 5-year period, but there is a data lag of approximately two years due to the SAR review process. This annual report focuses on available long-term interaction trends and summarizes relevant information from the most recent SAR.

1.1.3.2 DATA SOURCE FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Protected species interactions in the American Samoa longline fishery have been monitored through mandatory observer coverage since 2006. Observer coverage in the fishery ranged between 6 and 8 percent from 2006-2009, increased to 25 percent in 2010 and 33 percent in

2011. Coverage has been consistently about 20 percent since 2012. This report summarizes protected species interactions in the American Samoa longline fishery since 2006. Annual observed interactions are tallied based on vessel arrival date (rather than interaction date) for the purposes of this report for consistency with the Observer Program reports, and to allow comparison of historical yearly interactions data (e.g., Table 77). Comparison of annual incidental takes within a year to the ITSs are based on the interaction date rather than the vessel arrival date, consistent with the 2015 Biological Opinion (e.g., Table 78).

1.1.3.3 SEA TURTLE INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 77 summarizes the incidental take data of sea turtles from 2006 to 2019 in the American Samoa longline fishery. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from PIFSC. Observed take data are expanded to represent the estimated number of incidental takes for the entire fishery by PIFSC (referred to in this document as “McCracken estimates (ME)”). When ME are not available, a standard expansion factor estimate is used ($EF\ Est. = 100 / \% \text{ observer coverage} * \# \text{ takes}$).

Between 2006 and 2019, the PIRO Observer Program reported interactions with green, leatherback, olive ridley, and hawksbill sea turtles, but no observed interactions were reported with loggerhead sea turtles. The highest observed interaction rate involved green sea turtles, whereas interactions with leatherbacks, olive ridleys, and hawksbills were less frequent.

Green sea turtle takes were variable year to year, ranging between 0-11 observed takes (0-50 expanded annual estimated takes). From 2016 to 2019, four annual interactions per year with green turtles were observed, all of which resulted in mortalities. The interaction rate in 2018 was the highest since 2006. At its 170th Meeting in June 2017, the Council recommended evaluation of the effectiveness of the 2011 green turtle measure that required gear configuration to set hooks below 100 meters in the American Samoa longline fishery. PIFSC in response indicated they do not recommend evaluation at that time due to the low statistical power. At its 173rd Meeting in June 2018, the Council recommended PIFSC conduct an economic cost-benefit analysis on the use of large circle hooks in the American Samoa longline fishery to determine whether modifying the green turtle mitigation measures in the fishery may contribute to further reductions in interactions in the fishery without significant negative impacts on fishery operations and revenue. In response, PIFSC conducted a feasibility assessment for conducting a cost-benefit analysis, which indicated that a detailed analysis is not likely to provide new information beyond what is known from the Council-funded large circle hook study (Curran and Beverly 2012) due to data limitations (Raynor 2018).

All leatherback, olive ridley, and hawksbill sea turtle interactions were observed after 2010, with hawksbill interactions first occurring in 2016. Observer coverage was relatively low in 2006-2010 when interactions with these species were not observed (average observer

coverage = 10.8%) compared to 2011-2018. Since leatherback, olive ridley, and hawksbill interactions with this fishery are relatively uncommon, it is possible the recent occurrence of interactions after 2010 is due to higher observer coverage as opposed to a true increase in interactions in the fishery.

Table 29. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), estimated annual takes using expansion factor estimates and ME for sea turtles in the American Samoa longline fishery, 2006-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Green				Leatherback				Olive ridley				Hawksbill			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks		
2006	8.1	287	797,221	3(3)	0.004	37	-	0	0.000	0	-	0	0.000	0	-	0	0.000	-	-
2007	7.1	410	1,255,329	1(1)	0.001	14	-	0	0.000	0	-	0	0.000	0	-	0	0.000	-	-
2008	6.4	379	1,194,096	1(1)	0.001	16	-	0	0.000	0	-	0	0.000	0	-	0	0.000	-	-
2009	7.7	306	880,612	3(3)	0.003	39	-	0	0.000	0	-	0	0.000	0	-	0	0.000	-	-
2010	25.0	798	2,301,396	6(5)	0.003	-	50	0	0.000	-	0	0	0.000	-	0	0	0.000	-	-
2011	33.3	1,257	3,605,897	11(10)	0.003	-	32	2(1)	0.001	-	4	1	0.000	-	4	0	0.000	-	-
2012	19.8	662	1,880,525	0	0.000	-	0	1	0.001	-	6	1(1)	0.001	-	6	0	0.000	-	-
2013	19.4	585	1,690,962	2(2)	0.001	-	19	2(1)	0.001	-	13	1	0.001	-	4	0	0.000	-	-
2014	19.4	565	1,490,416	2(2)	0.001	-	17	0	0.000	-	4	2	0.001	-	5	0	0.000	-	-
2015	22.0	504	1,441,706	0	0.000	-	0	3(3)	0.006	-	22	1	0.002	-	6	0	0.000	-	-
2016	19.4	424	1,179,532	4(4)	0.003	-	16	1(1)	0.001	-	3	3(3)	0.003	-	14	1(1)	0.001	-	4
2017	20.0	447	1,271,803	4(4)	0.003	-	20	1	0.001	-	3	2(2)	0.002	-	19	0	0.000	-	5
2018	17.5	276	732,476	4(4)	0.006	23	-	1	0.001	6	-	2(2)	0.003	11	-	2(2)	0.003	11	-
2019	15.7	380	1,087,860	4(4)	0.004	25	-	0	0.000	0	-	3(3)	0.003	19	-	1(1)	0.001	6	-

^a Take data are based on vessel arrival dates.

Source: Take data—[2006-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—McCracken, 2015a; McCracken, 2017a, McCracken 2019a.

1.1.3.3.1 Comparison of Interactions with ITS

NMFS completed a Biological Opinion for the American Samoa longline fishery on October 30, 2015. The Biological Opinion includes data through June 30, 2015. NMFS began monitoring the American Samoa longline fishery ITS in the third quarter of 2015 and uses a rolling three-year period to track incidental take (Table 78). NMFS always uses the date of the interaction for tracking sea turtle interactions against the ITS, regardless of when the vessel returns to port. In the PIRO Observer Program Quarterly and Annual Reports, NMFS bases the percent observer coverage on vessel departures and bases sea turtle interactions on vessel arrivals. For this reason, the number of quarterly or annual interactions counted against an ITS may vary from those reported on the Observer Program's quarterly and annual reports. NMFS uses post-hooking mortality criteria (Ryder et al., 2006) to calculate sea turtle mortality rates.

On April 3, 2019, NMFS reinitiated ESA Section 7 consultation for the American Samoa deep-set fishery for all ESA-listed species under NMFS jurisdiction occurring in the action area due in part to exceeding the ITS for the east Indian west Pacific, southwest Pacific, central South Pacific, and east Pacific green sea turtle DPS, hawksbill turtle, and olive ridley turtles in 2018. NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d). Until NMFS completes the consultation process and issues a new biological opinion, the 2015 Biological Opinion remains valid for all species considered in the 2015 Biological Opinion.

Table 30. Estimated total interactions^a (extrapolated using quarterly observer coverage) and total mortality (M) (using Ryder et al., 2006) of sea turtles in the American Samoa longline fishery compared to the 3-year Incidental Take Statement (ITS) in the 2015 Biological Opinion

Species	3-year ITS Interactions (M)	Estimated total Interactions and Mortalities Interactions (M)	
		2016 – 2018	2017-2019 ^d
Green turtle ^b	60(54)	62.9(57.87)	68.2(68.2)
Central South Pacific DPS ^b	30(27)	31.9(29.35) ^c	35.1(35.1) ^c
Southwest Pacific DPS ^b	20(17.82)	21.1(19.41) ^c	19.2(19.2) ^c
East Pacific DPS ^b	7(6.48)	7.1(6.53) ^c	7.0(7.0) ^c
Central West Pacific DPS ^b	2(1.62)	1.7(1.56) ^c	5.7(5.7) ^c
East Indian-West Pacific DPS ^b	1(1.08)	1.2(1.1) ^c	1.2(1.2) ^c
Leatherback turtle	69(49)	10.6(7.21)	15(6.5)
Olive ridley turtle	33(10)	36.2(23.53)	36.7(36.7)
Loggerhead turtle	6(3)	0	0
Hawksbill turtle	6(3)	20.4(20.4)	16.6(16.4)

^a Takes are counted based on interaction date.

^b The green turtle DPS-specific ITSs became effective in May 2016 when the DPS listings were finalized.

^c Estimated total interactions for the green turtle DPSs are prorated based on the estimated proportion of each green turtle DPS indicated in the 2015 BiOp (NMFS 2015).

^d Estimated total interactions for 2018 and 2019 were calculated using the number of observed interactions multiplied by the expansion factor.

1.1.3.4 MARINE MAMMAL INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 79 summarizes the incidental take data of marine mammals from 2006 to 2019 in the American Samoa longline fishery. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Reported interactions listed in these tables reflect all observed interactions, including mortalities, serious injuries, and non-serious injuries. Refer to the most recent SARs for mortality and serious injury estimates and stock-specific abundance estimates and geographic range. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from PIFSC. Observed take data were expanded to represent the estimated number of incidental takes for the entire fishery using a standard expansion factor estimate (EF Est. = 100 / % observer coverage * # takes).

Observed marine mammal interactions with the American Samoa longline fishery between 2006 and 2019 were relatively infrequent with only one striped dolphin interactions in 2019. False killer whales had the highest interaction rate over this period, followed by rough-toothed dolphins, Cuvier’s beaked whales, short-finned pilot whales, and 2 unidentified cetaceans. Between 2006 and 2019, there were 5 years of no observed marine mammal interactions with this fishery (2006, 2007, 2009, 2010, and 2012).

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Table 31. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates for marine mammals in the American Samoa longline fishery, 2006-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Cuvier's beaked whale			False killer whale			Rough-toothed dolphin			Short-finned pilot whale			Striped dolphin			Unidentified cetacean		
				Observed		EF Est.	Observed		EF Est.	Observed		EF Est.	Observed		EF Est.	Observed		EF Est.	Observed		EF Est.
				Takes (M)	Takes/1,000 hooks		Takes (M)	Takes/1,000 hooks		Takes (M)	Takes/1,000 hooks		Takes (M)	Takes/1,000 hooks		Takes (M)	Takes/1,000 hooks		Takes (M)	Takes/1,000 hooks	
2006	8.1	287	797,221	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2007	7.1	410	1,255,329	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2008	6.4	379	1,194,096	0	0.000	0	2(1)	0.002	31	1	0.001	16	0	0.000	0	0	0.000	0	0	0.000	0
2009	7.7	306	880,612	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2010	25.0	798	2,301,396	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2011	33.3	1,257	3,605,897	1(1)	0.000	3	3	0.001	9	5	0.001	15	0	0.000	0	0	0.000	0	2	0.001	6
2012	19.8	662	1,880,525	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2013	19.4	585	1,690,962	0	0.000	0	1	0.001	5	1(1)	0.001	5	0	0.000	0	0	0.000	0	0	0.000	0
2014	19.4	565	1,490,416	0	0.000	0	0	0.000	0	0	0.000	0	1	0.001	5	0	0.000	0	0	0.000	0
2015	22.0	504	1,441,706	0	0.000	0	2(1)	0.001	9	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0
2016	19.4	424	1,179,532	0	0.000	0	2	0.002	10	2(2)	0.002	10	0	0.000	0	0	0.000	0	0	0.000	0
2017	20.0	447	1,271,803	0	0.000	0	1	0.001	5	1	0.001	5	0	0.000	0	0	0.000	0	0	0.000	0
2018	17.5	276	732,476	0	0.000	0	1	0.001	6	1(1)	0.001	6	0	0.000	0	0	0.000	0	0	0.000	0
2019	15.7	380	1,087,860	0	0.000	0	0	0.000	0	0	0.000	0	0	0.000	0	1	0.001	6	0	0.000	0

^a Take data are based on vessel arrival dates.

Source: [2006-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

Note: [McCracken \(2015a\)](#) produced annual estimates for cetaceans for 2010-2013, but they are not shown in this table. The ME did not include interactions classified as non-serious injury, thus do not correspond to the observed takes included in this table.

1.1.3.4.1 Comparison of Interactions with PBR under the MMPA

SARs are only available for four species of marine mammals for which stocks have been identified around American Samoa (humpback whale, false killer whale, rough-toothed dolphin and spinner dolphin). PBR comparisons with estimates of mortality and serious injury are not available for American Samoa stocks of marine mammals due to the lack of abundance estimates.

1.1.3.5 SEABIRD INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 80 summarizes the incidental take data of seabirds from 2006 to 2019 in the American Samoa longline fishery. The incidental take data in this section were compiled from the PIRO Observer Program Annual Status Reports and are for monitoring purposes. Many of these interactions have been further examined by NMFS, and updated information necessary for any data analyses is available from PIFSC. Observed take data are expanded to represent the estimated number of annual incidental takes for the entire fishery by PIFSC (referred to in this document as McCracken Estimates, or “ME”). When ME are not available, a standard expansion factor estimate is listed in the table (EF Est. = 100 / % observer coverage * # takes).

Observed seabird interactions with the American Samoa longline fishery between 2006 and 2019 were uncommon, including interactions with two unidentified shearwaters and one frigatebird. Additionally, the observer program report for 2015 included 13 observed interactions with black-footed albatrosses that occurred in the North Pacific with vessels departing American Samoa and landing in California. There were no observed seabird interactions from 2016 to 2018, and one unidentified shearwater was observed in 2019.

Table 32. Observed takes, mortalities (M), takes per fishing effort (1,000 hooks), and estimated annual takes using expansion factor estimates and ME for seabirds in the American Samoa longline fishery, 2006-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Black-footed Albatross				Unidentified shearwater				Unidentified frigatebird			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks		
2006	8.1	287	797,221	0	0.000	0	-	0	0.000	0	-	0	0.000	0	-
2007	7.1	410	1,255,329	0	0.000	0	-	1(1)	0.001	14	-	0	0.000	0	-
2008	6.4	379	1,194,096	0	0.000	0	-	0	0.000	0	-	0	0.000	0	-
2009	7.7	306	880,612	0	0.000	0	-	0	0.000	0	-	0	0.000	0	-
2010	25.0	798	2,301,396	0	0.000	0	-	0	0.000	-	0	0	0.000	-	0
2011	33.3	1,257	3,605,897	0	0.000	0	-	1(1)	0.000	-	2	0	0.000	-	0
2012	19.8	662	1,880,525	0	0.000	0	-	0	0.000	-	0	0	0.000	-	0
2013	19.4	585	1,690,962	0	0.000	0	-	0	0.000	-	0	1(1)	0.001	-	5
2014	19.4	565	1,490,416	0	0.000	-	0	0	0.000	0	-	0	0.000	-	0
2015	22.0	504	1,441,706	13(13) ^b	0.026	-	13	0	0.000	0	-	0	0.000	-	0
2016	19.4	424	1,179,532	0	0.000	0	-	0	0.000	0	-	0	0.000	0	-
2017	20.0	447	1,271,803	0	0.000	0	-	0	0.000	0	-	0	0.000	0	-
2018	17.5	276	732,476	0	0.000	0	-	0	0.000	0	-	0	0.000	0	-
2019	15.7	380	1,087,860	0	0.000	0	-	1(1)	0.000	6	-	0	0.000	0	-

^a Take data are based on vessel arrival dates.

^b These seabird interactions occurred in the North Pacific by vessels departing American Samoa and landing in California.

Source: [2006-2019 PIRO Observer Program Annual and Quarterly Status Reports](#)

ME—McCracken, 2015a; McCracken, 2017a.

1.1.3.6 ELASMOBRANCH INTERACTIONS IN THE AMERICAN SAMOA LONGLINE FISHERY

Table 81 summarizes the incidental take data for the Indo-west Pacific DPS scalloped hammerhead sharks, oceanic whitetip sharks, and giant manta rays in the American Samoa longline fishery. Giant manta rays were listed under the ESA on January 22, 2018 (83 FR 2916), and oceanic whitetip sharks were listed on January 30, 2018 (83 FR 4153). On April 3, 2019, NMFS reinitiated consultation for the American Samoa longline fishery and determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d).

Observed interactions with oceanic whitetip sharks are most common in the American Samoa longline fishery from 2006 to 2019. Scalloped hammerheads and giant manta rays are observed less frequently. There have been no observed takes of giant manta rays in the last five years.

An ITS is not required to provide protective coverage for the Indo-west Pacific scalloped hammerhead shark DPS because there are no take prohibitions under ESA section 4(d) for the DPS. However, NMFS included an ITS of 36 interactions over a three-year period in the 2015 Biological Opinion to serve as a check on the no-jeopardy conclusion by providing a reinitiation trigger. NMFS uses a rolling three-year period to track incidental take. NMFS counts takes for the Indo-west Pacific DPS of scalloped hammerhead sharks based on the end of haul incidental take date. There was an estimated total of 21 scalloped hammerhead interactions based on the expansion factor estimate in the American Samoa longline fishery from 2017 to 2019, thus the three-year ITS has not been exceeded.

Table 33. Observed and estimated total elasmobranch interactions with the American Samoa longline fishery for 2006-2019^a

Year	Obs. Cov. (%)	Sets	Hooks	Scalloped hammerhead				Oceanic whitetip				Giant manta ray			
				Observed		EF Est.	ME	Observed		EF Est.	ME	Observed		EF Est.	ME
				Takes (M ^b)	Takes/1,000 hooks			Takes (M ^b)	Takes/1,000 hooks			Takes (M)	Takes/1,000 hooks		
2006	8.1	287	797,221	1(1)	0.0013	12	-	46(11)	0.0577	568	-	0	0.0000	0	-
2007	7.1	410	1,255,329	1	0.0008	14	-	62(18)	0.0494	873	-	0	0.0000	0	-
2008	6.4	379	1,194,096	0	0.0000	0	-	48(17)	0.0402	750	-	0	0.0000	0	-
2009	7.7	306	880,612	0	0.0000	0	-	45(13)	0.0511	584	-	1	0.0011	13	-
2010	25	798	2,301,396	4(1)	0.0017	-	17	130(37)	0.0565	-	1,176	3	0.0013	-	11
2011	33.3	1,257	3,605,897	2(1)	0.0006	-	7	116(44)	0.0322	-	319	3	0.0008	-	11
2012	19.8	662	1,880,525	0	0.0000	-	0	71(26)	0.0378	-	470	3	0.0016	-	29
2013	19.4	585	1,690,962	0	0.0000	-	0	88(15)	0.0520	-	407	2	0.0012	-	8
2014	19.4	565	1,490,416	1	0.0007	-	6	104(37)	0.0698	-	464	1	0.0007	-	2
2015	22.0	504	1,441,706	1(1)	0.0007	-	3	168(59)	0.1165	-	827	0	0.0000	-	3
2016	19.4	424	1,179,532	1	0.0008	-	6	197(70)	0.1670	-	899	0	0.0000	-	0
2017	20.0	447	1,271,803	1	0.0008	-	4	63(22)	0.0495	-	458	0	0.0000	-	0
2018	17.5	276	732,476	3	0.0041	17	-	108(39)	0.1474	617	-	0	0.0000	0	-
2019	15.7	380	1,087,860	0	0.0000	0	-	140(51)	0.1287	892	-	0	0.0000	0	-

^a Take data are based on vessel arrival dates.

^b Mortality numbers include sharks that were released dead, finned (prior to the passage of the Shark Conservation Act of 2010), and kept.

Source: [2006-2019 PIRO Observer Program Annual and Quarterly Status Reports](#) and unpublished observer data; McCracken 2015a; McCracken 2017a, McCracken 2019a.

1.1.4 HAWAII TROLL FISHERY

1.1.4.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII TROLL FISHERY

In this report, the Council monitors protected species interactions in the Hawai`i troll fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

1.1.4.1.1 Conservation Measures

The Hawai`i troll fishery has not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

1.1.4.1.2 ESA Consultations

In a Biological Opinion completed on September 1, 2009 for the troll and handline fisheries in the western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handline fishing vessels (NMFS, 2009). The Biological Opinion also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 6, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

1.1.4.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish a LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2020 LOF (85 FR 21079, April 16, 2020), the Hawai`i troll fishery (HI troll) is classified as a Category III fishery (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals). The 2020 LOF lists the following marine mammal stock that may be incidentally killed or injured in this fishery:

- Pantropical spotted dolphin, HI stock

While NMFS lists Pantropical spotted dolphin as potentially interacting with the Hawai`i troll fishery in the LOF, there is a lack of direct evidence of serious injury or mortality in this fishery (78 FR 23708, April 22, 2013).

1.1.4.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAII TROLL FISHERY

NMFS has determined that the Hawai`i troll fishery operating under the Pacific Pelagic FEP is not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, scalloped hammerhead shark, and non ESA-listed marine

mammals, and has no effects on ESA-listed reef-building corals. The Hawai'i troll fishery has minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Chapter 2, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

1.1.5 MHI HANDLINE FISHERY

1.1.5.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE MHI HANDLINE FISHERY

In this report, the Council monitors protected species interactions in the MHI handline fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

1.1.5.1.1 Conservation Measures

The MHI handline fishery has not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

1.1.5.1.2 ESA Consultations

In a Biological Opinion completed on September 1, 2009 for the troll and handline fisheries in the western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handline fishing vessels (NMFS 2009). The Biological Opinion also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 16, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

1.1.5.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish an LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2020 LOF (85 FR 21079, April 16, 2020), the MHI handline (HI pelagic handline) fishery is classified as a Category III fishery (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

1.1.5.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE MHI HANDLINE FISHERY

NMFS has determined that the MHI handline fishery operating under the Pacific Pelagic FEP is not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, scalloped hammerhead shark, and non ESA-listed marine mammals, and has no effects on ESA-listed reef-building corals. The MHI handline fishery has minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Section Chapter 2, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

1.1.6 HAWAII OFFSHORE HANDLINE FISHERY

1.1.6.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE HAWAII OFFSHORE HANDLINE FISHERY

In this report, the Council monitors protected species interactions in the Hawai'i offshore handline fishery using proxy indicators such as fishing effort and changes in gear types as this fishery does not have observer coverage.

1.1.6.1.1 Conservation Measures

The Hawai'i offshore handline fishery has not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

1.1.6.1.2 ESA Consultations

In a Biological Opinion completed on September 1, 2009 for the troll and handline fisheries in the Western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handline fishing vessels. The Biological Opinion also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 16, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

1.1.6.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish an LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2020 LOF (85 FR 21079, April 16, 2020), the Hawai`i offshore handline (HI pelagic handline) fishery is classified as a Category III fishery (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

1.1.6.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE HAWAI`I OFFSHORE HANDLINE FISHERY

NMFS has determined that the Hawai`i offshore handline fishery operating under the Pacific Pelagic FEP is not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, scalloped hammerhead shark, and non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The Hawai`i offshore handline fishery has minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Chapter 2, no notable changes have been observed in the fishery. There is no other information to indicate that impacts to protected species from this fishery have changed in recent years.

1.1.7 AMERICAN SAMOA, GUAM, AND CNMI TROLL FISHERY

1.1.7.1 INDICATORS FOR MONITORING PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA, GUAM AND CNMI TROLL FISHERY

In this report, the Council monitors protected species interactions in the American Samoa, Guam, and CNMI troll fisheries using proxy indicators such as fishing effort and changes in gear types as these fisheries do not have observer coverage.

Details of these indicators are discussed in the sections below.

1.1.7.1.1 Conservation Measures

The American Samoa, Guam, and CNMI fisheries have not had reported interactions with protected species, and no specific regulations are in place to mitigate protected species interactions. The Pacific Pelagic FEP requires any vessel fishing under the FEP to comply with sea turtle handling and release regulations.

1.1.7.1.2 ESA Consultations

In a Biological Opinion completed on September 1, 2009 for the troll and handline fisheries in the Western Pacific region, NMFS concluded that these fisheries are not likely to jeopardize the continued existence of green turtles and included an ITS of four animals killed per year from collisions with troll and handline fishing vessels. The Biological Opinion also concluded that the fisheries are not likely to adversely affect all other protected species in the region. NMFS also determined on October 16, 2014 that fisheries managed under the Pelagic FEP have no effects on ESA-listed reef-building corals.

1.1.7.1.3 Non-ESA Marine Mammals

The MMPA requires NMFS to annually publish an LOF that classifies commercial fisheries in one of three categories based on the level of mortality and serious injury of marine mammals associated with that fishery. According to the 2020 LOF (85 FR 21079, April 16, 2020), troll fisheries in American Samoa, Guam and CNMI are classified as Category III fisheries (i.e., a remote likelihood of or no known incidental mortality and serious injury of marine mammals).

1.1.7.2 STATUS OF PROTECTED SPECIES INTERACTIONS IN THE AMERICAN SAMOA, GUAM AND CNMI TROLL FISHERY

NMFS has determined that the American Samoa, Guam, and CNMI fisheries operating under the Pacific Pelagic FEP are not likely to jeopardize green sea turtles and not likely to adversely affect other ESA-listed sea turtles, marine mammals, seabirds, scalloped hammerhead shark, and non ESA-listed marine mammals, and have no effects on ESA-listed reef-building corals. The American Samoa, Guam, and CNMI fisheries likely have minimal interactions with these protected species.

The ITS in the 2009 Biological Opinion estimates four green turtle mortalities annually in the troll and handline fisheries in the western Pacific region. There have not been any reported or observed collisions of troll and handline vessels with green turtles, and data are not available to attribute stranded turtle mortality source to troll and handline vessels.

Based on fishing effort and other characteristics described in Chapter 2, no notable changes have been observed in the American Samoa, Guam, and CNMI troll fisheries. There is no other information to indicate that impacts to protected species from these fisheries have changed in recent years.

1.1.8 IDENTIFICATION OF EMERGING ISSUES

Oceanic whitetip sharks were listed under the ESA in 2018. This species is incidentally captured in the Hawaii and American Samoa longline fisheries. Observed interaction data have been added to this report. RFMO conservation measures implemented in the U.S. domestic fisheries has required non-retention of oceanic whitetip sharks since 2011 in the IATTC area and 2015 in the WCPFC area. NMFS has reinitiated consultation for these two species for the Hawai`i and American Samoa longline fisheries. Additionally, NMFS PIFSC is conducting a study to assess

the post-release survivorship of sharks released alive in the Hawaii and American Samoa longline fishery.

In the ongoing study (Hutchinson and Bigelow, 2019), PIFSC researchers have been working with observer programs and fishermen to quantify post release mortality rates of blue (BSH), bigeye thresher (BTH), oceanic whitetip (OCS), and silky sharks (FAL) that are incidentally captured in the Hawaii deep-set (HiDS) and American Samoa (AS) tuna target longline fisheries, using pop-off archival satellite tags (PAT). This study also assessed the effects that standard shark bycatch handling and discard practices utilized in these fisheries may have on the post release fate of discarded sharks that are alive at haul back of the longline gear. Observers collected shark condition and handling data on 19,572 incidental elasmobranchs captured during 148 fishing trips that occurred between January 2016 and June 2019 on 76 different vessels. During 111 of these trips, 148 sharks were tagged by observers and fishers with pop-off archival tags (PAT). The handling and damage data recorded by trained observers indicated that most sharks (93.22%) were released by cutting the branchline. In the Hawaii deep-set tuna fishery this means that most sharks were released with an average of 9.02 meters of trailing gear, typically composed of a stainless-steel hook, 0.5 m of braided wire leader, a 45-gram weighted swivel, and monofilament branchline ranging in length from 1.0–25.0 m. Sharks released by cutting the line in American Samoa were released with an average of 3.038 m of trailing gear which is composed of a stainless-steel hook to an all monofilament line ranging in length from 1.0–9.0 m. The Kaplan-Meier (KM) survivorship function (Kaplan & Meier, 1958) was used to estimate the probability of survival over time, post release, and the Cox proportional hazards model (Cox, 1972) was used to assess the impact of different variables on the survivorship data. Results from the PAT deployments showed that survivorship to 30 days is relatively high (0.891 ± 0.03 S.E.) for sharks when captured in good condition. Survival rates are also higher for all species when they are left in the water and released by fishers cut the line versus removing the gear. Gear removal requires additional handling, and animals are sometimes brought on deck (sometimes using a gaff) and exposed to air which may impact release condition. The effects of the trailing gear was assessed in a subset ($n=12$) of BSH captured in the Hawaii deep-set fishery using tags programmed for longer deployments (180 and 360 days). Long term survival rates to 300 days were remarkably lower for this dataset (0.356 ± 0.18 S.E.). Additional details regarding the preliminary results of this study are available in Hutchinson and Bigelow (2019). Currently, tagging is ongoing to refine the post release survivorship estimates for BSH, BTH and OCS. Shortfin mako sharks (*Isurus oxyrinchus*) captured in the Hawaii deep-set fishery have recently been added to the study.

Potential interactions between Hawai'i non-longline pelagic fisheries and cetaceans have been identified and are summarized in the most recent marine mammal SARs. Available information do not identify which type of fisheries may be causing injury to cetaceans nor the extent to which the cetacean populations may be impacted by such injuries. New information on this subject published in 2016 that are not included in the current SARs are summarized below.

Madge, L., 2016. Exploratory study of interactions between cetaceans and small-boat fishing operations in the Main Hawaiian Islands (MHI). Pacific Islands Fisheries Science Center, Administrative Report H-16-07, 37 p. doi:10.7289/V5/AR-PIFSC-H-16-07.

Summary: The exploratory study was aimed at improving the understanding of fishery-cetacean interactions in the main Hawaiian Islands through interviews with small-boat fishermen on Oahu and the Big Island. The study highlighted that there is considerable uncertainty in species identification by fishermen of false killer whales and other odontocetes categorized as blackfish, and respondents generally reported avoiding interactions by leaving the fishing area when a blackfish is observed. The results of this study cannot be used to estimate frequency or assess the distribution of interactions due to the small sample size and non-random sampling method.

Table 34 summarizes current candidate ESA species, recent listing status, and post-listing activity (critical habitat designation and recovery plan development). Impacts from FEP-managed fisheries on any new listings and critical habitat designations will be considered in future versions of this report.

Table 34. Status of recent ESA listing processes, status reviews, critical habitat and recovery plan development for species occurring in the Pelagic FEP region

Species		Listing/Petition Response Process			Post-Listing Activity	
Common Name	Scientific Name	90-day Finding	12-month Finding / Proposed Rule	Final Rule	Critical Habitat	Recovery Plan
Oceanic whitetip shark	<i>Carcharhinus longimanus</i>	Positive (81 FR 1376, 1/12/2016)	Positive, threatened (81 FR 96304, 12/29/2016)	Listed as threatened (83 FR 4153, 1/30/18)	Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (85 FR 12898, 3/5/2020)	In development; recovery planning workshops convened in 2019; draft plan anticipated in late 2020.
Chambered nautilus	<i>Nautilus pompilius</i>	Positive (81 FR 58895, 8/26/2016)	Positive, threatened (82 FR 48948, 10/23/17)	Listed as threatened (83 FR 48876, 09/28/2018)	Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (85 FR 5197, 01/29/2020)	TBA
Giant manta ray	<i>Manta birostris</i>	Positive (81 FR 8874, 2/23/2016)	Positive, threatened (82 FR 3694, 1/12/2017)	Listed as threatened (83 FR 2916, 1/22/18)	Designation not prudent; no areas within US jurisdiction that meet definition of critical habitat (84 FR 66652, 12/5/2019)	Recovery outline published 12/4/19 to serve as interim guidance until full recovery plan is developed.
Corals	N/A	Positive for 82 species (75 FR 6616, 2/10/2010)	Positive for 66 species (77 FR 73219, 12/7/2012)	20 species listed as threatened (79 FR 53851, 9/10/2014)	In development, proposed rule anticipated by July 2020	In development, expected TBA, interim recovery outline in place

Cauliflower coral	<i>Pocillopora meandrina</i>	Positive (83 FR 47592, 9/20/2018)	12-month finding anticipated by June 2020	TBA	N/A	N/A
False killer whale (MHI Insular DPS)	<i>Pseudorca crassidens</i>	Positive (75 FR 316, 1/5/2010)	Positive, endangered (75 FR 70169, 11/17/2010)	Listed as endangered (77 FR 70915, 11/28/2012)	Designated in waters from the 45 m depth contour to the 3,200 m depth contour around the MHI from Niihau east to Hawaii (83 FR 35062, 07/24/2018)	In development, draft plan and public comment period anticipated in 2020
Green sea turtle	<i>Chelonia mydas</i>	Positive (77 FR 45571, 8/1/2012)	Identification of 11 DPSs, endangered and threatened (80 FR 15271, 3/23/2015)	11 DPSs listed as endangered and threatened (81 FR 20057, 4/6/2016)	In development, proposal expected TBA	TBA
Leatherback sea turtle	<i>Dermochelys coriacea</i>	Positive 90-day finding on a petition to identify the Northwest Atlantic leatherback turtle as a DPS (82 FR 57565, 12/06/2017)	TBA (status review and 12-month finding anticipated in 2020)	TBA	N/A	N/A
Loggerhead sea turtle (North Pacific DPS)	<i>Caretta caretta</i>	Positive (72 FR 64585, 11/16/2007)	9 DPSs listed as endangered and threatened (76 FR 15932, 03/22/2011)	9 DPSs listed as endangered and threatened (76 FR 58867, 10/24/2011)	Designated for Atlantic Ocean and Gulf of Mexico DPSs (79 FR 39855, 08/11/2014)	In development; concurrent 5-year status review ongoing

1.1.9 IDENTIFICATION OF RESEARCH, DATA, AND ASSESSMENT NEEDS

[THIS SECTION WILL BE UPDATED FOLLOWING THE PLAN TEAM MEETING]

The following research, data and assessment needs for pelagic fisheries were identified by the Council’s Protected Species Advisory Committee and Plan Team:

- Research on at-sea foraging behavior of albatross species to improve understanding of interaction rates in the Hawai`i longline fisheries;

- Identify zones to develop a regional look at environmental and oceanographic factors for area outside of the EEZ that may focus on areas of high-interactions. Develop metrics to characterize environmental data, effort, and bycatch rates at these regional scales (e.g. leatherback, olive ridley, albatrosses);
- Ecosystem considerations on catch and bycatch in the DSLR fishery (e.g., bigeye tunas, albatrosses, leatherback, and olive ridley turtles) as they relate to environmental and ecological drivers of changing species distribution and aggregation; and
- Evaluation of spatial and temporal representation of observer coverage compared to non-observed effort. While vessel behavior may be motivated by various factors, an assessment of sampling bias may be warranted.
- Improve observer data collection for oceanic whitetip shark in longline fisheries to record release condition, handling, trailing gear, size and sex for every observed interaction; and
- Improve data collection for oceanic whitetip shark capture data in non-longline pelagic fisheries.

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