WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

DRAFT
Regulatory Amendment under the Fishery Ecosystem Plan for the Pelagic Fisheries of the Western Pacific Region Including a Draft Environmental Assessment

Modification of Seabird Interaction Mitigation Measures in the Hawaii Deep-set Longline Fishery

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Abstract

The Council is considering a regulatory amendment to the Pacific Pelagic Fishery Ecosystem Plan (FEP) to modify seabird interaction mitigation measures in the Hawaii deep-set longline fishery. At the 184th Meeting in December 2020 the Western Pacific Regional Fishery Management Council directed staff to initiate development of a regulatory amendment to evaluate options for allowing the use of tori lines (also known as bird scaring lines or streamer lines) in lieu of blue-dyed bait and removing the strategic offal discharge requirement in the Hawaii deep-set longline fishery, and schedule further action when the results of a second tori line field trial was available.

Two field trials to develop and test tori lines in the Hawaii deep-set longline fishery were conducted in 2019-2021 under a joint Cooperative Research Project by the Council, Hawaii Longline Association, NMFS Pacific Islands Fisheries Science Center (PIFSC) and PIRO. The studies show that tori lines are significantly more effective in preventing longline gear interactions with black-footed and Laysan albatrosses than blue-dyed bait, which is currently required as part of the seabird interaction mitigation measures implemented under the Council's Pelagic FEP. Discharge of offal and spent bait is also required under the existing measures, but available information suggest that this practice may increase interactions over time by attracting more seabirds to the fishing vessels.

The Council at the 187th meeting in September 2021 considered initial action on the regulatory amendment, and recommended as preliminary preferred alternatives 1) replacing blue-dyed bait with tori line; and 2) removing strategic offal discard from the regulatory requirement, with the addition to include best practices training on offal management as part of the required annual protected species workshop. The Council directed staff to consider a contingency that would allow vessels to continue fishing if a tori pole breaks during a trip. Additionally, the Council directed staff to work with the Action Team to develop the necessary documentation including draft regulations for consideration of final action at the December 2021 meeting.

The Council at the 189th Meeting will consider final action on the regulatory amendment. The purpose of the action is to improve the overall operational practicality and mitigation efficacy of the required seabird mitigation measures for the Hawaii deep-set longline fishery. The Council will consider the following alternatives (*see* section 2.2):

1) No Action (Status Quo)
2) Replace blue-dyed thawed bait and strategic offal discharge measures required for stern-setting vessels with a new tori line requirement (preliminary preferred alternative)
3) Replace blue-dyed thawed bait with a new tori line requirement, and modify strategic offal discard requirement to an offal management requirement

In addition to considering a preferred alternative, the Council at the 189th meeting in December 2021 will consider providing direction for tori line regulatory specifications (*see* section 2.2.2).

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1 INTRODUCTION

1.1 Background Information

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

Seabird interactions in the Hawaii longline fishery, composed mostly of black-footed albatross (BFAL) and Laysan albatross (LAAL), have been monitored through the NMFS Pacific Islands Regional Office Observer Program since 1994. Starting in 2001, implementation of seabird mitigation measures including blue-dyed bait, weighted branch lines, and side-setting resulted in reductions in interactions by 70-90% (Van Fossen 2007; Gilman et al. 2008). LAAL and BFAL interactions in the Hawaii deep-set longline (DSLL) fishery have gradually risen in subsequent years with significant increases since 2015 for BFAL.

The increase in albatross interactions in the DSLL fishery appear to be driven by a combination of factors including oceanographic changes and increase in albatross density around the vessels (Gilman et al. 2016). In 2017, the Council held a workshop exploring the causes of higher BFAL interactions observed in the Hawaii longline fishery in 2015-2016. Potential drivers identified included positive Pacific Decadal Oscillation, strong westerly winds, and cooler sea surface temperatures, which may increase the overlap of DSLL effort and BFAL foraging grounds (Wren et al. 2019). Recent analysis of observer data also indicates that blue-dyed bait has a significantly higher seabird interaction rate than side-setting (Gilman et al. 2016).

In 2018, the Council held a second workshop to review seabird mitigation requirements and the best scientific information available for the Hawaii longline fishery. The workshop resulted in the identification of priority mitigation measures suitable for the Hawaii 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 blue-dyed bait as a candidate for removal from the existing suite of seabird mitigation measures because of concerns with efficacy and practicality, and identified deterrents such as tori lines (also called streamers) to be a high priority for further research and development due to its potential to provide an effective alternative to blue-dyed bait. 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[1] in both Hawaii 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.

[1] SSLL vessels are required to use mackerel-type fish bait and DSLL vessels use fish bait by preference. Squid bait is also more expensive than fish bait.

Tori lines were previously tested in the Hawaii longline fishery in the late 1990s, which showed that the deterrents were effective in reducing seabird contact rates with bait and gear (McNamara et al. 1999, Boggs 2001). However, these early studies also identified issues with practicality and crew safety resulting from tori line entanglement with gear. The Council considered inclusion of tori lines in the seabird mitigation measures in 1999 and again in 2004, but to date tori lines have not been included as a regulatory measure for the Hawaii longline fishery.

Following the 2018 workshop, the Council at its 174th Meeting in October 2018 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 (EFP) 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 in March 2019 reviewed the discussion paper and determined that removal of blue-dyed bait without replacement measures would likely increase seabird interactions. The Council additionally endorsed strategies for identifying alternative mitigation measures and improving seabird measure effectiveness for the Hawaii longline fishery, including addressing captain effects through strategic outreach, identifying tori line designs suitable for the Hawaii fishery, encouraging trials for making minor modifications to existing required measures, and progressing international bycatch assessments for North Pacific albatross species. To further address the priority for identifying suitable tori line designs, the Council directed staff to work with industry, NMFS, Pelagic Plan Team and other expertise as appropriate to identify draft minimum standards for tori lines, taking into consideration existing standards established for other fisheries, designs currently used voluntarily by Hawaii longline vessel operators, and diversity of vessel size and configuration in the Hawaii longline fishery. The Council at the 178th meeting reviewed a working paper on considerations for developing draft minimum standards for tori lines in the Hawaii longline fishery.

In 2019-2020, a joint Cooperative Research Project by the Council, Hawaii Longline Association (HLA), NMFS Pacific Islands Fisheries Science Center (PIFSC) and Pacific Islands Regional Office (PIRO) was implemented to conduct 1) a demonstration and trial of tori lines in the Hawaii deep-set longline fishery to inform minimum standards specific to this fishery, and 2) field trials of tori lines to collect data on operational practicality and effectiveness in using tori lines under commercial fishing operations in the DSLL fishery. The results from the study indicate that tori lines are effective in reducing albatross contacts and attempts on baited hooks when used in conjunction with existing seabird bycatch mitigation measures in the DSLL. Specifically, the results indicate that albatross attempts are about 2 times less likely, and contacts about 3 times less likely when tori lines are used (Gilman et al. 2021a, 2021b). The results also showed that seabird attempts and contacts were more likely to occur when offal discharge was used during the set, although results were inconclusive due to the lack of standardized procedure for strategic offal discharge during the field trials and the potential that crew utilized strategic offal discharge when attempts and contacts were actively observed.

The Council at its 183rd Meeting in September 2020 recommended additional at-sea trials for winter 2020/spring 2021 to test tori line efficacy in the DSLL without the use of blue-dyed bait when fishing north of 23°N under an EFP to inform development of options for revising mitigation measures. The Council concurrently recommended development of an options paper to consider inclusion of tori lines in the seabird mitigation measures, including an option to allow the use of tori lines without blue-dyed bait.

The Council at its 184th Meeting in December 2020 reviewed the options paper, and directed staff to form an Action Team, initiate development of a regulatory amendment to evaluate options for allowing the use of tori lines in lieu of blue-dyed bait and removing the strategic offal discharge requirement in the DSLL fishery, and schedule further action when the results of EFP study are available. The Council also directed staff to work with the Action Team to develop draft regulatory specifications for tori lines in the DSLL for Council review. The Council at the 186th Meeting in June 2021 reviewed the draft regulatory specifications and concurred with the approach of focusing the regulatory requirements on tori line length, attachment point height, and streamer design, and having additional design and safety recommendations as non-regulatory guidelines. The Council directed staff to refine the draft specifications and non-regulatory design guidance for inclusion in the Council action to revise seabird mitigation measures at a future meeting.

The Hawaii Longline Association (HLA) applied for an EFP to test tori lines in lieu of blue-dyed bait, and NMFS issued the approved EFP on January 27, 2021 (86 FR 8341; February 5, 2021). The EFP also exempted the use of strategic offal discharge. Field trials for the EFP study were conducted from February to June 2021. The results of the study were presented at the 187th Council meeting. The results showed that albatross attempts are 1.5 times less likely, contacts are 4 times less likely, and captures 14 times less likely on tori line sets compared to blue-dyed bait sets (Chaloupka et al. 2021).

The Council at the 187th Meeting in September 2021 considered initial action on the regulatory amendment, and recommended as preliminary preferred alternatives 1) replacing blue-dyed bait with tori line; and 2) removing strategic offal discard from the regulatory requirement, with the addition to include best practices training on offal management as part of the required annual protected species workshop. The Council directed staff to consider a contingency that would allow vessels to continue fishing if a tori pole breaks during a trip. Additionally, the Council directed staff to work with the Action Team to develop the necessary documentation including draft regulations for consideration of final action at the December 2021 meeting.

The Council at its 189th Meeting on December 7-9, 2021, will consider taking final action on the regulatory amendment under the Pelagic FEP to modify the seabird interaction mitigation measures for the Hawaii deep-set longline fishery.

1.1.1 Existing Seabird Mitigation Measures in the Hawaii Deep-set Longline Fishery

Current gear-based seabird mitigation measures required in the Hawaii DSLL (50 CFR 665.815) are summarized in Table 1. This set of seabird measures were implemented in 2006, which amended earlier requirements implemented in 2001.

DSLL vessels, when fishing north of 23°N, have the option to side-set or stern set, with each option having additional required measures. If vessels choose to side-set, they are also required to use a bird curtain and weighted branch lines. DSLL vessels that stern set are required to use blue-dyed thawed bait, weighted branch lines, line shooter, and strategic offal discards. In 2019, 115 out of the 140 (82.1%) observed DSLL vessels chose the blue-dyed thawed bait measure over side-setting (NMFS 2021). The management action under consideration focuses on the stern-setting DSLL measures because side-setting has been shown to have significantly lower seabird catch rate than blue-dyed bait (Gilman et al. 2016). The existing regulatory requirements for stern-setting vessels, when fishing north of 23°N are described in further detail below.

Blue-dyed thawed bait: Vessel owners and operators are required to use completely thawed bait that has been dyed blue to an intensity level specified by a color quality control card issued by NMFS, and maintain a minimum of two cans (each sold as 0.45kg or 1lb size) containing blue dye on board the vessel.

>45g weight within 1m of hooks: Vessel owners and operators are required to attach a weight of at least 45g (1.6 oz) to each branch line within 1 m (3.3 ft) of the hook.

Line shooter: Vessel owners and operators are required to employ a line shooter.

Strategic offal discard: Vessel owners and operators are required to discharge fish, fish parts (offal), or spent bait while setting or hauling longline gear, on the opposite side of the vessel from where the longline gear is being set or hauled, when seabirds are present. For purposes of strategically discharging in compliance with this requirement, owners and operators are also required to 1) retain sufficient quantities of fish, fish parts, or spent bait between the setting of longline gear, 2) remove all hook from fish, fish parts, or spent bait prior to discharge, and 3) remove the bill and liver of any swordfish that is caught, sever its head from the trunk and cut it in half vertically. Note that for the purpose of this requirement, offal discard practices include fish, fish parts, or spent bait.

In addition to the gear-based measures, the Hawaii longline fishery is required to handle live seabirds in a manner that maximizes the chances of long-term survival after release and to annually attend a protected species workshop conducted by NMFS.

Table 1. Summary of current seabird mitigation measures required in the Hawaii DSLL fishery (50 CFR 665.815).

When side-setting north of 23°N, also use:	When stern-setting north of 23°N, use:
Bird curtain	Blue-dyed thawed bait
>45g weight within 1m of hook	>45g weight within 1m of hooks Line shooter Strategic offal discards (when seabirds present)

1.1.2 Timeline of Seabird Mitigation Measure Implementation

The Council began addressing seabird interactions in the Hawaii longline fishery in the mid-1990s, with a series of workshops conducted in conjunction with the US Fish and Wildlife

Service (USFWS) to inform fishermen of seabird interaction issues and provide information on mitigation measures. The Council and NMFS in 1998-1999 conducted at-sea trials of various mitigation measures, including blue-dyed bait, thawed bait, towed deterrents, night setting, weighted branch lines, and offal discharge (McNamara et al. 1999; Boggs 2001).

The Council took action in October 1999 recommending that Hawaii longline vessel operators when fishing north of 25°N employ two or more of the following seabird deterrent techniques: 1) blue-dyed bait; 2) strategic offal discards; 3) towed deterrents (e.g., tori lines or towed buoy); 4) line-setting machine with weighted branch lines; 5) weighted branch lines; and 6) night setting. The Council's recommendation was intended to allow fishermen to select a combination of methods to use and find the most effective combination so that seabird measures may be amended based on their operational experience and data. At the time, blue-dyed bait had been primarily tested on squid bait used in the SSLL fishery, and minimal testing had been done on fish bait used in the DSLL fishery.

After NMFS published a proposed rule in July 2000 based on the October 1999 Council recommendation, USFWS issued a Biological Opinion (BiOp) in November 2000 analyzing the impacts of the Hawaii longline fishery on ESA-listed short-tailed albatrosses (STAL). The BiOp concluded that the fishery was not likely to jeopardize the STAL, but estimated that the fishery would take 15 STALs during a 7-year period (for the purpose of the BiOp, USFWS defined "take" to include injury, mortalities, and any STAL striking at baited hooks or gear). Based on this assessment the 2000 BiOp included Reasonable and Prudent Measures (RPMs) and Terms and Conditions that required 1) all Hawaii longline vessels to use thawed blue-dyed bait and strategic offal discards when operating north of 23°N; 2) DSLL vessels to additionally use line-setting machine with weighted branch lines when operating north of 23°N; 3) follow seabird handling techniques; and 4) operators attend annual protected species workshop. The Terms and Conditions of the 2000 BiOp was implemented in June 2001 through an Emergency Interim Rule (66 FR 31561), and later through a Framework Amendment to the Pelagic Fishery Management Plan (FMP) in June 2002 (67 FR 34408).

The USFWS issued a revised BiOp in November 2002 in response to the court-ordered SSLL fishery closure in 2001 resulting from sea turtle interactions that modified the federal action subject to ESA Section 7 consultation. In reinitiating the consultation, NMFS included as part of the proposed action an experiment to test the efficacy of blue-dyed fish bait. The revised BiOp recognized the limited data available on the effectiveness of blue-dye on fish bait, and required interim and final reports of the experiments to be submitted to USFWS.

Following a series of cooperative research trials that tested blue-dyed fish bait along with side-setting and underwater setting chutes, the Council took initial action in June 2004 for a regulatory amendment to the seabird measure. In October 2004, the Council took final action recommending the addition of side-setting as an alternative seabird mitigation measure to blue-dyed bait and the addition of tori lines to the existing blue-dyed bait measure. The Council additionally indicated in its action that it would use the period of the regulatory process to collect supplementary data on bird behavior and coordinate with the USFWS to remove the requirement for blue dyed thawed bait and offal discards, if appropriate. A letter from the US Department of Interior (DOI) to NMFS dated October 15, 2004, received after the Council Meeting, stated that blue-dyed thawed bait and strategic offal discards should be retained as mitigation measures.

DOI agreed that there is limited data on effectiveness of blue-dyed fish bait and acknowledged that trials in New Zealand show that mackerel-type bait hold dye less well than squid. However, DOI argued that blue-dyed thawed bait should be retained in the mitigation measures unless replaced by a demonstrably more effective deterrent, given that thawed bait has some deterrent effect due to its faster sink rate compared to frozen bait and that the blue dye has unclear but "perhaps neutral or positive deterrent effect". The letter further suggested that strategic offal discards should be used only when seabirds were present. DOI also recommended that tori lines not be included as an optional seabird deterrent unless they are used in addition to more effective deterrents, as results of Hawaii-based studies using tori lines indicated tori lines were not as effective as other deterrent measures.

Following the publication of the proposed rule, the Council in November 2005 modified its recommendation to remove tori lines from the regulatory amendment. The decision was due to information that seabird interactions had already been reduced significantly, and construction and operating performance standards of using tori line systems in the Hawaii longline fishery had not been thoroughly studied. Additionally, tori lines were originally included in the recommendations as an incentive to convert to side-setting whereas as of 2005, 40 out of the approximately 125 active vessels had converted to side setting with more on the way given NMFS financial assistance. The regulatory amendment adding the side-setting option was implemented in January 2006 (70 FR 75075).

1.1.3 Seabird Interaction Trends

Seabird interactions in the Hawaii longline fishery have been monitored through the Pacific Islands Regional Observer Program since 1994. The observer coverage rate was initially low at around 5% from 1994 to 1999. The bigeye tuna-targeting DSLL fishery has been consistently monitored at a minimum of 20% coverage since 2001, and the swordfish-targeting SSLL fishery has been monitored at 100% coverage since 2004.

Most seabird interactions in the Hawaii longline fishery are with BFAL and LAAL. Between 1994 and 1999, fleet-wide BFAL interactions were estimated to range from 1,134 to 1,830 annually, and LAAL interactions were estimated to range from 844 to 2,067 annually (McCracken 2000). Implementation of seabird mitigation measures in 2001 resulted in reductions in interactions by 70-90% (Van Fossen 2007; Gilman et al. 2008).

In the decade since the successful implementation of seabird mitigation measures, the DSLL fishery has seen a gradual increasing trend in LAAL and BFAL interactions (Gilman et al. 2016), with higher rates of BFAL interactions seen since 2015 (WPRFMC 2021**;** Figure 1). In contrast, LAAL interactions have remained relatively stable in recent years. A similar, but less pronounced pattern has been observed in the SSLL fishery. To date, STAL interactions have not been observed in the DSLL and SSLL fisheries. In both fisheries, interactions are highest in the first and second quarters of the calendar year (January-June) due to fishing effort overlapping with the BFAL and LAAL foraging distribution during breeding season in the northwestern Hawaiian Islands. Albatross interactions in the DSLL fishery peak in February and May. Most interactions on DSLL vessels occur during the setting operations, as indicated by the high proportion of observed dead interactions (over 90% on average, see section 3.2.5).

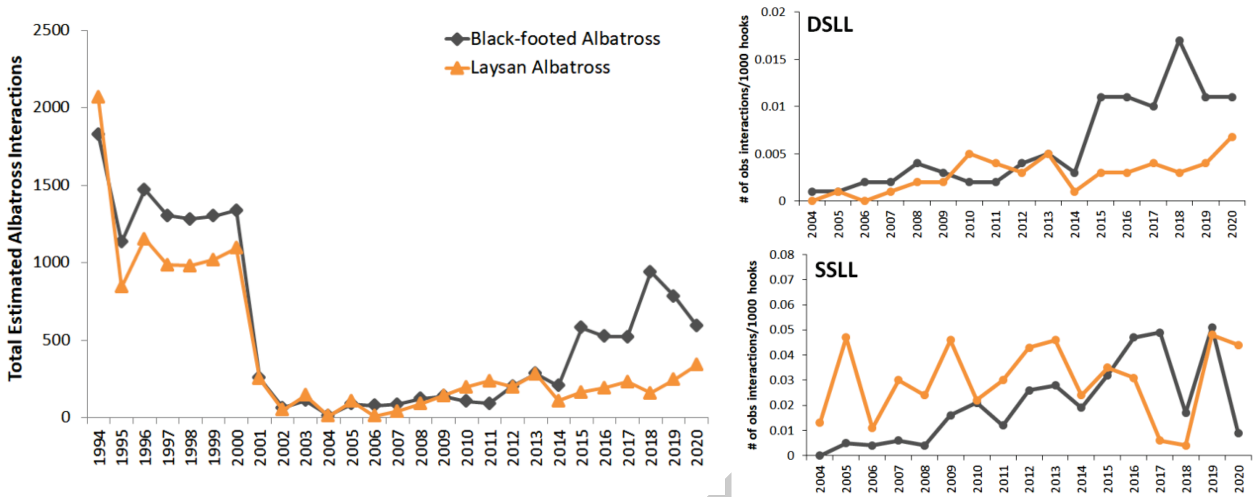

Figure 1. BFAL and LAAL interactions in the Hawaii longline fishery. Left panel shows total estimated BFAL and LAAL interactions in the DSLL and SSLL fishery combined, 1994-2020. Right panels show BFAL and LAAL interaction rates in the DSLL (top) and SSLL (bottom) fisheries. SSLL data for 2006 and 2018-2019 are primarily first quarter data due to fishery closures related to sea turtle interactions. Source: WPRFMC 2021.

The gradual increase of albatross interactions over time and recent elevated levels of interactions in the DSLL appear to be driven by a combination of factors. An analysis conducted by Gilman and colleagues (2016) using data from October 2004 to May 2014, indicated that albatross interaction rates significantly increased during years of higher annual mean multivariate El Niño index (MEI), suggesting that oceanographic changes may have contributed to the increasing trend in albatross catch rates. This analysis also showed a significant increasing trend in the number of albatrosses observed around fishing vessels, which may have contributed to the increasing catch rates. Council's 2017 Workshop further examined the potential environmental factors affecting higher BFAL interactions observed in the Hawaii longline fishery in 2015-2016. Analysis conducted for the 2017 Workshop suggested that while fleet dynamics (month, latitude and longitude of fishing) explained much of the variation over the years, positive Pacific Decadal Oscillation (PDO), strong westerly winds, and cooler sea surface temperatures explained the increase in BFAL sightings in recent years (Wren and Polovina 2018; Wren et al. 2019). Stronger westerly winds may drive productive surface waters to the south, increasing the overlap of DSLL fishing effort and BFAL foraging grounds, and more birds may also transit through the fishing grounds when westerly winds move south during positive PDO years.

Additionally, analysis prepared for the Council's 2018 Workshop suggested that a unique captain effect (i.e., probability of albatross interactions differed by individual vessel operators) may also be contributing to the higher interactions in recent years (Fitchett and Ishizaki 2018). Mean annual captain effects (calculated as odds ratios) increased significantly from 2010 to 2012 and again from 2016 to 2018, commensurate with the recent increase in seabird interactions. Increased albatross attraction to vessels through albatross learning behavior over time was speculated as a factor contributing to larger abundance around vessels in the 2017 Workshop discussions, although data are lacking to test this hypothesis.

BFAL population modeling updated for the 2017 Workshop indicated that the increased interactions in 2015-2016 in the Hawaii longline fishery, if it is temporary or stabilized at the higher level, is likely to have an imperceptible difference on the population growth (Bakker and Finkelstein 2017). If the elevated interaction rates are applied consistently throughout North Pacific fisheries (U.S. and international fleets) with BFAL bycatch, the population is projected to decline. However, data on BFAL interactions in non-U.S. fisheries are limited, and the total BFAL interactions in the North Pacific are unknown.

1.1.4 Summary of the Tori Line Cooperative Research Project

In 2019, a joint Cooperative Research Project by the Council, HLA, PIFSC, and PIRO 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.

The project was divided into two phases. Phase 1 goals were to identify potential tori line designs based on industry input, expert advice, existing international standards and guidelines for tori lines, land trials, and sea trials. Emphasis was placed on light-weight, streamlined designs with minimal potential for tangles to improve the practicality and safety of tori line use during commercial fishing operations. Five different tori line prototype designs were tested during at-sea demonstrations with the goal of determining operational practicality and design preferences based on interviews with vessel operators.

The final design selected for field trials under commercial fishing operations was a short streamer design with a 50 meter aerial extent using a light material backbone and 55 meter drag section using braided rope (

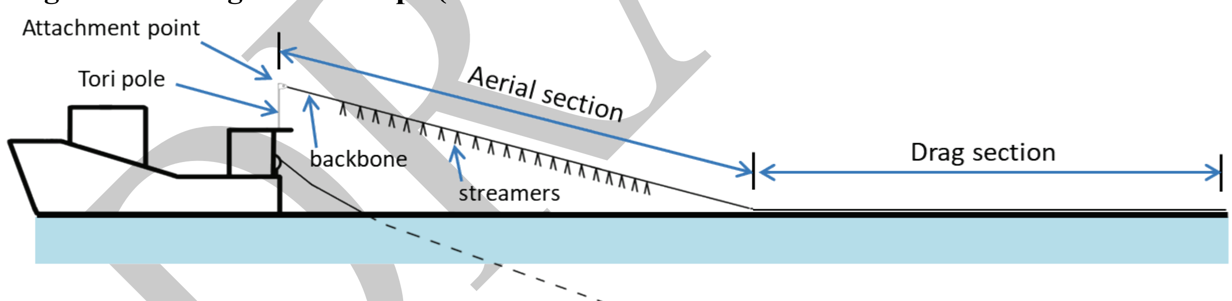

Figure 2, Figure 3). The aerial section used a thin braided rope made of ultra high molecular weight polyethylene, sold under brand names such as Dyneema or Spectra, which is light-weight, water resistant, low stretch, and floats on water. The drag section used a braided rope thicker than the aerial section made of material that is water resistant and floats on water. The short streamer design, which had streamers spaced 1 m apart on the aerial section, was most favored by captain and crew due to their ease of deployment and retrieval, and having sufficient amount of streamers to deter seabirds from sinking baited hooks. The 50 meter aerial extent provides sufficient distance to cover the area with sinking baited hooks in the DSLL (approximately 40 m from vessel stern[3]), and allowed the design to meet existing tori line specifications for the

[3] BFAL and LAAL, the primary species that have incidental interactions with the Hawaii longline fishery are not diving birds, thus the project team determined that aerial extent to cover the area with sinking baited hooks would be

Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC).

During Phase 2 field trials, data on seabird strike attempts and contacts were collected throughout each setting operation using stern video cameras connected to the vessel's Electronic Monitoring (EM) system to evaluate the tori line's effectiveness. The trials involved four DSLL vessels deploying a total of 175 sets on 17 trips.

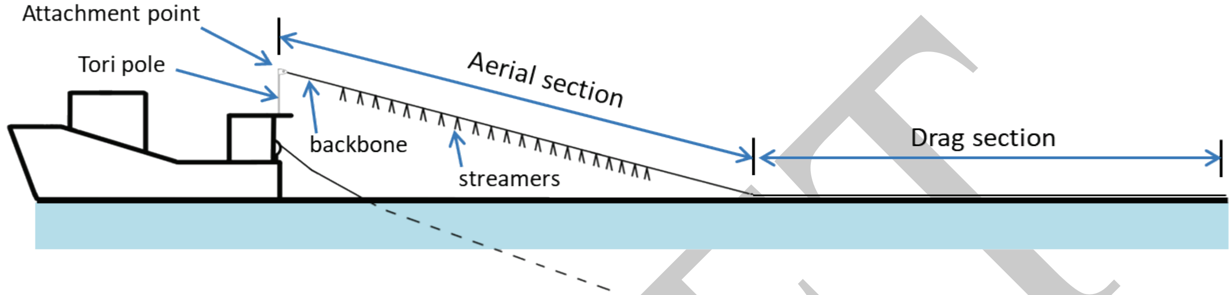

Figure 2. Components of a tori line.

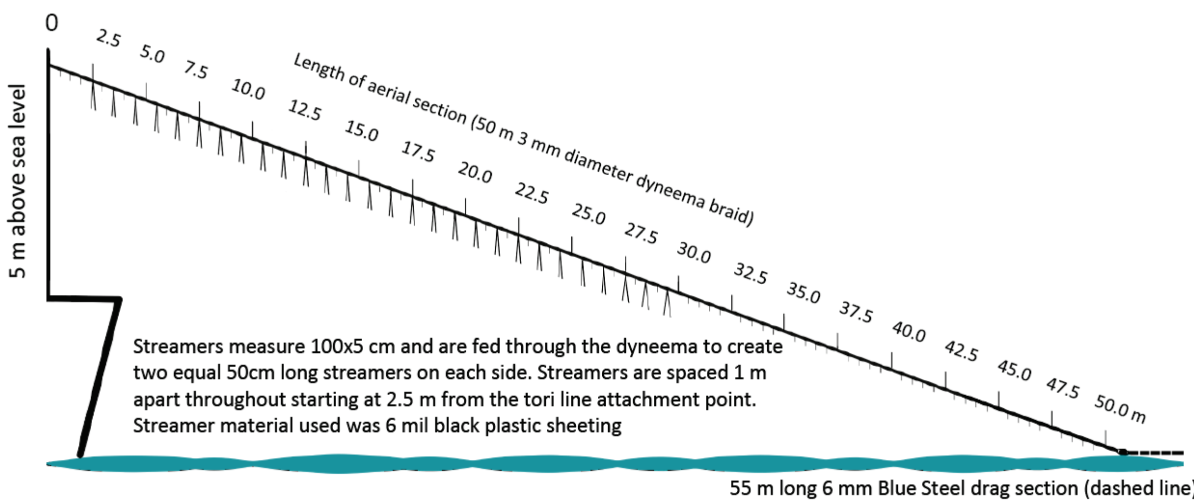

Figure 3. Schematic diagram showing the tori line design developed in the 2019-2020 cooperative research project (source: Gilman et al. 2021a).

The results from the field trials concluded that tori lines are effective in reducing albatross attempts and contacts on baited hooks. Specifically, the results indicate that albatrosses attempts are about 2 times less likely, and contacts about 3 times less likely when tori lines are used (Gilman et al. 2021a, 2021b). However, this initial study did not provide an evaluation of the tori line effectiveness if used in lieu of blue-dyed bait. Additionally, the results showed that seabird attempts and contacts were more likely to occur when offal discharge was used during the set,

sufficient to prevent primary attacks on baited hooks from these species. Secondary attacks by deeper diving seabirds that bring bait to the surface and making them available to other seabirds are not common in the Hawaii longline fishery.

although results were inconclusive due to the lack of standardized procedure for strategic offal discharge during the field trials and the potential that crew utilized strategic offal discharge when attempts and contacts were actively observed (*see* Section 1.1.6 for additional discussion on offal discharge).

The Council at its 183rd Meeting recommended additional at-sea trials for winter 2020/spring 2021 to test tori line efficacy without the use of blue-dyed bait when fishing north of 23°N under an EFP to inform development of options for revising mitigation measures. The Hawaii Longline Association (HLA) applied for an EFP to test tori lines without the use of blue-dyed bait or strategic offal discharge (discharging bait and fish offal when seabirds are present), both of which are normally required while deploying DSLL gear north of 23°N. NMFS issued the approved EFP on January 27, 2021 (86 FR 8341; February 5, 2021).

Field trials for the 2021 EFP study were conducted from February to June 2021. The trials involved three DSLL vessels, 7 total trips, and 87 sets. The vessels alternated sets between two treatments: 1) blue-dyed bait used in conjunction with branch line weights; and 2) tori line used in conjunction with untreated bait and branch line weights. On all sets, crew were instructed not to discharge offal or spent bait during setting operations. Data on seabird strike attempts and contacts were collected throughout each setting operation using stern video cameras connected to the vessel's EM system. The results show that albatross attempts are 1.5 times less likely, contacts are 4 times less likely, and captures 14 times less likely on tori line sets compared to blue-dyed bait sets (Chaloupka et al. 2021).

The DSLL tori line studies conducted in 2019-2021 provide robust scientific evidence that tori lines are significantly more effective in mitigating seabird interactions in the DSLL than the existing blue-dyed bait measure.

1.1.5 Background and Available Scientific Information on Blue-dyed Bait

Hawaii DSLL vessel owners and operators, when stern-setting, are required to use completely thawed bait that has been dyed blue to an intensity level specified by a color quality control card issued by NMFS. The owners and operators are also required to maintain a minimum of two cans (each sold as 0.45 kg or 1 lb size) containing blue dye on board the vessel.

Dyed bait in pelagic longline fisheries were experimented in East Coast fisheries as early as the mid-1970s to increase catch rates of target species. Fishermen found that a variety of different colored squid baits were effective in targeting swordfish, but found that blue-dyed bait reduced bait losses to seabirds (McNamara et al. 1999). It was not known whether the blue dye creates a camouflage effect against the ocean and the seabirds do not see dyed bait well, or if seabirds do not consider blue-dyed bait as food.

Blue-dyed bait was first tested in the Hawaii longline fishery in the late 1990s. McNamara and colleagues (1999) tested blue-dyed bait, tori lines, towed buoy system, and offal management on both SSLL and DSLL trips, with night setting additionally evaluated for SSLL. Each of the mitigation measures were tested individually, and data on all mitigation measures except for night setting were collected during daylight hours. Of the five trips observed for the study, one trip targeted tuna using DSLL gear and fish bait, and four trips targeted swordfish using SSLL gear and squid bait. Results from the SSLL trips indicated that blue-dyed squid bait was the most effective measure among the mitigation strategies tested, reducing seabird gear contacts by 77% and capture rates by 95%. Experimental treatments on the DSLL trip had a small sample size in the study, with only two sets testing blue-dyed fish bait, during which there were no gear contact with seabirds on hooks with blue-dyed fish bait, whereas 10.7 attempts to pick up baited hooks per seabird per 1,000 hooks were observed on control hooks. In this study, seabirds that were actively pursuing natural-colored baits were observed to ignore dyed baits that were within view and range, and their foraging behavior toward dyed baits was greatly reduced during setting and hauling operations. Based on the results of the study, the authors recommended different combination of mitigation measures to be considered for DSLL and SSLL vessels due to operational and gear characteristics unique to each component, and only recommended blue-dyed bait for SSLL using squid for bait.

A second experiment testing blue-dyed squid bait, tori lines and weighted branch lines was conducted in 1999 on a research vessel using SSLL gear (Boggs 2001). This study found that blue-dyed squid bait reduced the number of albatross contacts with baits by approximately 90% compared to the control treatment. These two studies (McNamara et al. 1999; Boggs 2001) provided the basis for the Council's 1999 recommendation that would have required that vessels in the Hawaii longline fishery use two out of six mitigation measures including blue-dyed bait, as well as the RPM and associated Terms and Conditions in USFWS' 2000 BiOp that first required blue-dyed bait to be used in both SSLL and DSLL fisheries.

Following implementation of the seabird measures, Gilman and colleagues (2007) tested the effectiveness of blue-dyed bait along with underwater setting chutes and side-setting on both DSLL and SSLL gear. The study found that blue-dyed bait had higher seabird catch rates than side-setting on both DSLL and SSLL sets, and found that blue-dyed bait was impractical due to the amount of time required to dye the bait and the need to fully thaw the bait, which increases bait loss from hooks. An analysis of DSLL observer data from 2004 to 2014 showed that blue-dyed bait had a significantly higher seabird catch rate than side-setting, with seabird catch rates for January-June with high albatross densities estimated at 0.061 interactions per 1,000 hooks when fishing with blue-dyed bait, whereas catch rates were estimated at 0.024 interactions per 1,000 hooks when fishing under the same conditions with side-setting (Gilman et al. 2016).

Studies of blue-dyed bait effectiveness on seabird interaction rates outside of Hawaii have had mixed results. An experiment testing blue-dyed squid and fish bait effectiveness on wedge-tailed shearwaters showed that dyed fish bait had higher bird strike rates compared to dyed squid bait, and that habituation to dyed fish bait was observed with bird strike rates increasing from 48% to 90% over the trial period (26 longline sets) (Cocking et al. 2008). In contrast, a trial of blue-dyed squid and fish baits on Japanese longline research vessels targeting Southern Ocean bluefin tuna showed that blue-dyed fish bait was effective in reducing albatross interactions at levels similar to blue-dyed squid bait, although blue-dyed bait also reduced target catch in this study (Ochi et al. 2011). Ochi and colleagues (2011) speculated that the blue-dyed fish bait effectiveness may vary by seabird species, as their study focused on interaction rates with albatrosses and petrels rather than shearwaters.

In addition to the study by Cocking and colleagues (2008), a study conducted in New Zealand also suggests that seabirds are able to detect blue-dyed bait but may not pursue them due to preference for non-dyed bait over dyed bait (Lydon and Starr 2005). In the New Zealand study where albatrosses, petrels and shearwaters were observed, seabird behavior appeared to change when blue-dyed bait was deployed after non-dyed control bait. Whereas seabirds actively pursued and fought over non-dyed bait, seabird behavior in six of the seven observed sets during the trial changed to making only brief landings on the surface and fewer seabirds present. However, in the final set during the trial, seabirds actively attacked the blue-dyed bait, even though setting conditions (e.g., time of day, water color, cloud cover) remained similar to the first six sets and thus contrast between dyed bait and the water would have been similar. Blue-dyed bait remained visible to the human eye in various sea conditions, thus Lydon and Starr (2005) concluded that seabirds preferred controlled bait over blue-dyed when given a choice, and that the lack of interest was not likely due to detection failure. Behavior observed in the New Zealand study is supported by available information on avian eyesight and color vision, which indicate that avian eyes are more morphologically complex than for mammals.

Early studies primarily testing blue-dyed squid bait in the Hawaii longline fishery showed that albatrosses showed little interest in dyed bait compared to non-dyed bait. It is unknown whether albatross behavior toward blue-dyed fish bait in the Hawaii fishery has changed over time.

1.1.6 Background and Available Scientific Information on Strategic Offal Discards

Hawaii DSLL vessels, when stern-setting, are required to discharge fish, fish parts, or spent bait while setting or hauling, on the opposite side of the vessel from where the longline gear is being set or hauled, when seabirds are present. This strategic offal discharge requirement was first implemented in 2001 (66 FR 31561) as a technique to distract seabirds away from baited hooks. Vessels are also required to retain sufficient quantities of offal and spent bait between setting operations, remove all hooks from fish, fish parts, or spent bait prior to discharge, and cut swordfish heads in half for the purpose of strategic offal discharge. The original regulations implemented in 2001 required the discharge of offal (fish, fish parts, or spent bait) while setting or hauling longline gear on the opposite side of the vessel from where gear is being set or hauled, and was required to be used in conjunction with blue-dyed thawed bait, line shooter, and weighted branch lines. Seabird mitigation requirements for the deep-set fishery was modified in 2006 (70 FR 75075) to add the side-setting option, which requires that vessels selecting to side set also use a bird curtain and weighted branch lines, but the strategic offal discharge was not included as a requirement for side-setting vessels. For stern-setting vessels, the 2006 regulation changes modified the strategic offal discharge requirement to include the language "when seabirds are present".

The use of strategic discards in the Hawaii fishery was a practice that started with SSLL vessels by using halved swordfish heads to attract seabirds away from fishing gear and bait. The large swordfish heads provide a large floating attractant that stayed afloat until seabirds were well astern of the vessel and less likely to resume pursuit of the baited hooks. Swordfish heads are not readily available on the tuna-targeting DSLL vessels, and thus smaller pieces of offal or spent bait may also be used as strategic discards, but they may allow seabirds to quickly consume them and resume pursuit of the vessel (McNamara et al. 1999). The measure also requires vessels to retain offal and spent bait during hauling operations so that discharge material is available during setting operations, as there is usually little to no offal or spent bait generated during the set.

Hawaii longline fishery may be unique in requiring 'strategic' offal discharge during setting or hauling as the only option for managing offal discharge. The seabird measures of the two Pacific Ocean tuna Regional Fishery Management Organizations (RFMOs) define 'management of offal discharge' as either (a) not discharging offal during setting or hauling, or (b) discharging offal only from the opposite side of the vessel from where setting or hauling is occurring (IATTC, 2012; WCPFC, 2018) and we are not aware of domestic fisheries management systems that implement option b other than in the Hawaii longline fisheries. The Agreement on the Conservation of Albatrosses and Petrels (ACAP) discourages discharge during line setting, and recommends retention or strategic discharge during hauling (from opposite side of the vessel from where hauling operation is taking place) (ACAP, 2019). The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) (2018) prohibits offal and discard discharging during setting in longline fisheries, consistent with the ACAP recommendations.

Prior to the regulatory requirement being implemented in 2001, strategic offal discard was tested in a controlled experiment only on a SSLL vessel during the setting operation (McNamara et al. 1999). The study tested several seabird mitigation measures individually, with strategic offal discard tested on one of four SSLL trips. During the SSLL experimental trial on a SSLL vessel, crew removed and retained swordfish heads from fish processing during hauls, and used the swordfish heads during the set by tossing them in plain view of the seabirds. Each observation period with strategic offal discard lasted 30 minutes, and a total of 880 hooks were observed for the strategic offal discard treatment during the set on a SSLL vessel, out of the total 8,023 hooks observed in all four SSLL trips. Based on this experiment, strategic offal discards were shown to reduce contact with SSLL gear by 51% (McNamara et al. 1999). However, strategic offal discard was not tested in the DSLL fishery in which swordfish heads are not readily available, nor was it tested during hauling operations in the SSLL or DSLL fishery. The study did test the effect of retaining offal during hauling operations in the SSLL fishery, and found that seabird interactions significantly increased when no offal or bait was discarded during the hauling operations, with seabirds following closer to the vessel and attempted to forage on the baited hooks remaining in the water because it was the only food available (McNamara et al. 1999). This study provided the basis for the Council's 1999 recommendation that would have required that vessels in the Hawaii longline fishery use two out of six mitigation measures including strategic offal discards, as well as the RPM and associated Terms and Conditions in USFWS' 2000 BiOp that first required strategic offal discards to be used in both SSLL and DSLL fisheries.

Discharging offal from processed catch, spent bait and dead discards away from setting and hauling operations may draw scavenging seabirds' attention away from where baited hooks are available and reduce seabird catch rates during that fishing operation, but this may be a short-term effect (Cherel et al., 1996; McNamara et al., 1999). Based on research conducted in trawl fisheries, increased time between offal discharge events and retention of offal reduces the number of seabirds attending vessels (Abraham et al., 2009; Pierre et al., 2010, 2012), indicating that offal discharge may be attracting more seabirds to the vessels. Studies have shown that the lower the seabird density attending vessels, the lower the seabird catch risk (Gilman et al., 2005; Abraham et al., 2009). Retention (i.e., no discards) might also reduce competitive seabird scavenging behavior and foraging intensity, reducing capture risk (Delord et al., 2005; Gilman et al., 2016), or may increase capture risk by making the baited hooks the only available food around the vessel for attending seabirds (McNamara et al. 1999).

An analysis of observer data for the period of 2004-2014 found that strategic offal discards in the DSLL, recorded as being used in 39% of sets and 65% of hauls, did not significantly affect seabird catch rates (Gilman et al. 2016). An analysis of observer data for SSLL hauling operations also indicated that records of crew employing strategic offal discard did not have a significantly different seabird interaction rate compared to records when discards were not made on the opposite side of the vessel (Gilman at al. 2014). In the 2019-2020 Cooperative Research Project conducted in the DSLL fishery, analysis showed that seabird attempts and contacts were more likely to occur when offal discharge was used during the set, although the effect of offal on seabird capture risk from this study was inconclusive due to the lack of standardized procedure for strategic offal discharge during the field trials and the potential that crew utilized strategic offal discharge when attempts and contacts were actively observed (Gilman et al. 2021a, 2021b). In the 2021 study conducted under the EFP, participating vessels were instructed to withhold offal during the set to eliminate the potential confounding factor of offal discharge and to allow a robust comparison of the effects of blue-dyed bait and tori lines in the DSLL (Chaloupka et al. 2021). The two recent studies in the DSLL fishery did not test the effect of strategic offal discards during hauling operations.

1.2 Proposed Action

The proposed action is to be determined pending Council final action at its 189th Meeting to be held December 7-9, 2021. The Council at its 187th Meeting in September 2021 recommended as preliminary preferred alternatives 1) replacing blue-dyed bait with tori line; and 2) removing strategic offal discard from the regulatory requirement, with the addition to include best practices training on offal management as part of the required annual protected species workshop. If the Council selects a preferred alternative, the action would amend the regulations implementing the Pelagic FEP.

1.3 Purpose and Need for Action

The purpose of this action is to improve the overall operational practicality and mitigation efficacy of the required seabird mitigation measures for the Hawaii deep-set longline fishery.

The action is needed to address the increased albatross interactions observed in the deep-set fishery since 2015, and to minimize seabird bycatch and bycatch mortality to the extent practicable consistent with National Standard 9 and other applicable law. The action is also needed to provide relief from the burden of cost and time with less effective existing mitigation measures, and to reflect the results of the recent cooperative research and the best available scientific information.

1.4 Action Area

The Hawaii deep-set fishery operates around the main Hawaiian Islands primarily within 300-400 nm between the Equator and 35° N. In general, deep-set longline vessels operate out of Hawaii ports, with the vast majority based in Honolulu and a few in Hilo. Some deep-set trips originate from other ports such as Long Beach or San Francisco, California, or Pago Pago, American Samoa. Fishermen departing from California begin fishing on the high seas, outside the U.S. EEZ. Fishermen departing from American Samoa and landing in Hawaii usually begin fishing near the Equator or in the North Pacific where they expect higher catch rates of bigeye tuna.

1.5 Decision(s) to be Made

The Council will consider final action on modifying the seabird interaction mitigation measures in the Hawaii deep-set longline fishery at the 189th meeting to be held December 7-9, 2021.

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

1.6 List of Preparers

Asuka Ishizaki, Protected Species Coordinator, WPRFMC
Maria Carnevale, NEPA Coordinator, WPRFMC

1.7 NEPA compliance

This Environmental Assessment (EA) is being prepared using the 2020 Council on Environmental Quality (CEQ) National Environmental Policy Act (NEPA) Regulations. The effective date of the 2020 CEQ NEPA Regulations was September 14, 2020, and reviews begun after this date are required to apply the 2020 regulations unless there is a clear and fundamental conflict with an applicable statute. 85 Fed. Reg. at 43372-73 (§§ 1506.13, 1507.3(a)). This EA began after June 30, 2021 and accordingly proceeds under the 2020 regulations.

On October 21, 2021 NMFS Assistant Administrator, and Acting Assistant Secretary of Commerce for Oceans and Atmosphere, and Deputy NOAA Administrator, Janet Coit, extended a blanket waiver for time and page limits for a one-year period for all Environmental Assessments (EAs) and Environmental Impact Statement (EISs) developed to support fishery management actions that are: developed by the regional fishery management councils (Councils) pursuant to the requirements of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), or developed by the National Marine Fisheries Service (NMFS) Atlantic Highly Migratory Species (HMS) Management Division for actions taken under the requirements of the MSA. Because this EA was prepared to support a Council fishery management action, the page and time limits defined in CEQ regulations are waived.

1.8 Public Involvement

Council meetings and meetings of the Council's advisory bodies are open to the public and are noticed in the Federal Register and local newspapers and publications and on the Council's website (www.wpcouncil.org). Meeting agendas provide opportunities for public comment.

At its 184th meeting held on December 2-4, 2020 (85 FR 73029; November 16, 2020), the Council considered an options paper and directed staff to initiate development of a regulatory amendment. The Council's Pelagic Plan Team, Hawaii FEP Advisory Panel, and the SSC also met on November 19, 20, and November 30 – December 1, 2020, respectively (85 FR 70132, November 4, 2020; 85 FR 70131, November 4, 2020; 85 FR 73029; November 16, 2020), to advise on the options paper.

At its 185th meeting held on March 23-25, 2021 (86 FR 11505, February 25, 2021), the Council considered an options paper for the Hawaii shallow-set longline fishery but did not recommend including this sector within the scope of the action for modifying the seabird mitigation measures at this time. The Council's Pelagic Plan Team, Fishing Industry Advisory Committee,, Hawaii FEP Advisory Panel, and the SSC also met on March 3-4, 11, 12, and 16-18, 2021, respectively (86 FR 9910, February 17, 2021; 86 FR 12175, March 2, 2021; 86 FR 11505, February 25, 2021), to advise on the specifications.

At its 186th meeting held on June 22-24, 2021 (86 FR 29251, June 1, 2021), the Council reviewed the draft regulatory specifications for tori lines. The Council's Fishing Industry Advisory Committee, Hawaii FEP Advisory Panel, and the SSC also met on June 10, 11, 15-17, 2021, respectively (86 FR 28080, May 25, 2021; 86 FR 29251, June 1, 2021), to advise on the specifications.

At its 187th meeting held on September 21-23, 2021 (86 FR 47626, August 26, 2021), the Council considered initial action on the regulatory amendment to modify seabird interaction mitigation measures in the Hawaii deep-set longline fishery and recommended a preliminary preferred alternative. The Council's Hawaii FEP Advisory Panel, Fishing Industry Advisory Committee, and the SSC also met on September 3, September 9, and September 14-16, 2021, respectively (86 FR 45710, August 16, 2021; 86 FR 47626, August 26, 2021), to advise on the action.

At its 189th meeting to be held on December 7-9, 2021, the Council will consider taking final action on the regulatory amendment. The Council's Fishing Industry Advisory Committee, Hawaii Archipelago FEP Advisory Panel, and the SSC will also meet on November 16, November 19, and November 30 – December 2, 2021, respectively, to advise on the final action.

After Council final action, NMFS will publish in the *Federal Register* the proposed regulatory amendment to implement the proposed action. The public will have another opportunity to provide a comment on the action, and NMFS will consider public comments on the proposed action before making a decision on the regulatory amendment and publishing the final rule.

2 DESCRIPTION OF THE ALTERNATIVES CONSIDERED

2.1 Development of the Alternatives

As described in Section 1.1, the Council has been considering potential modifications to the Hawaii deep-set longline fishery seabird mitigation measures following observed increases in black-footed albatross interactions since 2015. Based on the 2018 workshop to review seabird mitigation measures, the Council at the 174th meeting in October 2018 identified blue-dyed bait as a measure for potential removal and tori line as a potential alternative to blue-dyed bait, and recommended research and development to identify suitable tori line designs for the Hawaii deep-set longline fishery. The joint cooperative research effort in 2019-2021 resulted in a light-weight short-streamer design that was practical and safe to deploy, and was found to be significantly more effective at deterring seabirds than blue-dyed bait. The 2020 field trials showed seabird interaction risk was higher on sets with offal discards, but results were inclusive due to confounding factors (Gilman et al. 2021a, 2021b). The 2021 study conducted direct comparison of blue-dyed bait and tori line, with offal withheld during set. The Council considered the results of the first field trials at the 183rd meeting in September 2020, and the second field trial results at the 187th meeting in September 2021.

The Council considered a broad range of options at the 184th meeting in December 2020, including options to allow use of tori lines in place of blue-dyed bait, as well as consideration of broadening the scope to include modification of other aspects of the Hawaii longline seabird measures, such as the modification of strategic offal discharge requirement, inclusion of shallow-set longline fishery measures, converting to a “menu” approach used under RFMOs, and addressing cross-taxa impacts associated with weighted branch lines. The Council considered additional range of options for the shallow-set longline fishery at 185th meeting in March 2021. Through these two meetings, the Council determined that the regulatory amendment should focus on the modification of seabird mitigation measures for the Hawaii deep-set longline fishery at this time, with a focus on allowing the use of tori lines in lieu of blue-dyed bait, and removing the strategic offal discharge requirement. The broader set of alternatives that the Council considered at this stage but did not recommend for further analysis are described in Section 2.3.

At the 187th meeting in September 2021, the Council considered initial action on the regulatory amendment for modifying seabird mitigation measures in the Hawaii deep-set longline fishery. The Council considered an options paper that evaluated the addition of tori lines as a third suite of measures, replacement of blue-dyed bait with tori lines, and modification of the strategic offal discard requirement (either to remove from the requirements or to refine the regulatory language to prohibit discards during setting when seabirds are most active). The Council also considered recommendations from the Hawaii FEP Advisory Panel, Fishing Industry Advisory Committee, and the Scientific and Statistical Committee, all of which supported the replacement of blue-dyed bait with tori lines, and removal of the strategic offal discard requirement. The SSC additionally recommended that the Council consider either an option for an additional regulation for not discharging fish waste immediately before and during setting, or incorporate best practices training to the currently required annual protected species training workshop. Taking into account these advisory body recommendations, the Council recommended as preliminary preferred alternative the following:

- Replace blue-dyed bait with tori line; and
- Remove strategic offal discard from the regulatory requirement, with the addition to include best practices training on offal management as part of the required annual protected species workshop.

The Council additionally directed staff to consider a contingency that would allow vessels to continue fishing if a tori pole breaks during a trip.

The alternatives presented in this draft regulatory amendment are based on the Council's preliminary preferred alternative recommended at the 187th meeting. The alternatives that consider tori lines include draft regulatory and non-regulatory specifications based on the design developed through the 2019-2021 research effort and existing international standards (*see* Appendix A in Gilman et al. 2021a), as well as the Council's preliminary review of the specifications at the 186th meeting in June 2021. Detailed description of the offal measure modifications were refined by the Action Team following the 187th meeting with input from the Pacific Islands Regional Observer Program and NOAA Office of Law Enforcement personnel.

2.2 Description of the Alternatives

This section describes the alternatives for modifying seabird interaction mitigation measures in the Hawaii deep-set longline fishery under the Pelagic FEP for Council's consideration of final action at the 189th meeting in December 2021. Alternative 1 is the No Action (status quo) alternative, Alternative 2 would replace blue-dyed thawed bait and strategic offal discharge measures required for stern-setting vessels with a new tori line requirement, and Alternative 3 would replace blue-dyed thawed bait with a new tori line requirement, and modify strategic offal discard requirement to an offal management requirement. Alternative 2 is the Council's preliminary preferred alternative recommended at the 187th meeting in September 2021.

The difference between Alternatives 2 and 3 is whether the updated offal management measure would be implemented through a non-regulatory best practices training (Alternative 2) or a regulatory requirement (Alternative 3). The removal of blue-dyed thawed bait and addition of the tori line requirement is the same between the two action alternatives.

Features common to all alternatives are described in Section 2.2.1, and a summary of the alternatives are described in Table 6.

2.2.1 Features Common to All Alternatives

Under all alternatives considered, requirements for owners and operators of Hawaii deep-set longline vessels to use seabird mitigation techniques will continue to apply when fishing north of 23°N. An analysis of observer data indicates that seabird interaction rates north of 23°N are an order of magnitude higher than to the south (Gilman et al. 2016) even with the presence of required seabird mitigation measures, and no new information is available that suggest additional protections are warranted to the south. Additionally, owners and operators of all Hawaii longline vessels will continue to be required to follow existing seabird handling and release requirements (50 CFR 665.815(b)-(c)) regardless of where they fish to maximize the chances of post-release survival of any seabirds that are caught alive, as well as attend and be certified for completion of an annual protected species workshop conducted by NMFS (50 CFR 665.814).

These alternatives focus on seabird mitigation requirements for deep-set vessels that stern set, and none of the alternatives consider modifications to the measures required for vessels that side-set because side-setting has been shown to have significantly lower seabird catch rates than the blue-dyed bait required for stern-setting vessels (Gilman et al. 2016).

Under all alternatives considered, NMFS would continue to monitor the Hawaii deep-set longline fishery under statistically reliable observer coverage. The deep-set fishery has had consistent coverage exceeding 20% of all trips since 2001, with the exception of 2020, when COVID-19 restrictions resulted in a reduced annual coverage of approximately 15%. NMFS collects data on seabird sightings, mitigation measures used, and interactions: species caught; capture and release location, date and time, and condition; hooking and/or entanglement location; recovered bands, injuries, and handling techniques used. This information is documented in an annual report required by the Terms and Conditions of the 2012 BiOp of the U.S. Fish and Wildlife Service for the operation of Hawaii-based pelagic longline fisheries.

2.2.2 Description of Measures Contained in the Alternatives

Alternatives 2 and 3 consider the implementation of tori lines in the Hawaii DSLL fishery and associated regulatory specifications for the tori line design. Alternatives 2 and 3 also consider the modification of the existing strategic offal discard requirement through the adoption of revised best practices for the DSLL fishery either through a non-regulatory approach (Alternative 2) or regulatory approach (Alternative 3). This section describes the tori line regulatory specifications, for which the Council will provide further direction as part of the final action, and the proposed best practices for the DSLL fishery based on the available information.

Tori Line Specifications

As part of the tori line requirement considered under Alternative 2 and 3, the Council at the 189th meeting in December 2021 will consider providing direction for regulatory specifications for tori lines. At the 186th meeting in June 2021, the Council consider draft specifications based on the short-streamer design developed during the 2019-2021 field trials conducted in the Hawaii deep-set fishery (*see* Section 1.1.4) and existing international standards (*see* Appendix A in Gilman et al. 2021a). At the time, the Council supported the approach of focusing the regulatory requirements on tori line length, attachment point height, and streamer design, and having additional design and safety recommendations as non-regulatory guidelines. The Council directed staff to refine the draft specifications and non-regulatory design guidance for inclusion in the Council action to revise seabird mitigation measures at a future meeting. The specifications considered in the Council's recommendations were as follows:

- Tori line length
    - The tori line must have a minimum aerial section length of 50m, *AND*
    - A minimum total length of three times the total length of the vessel
- Streamers

    - Streamers must be 30cm minimum length and must be spaced less than 1m apart; *AND*
    - Streamers are not required for the last 20m of aerial section to minimize entanglements with buoys and fishing gear
- Attachment point height
    - Tori line should be attached to the vessel at a point a minimum of 5m above the water if attachment point is within 2m of vessel stern.
    - If the attachment point is more than 2m from the stern, the attachment point height should be increased by 0.5m for every 5m distance from the stern.

The intent of the approach supported by the Council at the 186th meeting was to keep the regulatory specifications similar to international specifications applicable to the Hawaii deep-set longline fishery (WCPFC and IATTC) by focusing on the length of the line and attachment height, while maintain flexibility for fishermen to further improve their lines and for updating guidance as new information or material becomes available. Review of available literature and guidance indicated that the most important part of the tori line design is the ability to maintain a consistent aerial extent that covers the distance astern where baited hooks are available to seabirds (WPRFMC 2019; Gilman et al. 2021a). While the tori line design developed under the DSLL cooperative research project was based on extensive review of available literature, expert input, and input from participating fishermen, the project did not exhaust potential material options in the process of design development due to the project timeline and priority placed on finding materials that were available through local retailers at the time. The project was only able to test one design during the field trials to evaluate efficacy of tori line compared to blue-dyed bait due to funding limitations. Additionally, the DSLL cooperative research project did not test tori lines with different types of material for mitigation effectiveness, and did not exhaust potential material options in the process of design development. The non-regulatory design guidance, coupled with a roll-out strategy to provide tori lines and poles at no cost to vessels, would help maintain consistent design used in the fleet to set a standard through non-regulatory means.

Further, the Council at the time of initial action taken at the 187th meeting in September 2021 directed staff to consider a contingency that would allow vessels to continue fishing if a tori pole breaks during a trip. An exemption for the attachment point height would allow vessels to continue fishing north of 23°N if the attachment point breaks during a fishing trip. Under the draft specifications, owners and operators of a vessel may use an existing structure on the vessel (such as a mast or outrigger) or mounting a dedicated pole to attach the tori line (tori pole) that may be welded or affixed to the vessel. These structures may be difficult to repair at sea if they break and can no longer function as a safe attachment point for the tori line. Such an instance is expected to be rare, but could result in an economic loss to the vessel for that trip if the vessel is fishing well north of 23°N when fish catch rates are high. This contingency under regulatory specifications would only be considered for the structure to attach the tori line, and is not considered for the tori line itself, because the vessels can store backup tori lines on board.

Following the 187th meeting, NMFS PIRO has recommended that the Council consider some of the material specifications as part of the regulatory requirements to ensure that the tori lines to be used in the fishery maintains similar effectiveness to those tested during the 2019-2021 studies (Gilman et al. 2021a, Chaloupka et al. 2021). These additional specifications are also intended to ensure that fishermen do not use materials that are known to be ineffective, cause entanglements, or affect crew and observer safety. The additional specifications are also intended to reduce the chances of attachment point failure resulting from tori line entanglement with longline gear. The Council may consider following additional or alternative specifications:

- Specify aerial section and drag section materials for consistency with the design used in the 2019-2021 studies due to its properties that help maintain a consistent aerial extent and reduce entanglements and tangles. Specifically, require that:
    - The aerial section is made of ultra high molecular weight polyethylene (sold under brand names such as Dyneema and Spectra) or other similar material that is light-weight, water resistant, low stretch, and floats in water; and
    - The drag section is made of 6mm or larger braided material that is water resistant and floats in water;
- Prohibit the use of monofilament nylon in the aerial or drag sections of the tori line due its known properties for sagging and requiring a longer length to achieve the necessary aerial extent (Pierre et al. 2016);
- Require that vessels have two tori lines meeting specifications at the start of every trip so that a backup line can be deployed in the event of a tori line breakage during the set or trip;
- Require that the attachment point on the vessel to be made of rigid material to ensure consistent aerial extent and to reduce the chances of attachment point breakage; and
- Require that a breakaway point for the tori line is included at the attachment point to reduce the tension on the attachment point in the event of a tori line tangle with longline gear.

The draft regulatory specifications for Council consideration at the 189th meeting are summarized in Table 2 below.

Table 2. Draft tori line regulatory specifications for Council consideration at the 189th meeting.

Minimum specification approach previously considered by the Council at the 186th and 187th meetings	Additional or alternative specifications for Council consideration at the 189th meeting
Tori line length • The tori line must have a minimum aerial section length of 50m, *AND* • A minimum total length of three times the total length of the vessel	**Total minimum length** • 100m (instead of 3x vessel length) **Add material specifications for aerial section:** • Ultra high molecular weight polyethylene or other similar material that is light-weight, water resistant, low stretch, and floats in water **Add material specifications for drag section** • 6mm or larger braided material that is water resistant and floats in water **Prohibit use of certain materials** • Prohibit use of monofilament nylon in the aerial or drag sections of the tori line **Require number of tori lines to maintain on board** • Two tori lines meeting these specifications must be present on the vessel at the start of every trip

Streamers • Streamers must be 30cm minimum length and must be spaced less than 1m apart; *AND* • Streamers are not required for the last 20m of aerial section to minimize entanglements with buoys and fishing gear	*No additional specifications under consideration for streamer configuration*
Attachment point specifications • Tori line must be attached to the vessel at a point a minimum of 5m above the water if attachment point is within 2m of vessel stern. • If the attachment point is more than 2m from the stern, the attachment point height should be increased by 0.5m for every 5m distance from the stern.	**Add material specification for attachment point** • Tori line must be attached to the vessel or a fixed structure on the vessel made of rigid material **Add breakaway point requirement** • A breakaway point for the tori line must be included at the point of attachment
Attachment point exemption In the event that the structure normally used on the vessel to attach the tori line breaks during a trip, the operator may use an alternative attachment at the highest possible point on the vessel that is lower than the height required in regulations to continue fishing north of 23°N. The exemption is only valid during the trip in which the structure broke.	*No additional specifications under consideration for the attachment point exemption.*

Revised Best Practices for Offal Management

Under the two action alternatives, the Council will consider modification of the existing strategic offal discard requirement through the adoption of revised best practices for the DSLL fishery either through a non-regulatory approach (Alternative 2) or regulatory approach (Alternative 3). This section summarizes information that provides the basis for the proposed best practices (Table 3).

Characteristics of seabird interaction risk in the DSLL fishery associated with offal discards differ by setting and hauling operations. Setting operations in the DSLL occur during daylight hours when seabirds are actively foraging. Over 90% of the seabird interactions (hooking or entanglements) in the DSLL occur on the set, which is the focus of the tori line measure considered under Alternatives 2 and 3. Additionally, seabirds incidentally hooked or entangled during the setting operations have a high mortality rate because they drown if they do not escape from the gear before the branch line sinks to depth. Little to no offal (fish, fish parts, or spent bait) is generated during the setting operations, and thus fishermen are required to retain offal from hauling operations to comply with the existing strategic offal discard requirement during the set. In the absence of a strategic offal discard requirement for the set, it is unlikely that DSLL fishers would retain offal from the haul to discard during the set. As described in section 1.1.6, the effect of the existing strategic offal discard requirement (which requires offal to be retained from the hauling operations to be discarded during the set) on seabird interaction risk during the setting operations is inconclusive, but is likely not having a significant effect on seabird interaction rates (Gilman et al. 2016) or may increase risk over the long-term by attracting more seabirds (Abraham et al., 2009; Pierre et al., 2010, 2012).

Hauling operations in the DSLL occur primarily at night when seabirds are not actively foraging. Less than 10% of all seabird interactions in the DSLL occur during the haul. Seabird interactions during the haul typically occur near the vessel as seabirds are attracted to baited hooks that come to the surface as gear is being hauled, and thus any seabirds that become hooked or entangled during this time would be within sight of the vessel and are usually released alive after removing gear pursuant to existing handling requirements. Post release mortality rates for seabirds released alive are unknown. During the haul, interaction risk is highest when the hauling operations overlap with daylight hours at the start or end of the set. Where interactions occur during the hauling operations in the DSLL, seabirds tend to be an issue on the side of the vessel where gear is being hauled. Fish parts (from gilling and gutting) are typically discarded on the opposite side of where gear is hauled by preference and as general practice in this fleet, because fish cleaning typically happens away from the fish door, and discarding fish parts on the side of the vessel where gear is being hauled could result in those fish parts becoming snagged on hooks that are being hauled. Fish parts would be generated when fish is landed (and there could be some time, sometimes a couple of hours between fish being landed), whereas spent bait is being generated throughout the hauling operation as hooks with remaining bait are retrieved. Spent bait, if discarded on the hauling side, could further attract birds to the hooks still in the water if birds are actively pursuing baited hooks, although the extent to which this increases interaction risk overall in the DSLL is unknown. As described in section 1.1.6, there is little empirical evidence that strategic offal discharge during the hauling operations reduces seabird interaction risk, whereas retaining offal (i.e., no discharge) during hauling operations may increase seabird capture risk (McNamara et al. 1999).

Several additional management issues warrant consideration for modifying the existing strategic offal discharge requirement. The existing regulatory language that requires strategic offal discard to be used “when seabirds are present” has created monitoring, enforcement and compliance burdens. Specifically, seabirds present in the vicinity of the fishing vessel do not immediately lead to interaction risk if seabirds are flying by and not actively foraging, and crew may not spot all seabirds present if they are focused on the hauling operation occurring on deck. This language is also problematic in the DSLL fishery because most of the hauling operations take place at night, and seabirds cannot be seen flying in the vicinity. Additionally, the regulations do not specify the amount or frequency of offal discharge, thus a small amount of offal or bait discarded during setting or hauling would meet the requirement. As described in McNamara et al. (1999), effective use of strategic offal discard would require a dedicated crew to observe seabirds and discharge offal accordingly, but most vessels likely do not have crew available to be assigned to such a task, and thus it is likely that the strategic offal discard is not a practical measure that can be utilized in a manner that is effective.

Based on the above information, the proposed best practices for modifying the strategic offal discharge requirement in the DSLL fishery are as follows:

- *During setting operations*: No offal discard (fish, fish parts, spent bait). This would be consistent with the lack of offal generated during setting operations.

- *During hauling operations*: When seabirds are actively pursuing baited hooks during hauling operations, discharge offal (fish, fish parts, or spent bait) from the opposite side from where gear is being hauled. This would focus the use of strategic offal discard when interaction risk is highest during the DSLL hauling operations, which is likely to be when hauling operations overlap with daylight hours and when seabirds are actively pursuing baited hooks.

For practical purposes, fishermen may need to keep a bin in the vicinity of where gear is being hauled so that spent bait may be accumulated when seabirds are actively pursuing hooks, and discharged to the opposite side. When seabirds are not actively pursuing baited hooks, offal or spent bait may be discharged in a manner most practical for crew. If offal and spent bait remain on deck when there is limited time between the end of hauling operations and the start of next setting operations, and if seabirds are observed in the area, the remaining offal and spent bait may be retained rather than discharged before the setting operations to avoid attracting seabirds further to the vessel. If no seabirds are observed in the area, offal may be discharged prior to the start of the next set.

Table 3. Summary of relevant fishery and seabird interaction characteristics for modifying offal management best practices in the DSLL fishery.

Characteristic	**Set**	**Haul**
Time of day	During the day when seabirds are actively foraging	Primarily at night when seabirds are not actively foraging, with some overlap with daylight hours at the start and end of set when foraging activity is higher
Fishing operation	Gear deployed	Gear retrieved and catch processing occurring as fish are hauled on deck
Offal generated	Little to no offal generated.	Fish parts (from gilling and gutting) generated as fish are landed. Processing of catch typically occur away from the fish door, and fish parts from gilling and gutting typically discarded from opposite side of vessel from where gear is hauled. Spent bait generated throughout the haul as hooks with remaining bait are retrieved, and may be discarded on the same side as the vessel from where gear is hauled, if not required to retain for purposes of strategic offal discard.
Proportion of seabird interactions under status quo	>90% of all interactions	<10% of all interactions
Current offal requirements	Discharge offal during setting on opposite side of vessel when seabirds present. Retain sufficient quantities of offal between setting.	Discharge offal during hauling on opposite side of vessel when seabirds present. Remove all hooks from fish parts or spent bait prior to discharge. Remove bill and liver of any swordfish, sever head from trunk and cut in half to discharge.
Management issues associated with	Effect of strategic offal discard on seabird interactions	When haul overlaps with daylight hours, spent bait may further attract seabirds to the hooks

current offal requirement	inconclusive but may increase risk by attracting more seabirds	remaining in the water. Discard of fish parts from gilling and gutting is not a management concern due to discharge occurring on opposite side of where gear is being hauled due to practicality reasons.
Proposed best practices for offal management	No offal discharge during the set	Discharge offal during hauling on opposite side of vessel when seabirds are *actively pursuing baited hooks*

2.2.3 Alternative 1: No Action (Status Quo/Current Management)

Under the No Action Alternative, the Council would not recommend changes to management measures intended to mitigate seabird interactions in the Hawaii deep-set longline fishery. All existing measures to mitigate interactions with seabirds would be maintained, including blue-dyed thawed bait and strategic offal discards, and no new measures would be required.

Expected Fishery Outcomes

Under Alternative 1, the Hawaii deep-set longline fishery would continue to be managed under the existing seabird mitigation measures under the Pelagic FEP, and fishery participants would be required to use blue-dyed bait and strategic offal discards when stern-setting north of 23°N. This alternative would not implement any measures to improve the operational practicality and mitigation efficacy of seabird measures for the Hawaii deep-set longline fishery. The blue-dyed bait measure is known to be less effective than the alternative side-setting measure (Gilman et al. 2016), whereas most Hawaii deep-set longline fishermen currently use blue-dyed bait instead of side-setting (82.1% of observed deep-set vessels in 2019; NMFS 2021). Additionally, offal discharge may be contributing to long-term increase in albatross interactions in the Hawaii deep-set longline fishery by attracting more birds attending the vessels.

If vessel operators in the Hawaii deep-set longline fishery prefer to use tori lines as a seabird mitigation measure, they would need to use it in addition to the existing suite of required measures. While some vessels may voluntarily add another mitigation measure, tori line is not likely to be widely adopted in the fleet without additional incentives. Additionally, voluntary adoption of tori lines by Hawaii deep-set longline vessels would lack the implementation of minimum standards, and effectiveness of tori lines would likely vary significantly between vessels.

Therefore under Alternative 1, BFAL and LAAL albatross interactions would be expected to remain at the higher levels observed since 2015 as no changes would be made to improve the effectiveness of the required mitigation measures. Additionally, NMFS would continue to experience administrative burden to monitor and enforce the blue-dye bait and strategic offal discard measures, both of which require observer program staff resources to consistently review and provide information on potential violations to the NOAA Office of Law Enforcement. The Hawaii deep-set longline fishery's effort, target and non-target catch, and other protected species interactions would be expected to remain similar to the historical baseline under Alternative 1.

2.2.4 Alternative 2: Replace blue-dyed thawed bait and strategic offal discharge measures required for stern-setting vessels with a new tori line requirement (*Council preliminary preferred alternative*)

Under Alternative 2, seabird mitigation measures for the Hawaii deep-set longline vessel owners and operators that stern-set would be modified as follows (Table 4):

- Replace existing requirements to use blue-dyed thawed bait and strategically discharge offal (fish, fish parts, of spent bait) with a new requirement to use a tori line during the setting operation; and
- As a non-regulatory measure, include best practices training on offal management as part of the annual protected species workshop that is already required for Hawaii longline vessel owners and operators.

This alternative would not modify the other existing seabird mitigation requirements for deep-set vessels that stern-set (i.e., weighted branch lines and line shooter). The modifications to be made under this alternative are described in further detail below.

Table 4. Comparison of existing seabird mitigation measures require for stern-setting deep-set longline vessels when fishing north of 23°N with modification under Alternative 2.

Stern-setting deep-set vessels must use:	
Existing Requirements[1]	**Modified Requirements under Alternative 2**
Blue-dyed thawed bait Strategic offal discards (when seabirds present) >45g weight within 1m of hooks Line shooter	Tori line >45g weight within 1m of hooks Line shooter

[1] See full details of the existing requirements in Section 1.1.1.

Tori line

Owners and operators of Hawaii deep-set longline vessels, when stern-setting and fishing north of 23°N would be required to use a tori line throughout the duration of each applicable setting operation. Tori lines would only be required for use during setting operations because over 90% of DSLL seabird interactions occur during the set, and tori line is considered to be an impractical and untested measure in the DSLL fishery (Gilman and Ishizaki 2018). The tori line must meet regulatory specifications, which would be based on the short-streamer design developed during the 2019-2021 field trials conducted in the Hawaii deep-set fishery existing international standards, the Council's preliminary review of the specifications at the 186th meeting in June 2021, and additional specifications under consideration for the Council at the 189th meeting as described in section 2.2.2.

In addition to the regulatory specifications, NMFS would make available and provide information on non-regulatory guidelines on tori line design and safety recommendations through the annual protected species workshops required for Hawaii longline vessel owners and operators. These non-regulatory guidance may include recommendation on additional materials and design configurations for constructing tori lines and tori poles, suitable attachment points, alternative streamer designs, and design guidance for crew safety components of the tori line (such as having a breakaway mechanism and safety line integrated into the design). Draft non-regulatory guidelines are included in APPENDIX A.

Offal management best practice training (non-regulatory)

The regulatory requirement to strategically discharge offal during setting or hauling when seabirds are present would be removed under Alternative 2, and replaced with a non-regulatory measure that would add best practices training on offal management as part of the annual protected species workshop. Hawaii longline vessel owners and operators are required to annually attend and be certified for completion of an annual protected species workshop conducted by NMFS, where they receive training on interaction mitigation techniques for sea turtles, seabirds, and other protected species.

The proposed best practices for managing offal discharge in the Hawaii deep-set longline fishery is described in section 2.2.2, and focuses on the following:

- *During setting operations*: No offal discard (fish, fish parts, spent bait); and
- *During hauling operations*: When seabirds are actively pursuing baited hooks during hauling operations, discharge offal (fish, fish parts, or spent bait) from the opposite side from where gear is being hauled.

Expected Fishery Outcomes

Under Alternative 2, Hawaii deep-set longline fishery participants who stern-set would be required to use tori lines that meet regulatory specifications in lieu of the existing blue-dyed thawed bait and strategic offal discharge requirements, when fishing north of 23°N. Fishery participants who currently use blue-dyed bait would be required to switch to tori lines, or to side-setting. This alternative is expected to improve the operational practicality and mitigation efficacy of seabird measures in the Hawaii deep-set longline fishery.

Many deep-set longline fishery participants have expressed interest in using tori lines in lieu of blue-dyed bait, citing the operational burdens of using blue dye (Ayers and Leong 2020; Gilman and Ishizaki 2018). A small portion of participants may initially favor blue-dyed bait over tori lines due to its familiarity and perceived uncertainty associated with a new measure. Most fishery participants who currently side-set are expected to continue using that measure, because those captains are likely to be using that method by preference and consider it to be practical and safe for their fishing operation and vessel configuration (Gilman and Ishizaki 2018). Therefore, majority of the deep-set longline participants are expected to use tori lines as the primary mitigation measure over side-setting under Alternative 2. Data are not available to evaluate the effectiveness of stern-setting using tori lines compared to the side-setting measure; however, analysis of observer data indicate that side-setting is significantly more effective than blue-dyed bait in the DSLL fishery (Gilman et al. 2016).

Albatross interactions are expected to be significantly reduced on vessels that convert to tori lines from blue-dyed bait. The 2021 study showed that albatross contact with bait when tori line is used was 4 times less likely than when blue-dyed bait is used, and captures may be reduced as much as 14 times (Chaloupka et al. 2021). The reduction in capture was estimated based on a limited number of recorded captures during the study, with no seabirds captured on sets using tori lines, and thus the actual extent of reduction in albatross captures under Alternative 2 may vary from the experimental results. However, the 2021 study provides a robust scientific basis indicating that replacing blue-dyed bait with tori lines in the Hawaii deep-set longline fishery would have a significant reduction in albatross attempts and contacts on bait and associated captures.

The fleet-wide effectiveness of tori lines may also be affected by the extent to which design details are specified in regulations, as described in section 2.2.2, and the extent to which fishermen use tori lines similar to those tested in the DSLL fishery. If the Council recommends a minimum level of regulatory specifications that do not include material, some fishermen may use monofilament nylon or other materials that do not produce a consistent aerial section, which may affect the ability to deter seabird interactions. The minimum specification approach may result in fishermen testing alternative material configurations that produce similar effectiveness as the tested design, or such designs may result in reduced effectiveness. If the Council recommends tori line regulatory specifications that include material specifications as described in section 2.2.2, there would be increased certainty that the tori line would perform similar to the field trials conducted in 2019-2021. Regardless of the level of regulatory specification, providing additional non-regulatory guidance, coupled with a roll-out strategy to provide tori lines and poles at no cost to vessels, would help the fleet transition successfully to a new seabird mitigation measure.

The regulatory exemption for the attachment point height to provide contingency for a potential tori pole breakage at sea is not likely to affect the fleet-wide effectiveness of the modified seabird measures, because such breakage are likely to be rare and the exemption is only provided for that trip. While higher attachment points generally increased the aerial extent, experiments conducted in New Zealand showed that attachment point heights between 3-5 meters produced overlapping aerial extents (Pierre et al. 2016), suggesting that temporarily attaching the tori line at the highest alternative point on the vessel below 5 meters may not significantly reduce the aerial extent and thus the effectiveness of the tori line in deterring seabird interactions.

The removal of blue-dyed bait from the DSLL seabird mitigation measures may have some effect on seabird interaction rates during the haul. McNamara and colleagues (1999) found that in the SSLL fishery, blue-dyed bait reduced seabird attempts during the haul to about one third compared to when no other measure was used, while a more recent analysis of the SSLL observer data suggested that blue-dyed bait did not have a significant effect in reducing seabird interactions during the haul after approximately 9 hours of gear soak (Gilman et al. 2014). Data are not available on the efficacy of blue-dyed bait on the haul in the DSLL. Nevertheless, any potential increase in interaction rates during the haul from the removal of blue-dyed bait is likely to have a small effect on the number of seabird interactions, given that hauling operations primarily occur at night when seabirds are not actively foraging.

Under Alternative 2, the existing strategic offal discharge requirement would be replaced with best practice training on offal management as part of the annual protected species workshop. As described in sections 1.1.6 and 2.2.2, there is inconclusive evidence that the existing strategic offal discharge requirement reduces seabird interaction risk as intended in either the setting or hauling operations. In the absence of a strategic offal discharge requirement in the DSLL fishery, there would be limited overlap between the time when seabirds are actively foraging and when fish waste is being generated and discarded, thus there is generally low overall risk that unregulated offal discharge in the DSLL fishery would exacerbate seabird catch risk. Specifically, little to no fish waste is generated during setting operations, and fishermen are not likely to retain offal and spent bait from the hauling operation to discard during setting if there is no requirement to do so. Therefore, the best practices training would focus on discouraging any offal discharge during setting operations, which represents a change in practice for fishermen compared to the status quo that requires strategic offal discharge when seabirds are present. Disseminating this information through the workshops would help update the fishermen's knowledge and practice of discharge practices, given long-standing requirement that require offal discharge during the set, when seabirds are present.

The best practice training would also clarify best practices for hauling operations. The majority of hauling operations and catch processing take place at night when seabirds are not actively foraging, and there is typically some break time between the end of hauling operation (including catch processing) and the start of the next set. Catch processing occurs as fish are retrieved during the haul, and fish parts are generated as the catch are gilled and gutted prior to being packed in ice in the fish hold. By operational preference, gilled and gutted material is typically discarded on the opposite side of the vessel from where gear is being hauled. Therefore, the main management concern with unregulated offal discharge would be spent bait discards in the minority of hauling operations that overlap with daylight hours, and the best practices training would focus on situations when offal should be discharged from the opposite side from where the gear is being hauled to prevent seabirds from being further attracted to the hooks and exacerbating capture risk.

The recommended best practice to not discharge offal during setting would also remove fishery participants' burden of retaining offal from the haul to discharge during the set. Removing the regulatory requirement for strategic offal discharge would also eliminate the administrative burden associated with the existing requirement. Further, providing the offal management as a non-regulatory guidance allows for this information to be updated based on best scientific information available without the administrative burden and process of a regulatory amendment.

Under Alternative 2, the Hawaii deep-set longline fishery's effort, target and non-target catch, and other protected species interactions would be expected to remain similar to the historical baseline. Blue-dyed bait compared to untreated bait have been shown to have no significant effects on target and non-target fish and shark catch rates (Yokota et al. 2009). Additionally, bait color is not known to affect sea turtle capture rates (Swimmer et al. 2005; Yokota et al. 2009) or other protected species.

2.2.5 Alternative 3: Replace blue-dyed thawed bait with a new tori line requirement, and modify strategic offal discard requirement to an offal management requirement

Under Alternative 3, seabird mitigation measures for the Hawaii deep-set longline vessel owners and operators that stern-set would be modified as follows (Table 5):

- Replace existing requirement to use blue-dyed thawed bait with a new requirement to use a tori line during the setting operation; and

- Modify the existing requirement for strategic discharge of offal (fish, fish parts, of spent bait) to an offal management requirement as follows:
  - Prohibit offal discard during set; and
  - Refine haul requirement to discharge offal (fish, fish parts, spent bait) on opposite side from where gear is hauled when "any seabirds are actively pursuing baited hooks"

This alternative would not modify the other existing seabird mitigation requirements for deep-set vessels that stern-set (i.e., weighted branch lines and line shooter). The main difference between Alternatives 2 and 3 is whether the updated offal management measure would be implemented through a non-regulatory best practices training (Alternative 2) or a regulatory requirement (Alternative 3). The Council may consider recommending modification of the offal measure to be a combination of those described under Alternative 2 and 3, such as recommending a non-regulatory approach for the set and a regulatory approach for the haul. The removal of blue-dyed thawed bait and addition of the tori line requirement is the same between the two action alternatives. The modifications to be made under this alternative are described in further detail below.

Table 5. Comparison of existing seabird mitigation measures require for stern-setting deep-set longline vessels when fishing north of 23°N with modification under Alternative 3.

Stern-setting deep-set vessels must use:	
Existing Requirements[1]	**Modified Requirements under Alternative 3**
Blue-dyed thawed bait	Tori line
Strategic offal discards (when seabirds present)	Offal management (prohibit discard during set; strategic discard on haul when seabirds are actively pursuing baited hooks)
>45g weight within 1m of hooks	>45g weight within 1m of hooks
Line shooter	Line shooter

[1] See full details of the existing requirements in Section 1.1.1.

Tori line

The tori line regulatory requirements and non-regulatory design and safety guidelines described under Alternative 2 would be implemented under Alternative 3. Specifically, owners and operators of Hawaii deep-set longline vessels, when stern-setting and fishing north of 23°N would be required to use a tori line throughout the duration of each applicable setting operation. The tori line must meet regulatory specifications as described under Alternative 2, and the Council at the 189th meeting will consider providing additional direction on the specifications as described in section 2.2.2. In addition to the regulatory specifications, NMFS would make available and provide information on non-regulatory guidelines on tori line design and safety recommendations through the annual protected species workshops required for Hawaii longline vessel owners and operators. See Section 2.2.4 for further details on the regulatory specifications and non-regulatory guidelines.

Offal management requirement

The existing regulatory requirement to strategically discharge offal during setting or hauling when seabirds are present would be modified under Alternative 3 to reflect current best practices for offal management, as described in section 2.2.2. The modified requirement would address offal management separately for setting and hauling operations, and address enforcement issues associated with the existing language "when seabirds are present". Specifically, offal management requirements under Alternative 3 would:

- Prohibit offal discard (fish, fish parts, spent bait) during set; and
- Refine requirement during the haul to discharge offal (fish, fish parts, spent bait) on the opposite side from where gear is hauled when seabirds are actively pursuing baited hooks

Expected Fishery Outcomes

The expected outcomes for Alternative 3 in terms of replacing blue-dyed bait with tori lines would be similar to that of Alternative 2. As described under the expected outcomes for Alternative 2 in section 2.2.4, the requirement for stern-setting deep-set longline fishery participants to use tori lines in lieu of blue-dyed bait is expected to significantly reduce albatross interactions and reduce operational burdens associated with blue-dyed bait. As with Alterntaive 2, the fleet-wide effectiveness of tori lines under Alternative 3 may be affected by the extent to which design details are specified in regulations, as described in section 2.2.2, and the extent to which fishermen use tori lines similar to those tested in the DSLL fishery. The regulatory exemption for the attachment point height to provide contingency for a potential tori pole breakage at sea is not likely to affect the fleet-wide effectiveness of the modified seabird measures due to the expected rare occurrences of such breakage. The Hawaii deep-set longline fishery's effort, target and non-target catch, and other protected species interactions would also be expected to remain similar to the historical baseline.

The difference between the alternatives is whether the updated offal management measure would be implemented through a non-regulatory best practices training (Alternative 2) or a regulatory requirement (Alternative 3). Under Alternative 3, the regulations would be revised to update the requirements in accordance with the current best practices for the deep-set fishery. For setting operations, the modified offal measure would prohibit fishermen from discharging offal to prevent seabirds from becoming more attracted to the vessel and exacerbating seabird capture risk. This prohibition would apply regardless of seabird presence. This will be a change from the current measure, which requires that fishermen strategically discharge offal on the other side of the vessel from where gear is being deployed, when seabirds are present. If any fish waste is generated during the setting operations, fishermen would need to retain them until setting operations are completed prior to discharging them.

For hauling operations, fishermen would be required to strategically discharge offal and spent bait on the opposite side from where the gear is hauled, but the trigger for this requirement would be changed from the current "when seabirds are present" to be more specific to "when seabirds are actively pursuing baited hooks". This change is intended to clarify the existing language that has created monitoring and compliance burdens. Seabirds present in the vicinity of the fishing vessel do not immediately lead to interaction risk if seabirds are flying by and not actively foraging, and crew may not spot all seabirds present if they are focused on the hauling operation occurring on deck. The existing language is also problematic in the deep-set fishery because most of the hauling operations take place at night, and seabirds cannot be seen flying in the vicinity. The modified language would therefore focus the requirement to strategically discharge offal during haul by only requiring it when seabirds are actively pursuing baited hooks, which is a situation in which offal discards on the side where the gear is being hauled could exacerbate capture risk by attracting more seabirds into the area or causing seabirds to more aggressively pursue baited hooks as a result of increased food availability. Discarding offal on the opposite side of the vessel in these instances could also distract birds away from the hooks and reduce capture risk.

The difference between Alternative 2 and 3 in terms of how the best practices would be implemented is not expected to significantly affect seabird capture risk because the recommended best practices for offal management would be consistent with how offal would be generated and discarded in the DSLL in the absence of the existing strategic offal discard requirement, especially during the setting operations when seabird capture risk is higher due to the temporal overlap with albatross foraging. Specifically, in the absence of a regulatory requirement to strategically discharge offal during setting operations, fishery participants are not likely to retain offal and spent bait from hauling operations, and there would be no offal or spent bait available during setting operations to discharge. During the haul, retaining the regulatory requirement for strategic offal discharge and clarifying the language on when this measure is required would likely provide greater compliance with this proposed best practice. However, improved compliance may only provide a marginal conservation benefit in reducing seabird interaction risk, considering that seabird interactions during hauling operations represent less than 10% of all DSLL interactions, and available evidence on the effect of offal measures during hauling operations are inconclusive, as described in sections 1.1.6 and 2.2.2.

Compared to the No Action Alternative, Alternative 3 is expected to reduce administrative burden on the observer program by clarifying the language on when offal and spent bait should be discharged on the other side of the vessels from where gear is being hauled. However, some administrative burden to monitor and enforce would remain in place as Alternative 3 would implement the modified offal management measure through regulations.

Table 6. Comparison of Features of the Alternatives.

Topic	**Alternative 1 (Status quo[1])**	**Alternative 2 (*Council preliminary preferred*)**	**Alternative 3**
Overview of Alternatives	Status quo with stern setting vessels required to use blue-dyed thawed bait, strategic offal discharge, weighted branch lines and line shooter	Replace blue-dyed thawed bait and strategic offal discharge measures required for stern-setting vessels with a new tori line requirement	Replace blue-dyed thawed bait with a new tori line requirement, and modify strategic offal discard requirement to an offal management requirement
Blue-dyed thawed bait	Required	Not required	Not required
Tori line	Not required	Required • Council to consider direction on tori line regulatory specifications • Provide additional non-	Required (same as Alt 2) • Council to consider direction on tori line regulatory specifications • Provide additional non-

Topic	Alternative 1 (Status quo[1])	Alternative 2 (*Council preliminary preferred*)	Alternative 3
		regulatory design guidance	regulatory design guidance
Strategic offal discharge	Required (require discharge from opposite side of vessel from where gear is being set or hauled, when seabirds are present)	Remove from regulations, and provide best practice training for offal management in annual protected species workshop	Modify regulations to prohibit offal discard during set and refine haul requirement to discharge offal on the opposite side of the vessel from where gear is being hauled when any seabirds are actively pursuing baited hooks
Other seabird mitigation requirements	• Weighted branch lines • Line shooter • Handling requirements • Annual protected species workshop	Same as status quo	Same as status quo

[1] See full details of the existing requirements in Section 1.1.1.

2.3 Alternatives Considered, but Rejected from Further Analysis

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

<u>Allow the use of tori lines in the Hawaii deep-set longline fishery as a third mitigation option</u>

This alternative would have created a third suite of seabird mitigation measures in addition to the existing side-setting and blue-dyed bait suite of measures for the Hawaii deep-set longline fishery. Under the new third suite, tori lines would have replaced the use of blue-dyed bait, but fishery participants would otherwise have been required to follow the same set of requirements as the existing blue-dyed bait suite of measures (i.e., weighted branch lines, line shooter, and strategic offal discards when seabirds are present). However, this alternative would have also maintained the existing blue-dyed bait suite of measures as one of the three options from which deep-set fishery participants could choose. Based on the results from the 2021 study, tori lines were found to be significantly more effective than blue-dyed bait for seabird bycatch mitigation (Chaloupka et al. 2021). Additionally, available evidence based on an analysis of observer data have shown that the blue-dyed bait measure is significantly less effective than side-setting (Gilman et al. 2016).

This alternative was considered by the Council at the 184th meeting in December 2020 and again at the 187th meeting in September 2021. Based on the robust scientific results from the 2021 study that found tori lines to be significantly more effective at deterring albatross attempts, contacts and captures than blue-dyed bait, the Hawaii FEP Advisory Panel, Fishing Industry Advisory Committee, and the Scientific and Statistical Committee supported the alternative to replace blue-dyed bait with tori lines rather than adding tori lines as a third option. The Council additionally received public comment at the 187th meeting from the Hawaii Longline Association (HLA) supporting the replacement of blue-dyed bait with tori lines. The Council therefore recommended the alternative to replace blue-dyed bait with tori lines over the alternative to add tori lines as a third option. For these reasons, this alternative was eliminated from further analysis for the purpose of the Council's consideration of final action and this EA.

<u>Applicability of the action to the Hawaii shallow-set longline fishery</u>

The Council at the 184th Meeting directed staff to work with the Action Team and industry representatives to further develop options for the shallow-set longline fishery for Council consideration at the March 2021 meeting. The options paper presented at the 185th Meeting in March included considerations for removing blue-dyed bait and strategic offal from the shallow-set seabird mitigation measures, allow flexibility in setting time by requiring additional mitigation measures, and exploring a broader set of potential modifications. Based on input from the advisory bodies and industry representatives, the Council recommended prioritizing additional research and development of appropriate measures for the shallow-set fishery, with high priority placed on identifying combination of mitigation measures that maintain effectiveness of seabird deterrence during dusk compared to the existing night-setting suite of measures, to provide operational flexibility in starting the setting operations before sunset. Management action on the Hawaii shallow-set longline fishery will be considered separately from this action at a later time.

<u>Conversion of requirements to mirror international measures</u>

This alternative was considered by the Council in the initial options paper prepared for the 184th meeting in December 2020. The menu approach implemented under the conservation measures for Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC) provides more flexibility for vessel operators to select mitigation methods that work best for their fishery. However, this approach may also allow vessel operators to use combination of methods that may not be as effective as others. For example, under the WCPFC measures, a Hawaii deep-set longline vessel could either side-set with a bird curtain and weighted branch lines, or use weighted branch lines and deep-setting line shooter, and be both compliant. However, since all Hawaii deep-set longline vessels use a line shooter for the gear to reach depths needed to target bigeye tuna, the addition of side-setting is likely to be more effective than only using weighted branch lines. Therefore, applying the WCPFC and IATTC menu approach may reduce the fleet-wide effectiveness of seabird mitigation measures in the Hawaii longline fishery. Alternatively, considering a limited set of menu options that eliminates the less effective measures results in a list of options similar to what was otherwise considered by the Council at the 187th meeting in September 2021, with the exception of measures that are considered not practical for the deep-set fishery (i.e., night setting) or have not been tested in the fishery (i.e., hook pods).

<u>Addressing cross-taxa impacts associated with weighted branch lines</u>

This alternative was considered by the Council in the initial options paper prepared for the 184th meeting in December 2020. The intent of this alternative was to consider the impacts that the weighted branch line requirement may have on sharks and other protected species, as the Hawaii deep-set longline fishery has adapted to use wire leaders to reduce the risk of gear flyback. HLA since announced the voluntary conversion of wire leaders to monofilament nylon, and the Council took final action at the 186th meeting in June 2021 to prohibit wire leaders in the deep-set longline fishery. Therefore, this alternative is no longer a priority and was not considered further by the Council.

3 DESCRIPTION OF THE AFFECTED ENVIRONMENT

This section describes the baseline condition of resources in the action area under recent fishery conditions. The environmental resources that are potentially affected include target and non-target species and protected resources. This section also describes the socioeconomic and management setting, as well resources eliminated from detailed analysis. NMFS and the Council derive the information in this section primarily from the 2020 Annual Stock Assessment and Fishery Ecosystem (SAFE) Report (WPRFMC 2021) and other available information cited below.

3.1 Target and Non-Target Stocks

This section identifies the pelagic management unit species (MUS) managed under the Pelagic FEP that the Hawaii deep-set longline fishery harvests. They include several species of tuna, billfish and sharks shown in Table 7. For a comprehensive discussion of the biology, life history, and factors which affect distribution and abundance of pelagic MUS, see the Pelagic FEP (WPFMC 2009a). Recent catch data for these three longline fisheries is summarized in Section 3.1.13, with additional details available in the 2020 Annual SAFE Report (WPFMC 2021). The 2020 SAFE report contains a detailed summary of the environment affected by this action, and is incorporated here by reference.

The Pelagic FEP (WPFMC 2009a) includes status determination criteria (SDC), also known as limit reference points (LRPs) for overfishing and overfished conditions. Specifically, overfishing occurs when the fishing mortality rate (F) for one or more years is greater than the maximum fishing mortality threshold (MFMT), which is the fishing mortality rate that produces maximum sustainable yield (F_{MSY}). Thus, if the F/F_{MSY} ratio is greater than 1.0, overfishing is occurring.

A stock is considered overfished when its biomass (B) has declined below the minimum stock size threshold (MSST), or the level that jeopardizes the capacity of the stock to produce MSY on a continuing basis (B_{MSY}). Specifically, the B_{MSST} = (1-M)B_{MSY}, where M is the natural mortality rate of the stock, or one half of B_{MSY}, whichever is greater. For example, if the natural mortality rate of a stock is 0.35, B_{MSST} = 0.65*B_{MSY}. Thus, if the B/B_{MSY} ratio for the stock falls below 0.65, the stock is overfished. If a stock has a natural mortality rate greater than 0.6, MSST is set at the default of 0.5*B_{MSY} (because 1- 0.6 = 0.4, and 0.5 is greater than 0.4). For such a stock, the stock is overfished when the B/B_{MSY} ratio falls below 0.5. It is important to note that NMFS National Standard 1 guidelines at 50 CFR 665.310(e)(1)(i)(C) defines B_{MSY} as the long-term average size of the stock measured in terms of spawning biomass (SB) or other appropriate measure of the stock's reproductive potential that would be achieved by fishing at B_{MSY}. Thus, whenever available, NMFS will use estimates of SB in determining the status of a stock. When estimates of

SB are not available, NMFS may use estimates of total biomass (B), or other reasonable proxies for determining stock status. FEP.

Table 7 shows the stock status of pelagic MUS measured against the SDCs of the Pelagic FEP, based on the most recent stock assessment for the stock at the time of this publication. The current status of the stock represents the best scientific information available regarding the effects of past and present actions on the target and non-target stocks.

For some pelagic MUS, the SDC specified in the Pelagic FEP differs from the SDC or LRPs adopted by the WCPFC and IATTC. Additionally, in some cases, the LRPs adopted by the WCPFC for a particular stock of fish differs from the LRPs adopted by the IATTC. Finally, in other cases, no stock assessments are available and fishery management organizations must infer stock status from other indicators or not at all. For the purposes of stock status determinations, NMFS uses the SDCs specified in the Pelagic FEP.

Table 7. Stock status of pelagic management unit species under the Pelagic FEP.

Stock	Is overfishing occurring?	Is the stock overfished?	Assessment results
Skipjack Tuna (WCPO)	No	No	Vincent et al. (2019)
Skipjack Tuna (EPO)	No	No	Maunder (2018)
Yellowfin Tuna (WCPO)	No	No	Vincent, et al 2020
Yellowfin Tuna (EPO)	No	No	Minte-Vera et al. (2020)
Albacore (S. Pacific)	No	No	Tremblay-Boyer et al. (2018)
Albacore (N. Pacific)	No	No	ISC (2017b)
Bigeye Tuna (WCPO)	No	No	Ducharme-Barth et al. (2020)
Bigeye Tuna (EPO)	Yes	No	Aires-da-Silva et al (2018)
Pacific Bluefin Tuna	Yes	Yes	ISC (2018a)
Blue Marlin (Pacific)	No	No	ISC (2016)
Swordfish (WCNPO)	No	No	ISC (2018b)
Swordfish (EPO)	Yes	No	ISC (2014)
Striped Marlin WC (N. Pacific)	Yes	Yes	ISC (2019)
Striped Marlin (NEPO)	No	No	Hinton and Maunder (2011)
Blue Shark (N. Pacific)	No	No	ISC (2017a)
Oceanic white-tip shark (WCPO)	Yes	Yes	Tremblay-Boyer et al. (2019)
Silky shark (WCPO)	Yes	No	Clarke et al. (2018)
Silky Shark (EPO)	Yes	No	Lennert-Cody et al. (2018)
Shortfin mako shark (N. Pacific)	No	No	ISC (2018c)
Common thresher shark (N. Pacific)	No	No	Teo et al. (2018)
Other Billfishes[1]	Unknown	Unknown	--
Other Pelagic Sharks[2]	Unknown	Unknown	--
Other PMUS[3]	Unknown	Unknown	--

[1]Black Marlin (Pacific), Shortbill Spearfish (Pacific), Sailfish (Pacific)
[2]Longfin Mako Shark (N. Pacific), Bigeye Thresher Shark (N. Pacific), Pelagic Thresher Shark

(N. Pacific), Salmon Shark (N. Pacific)
[3]Dolphinfish (Pacific), Wahoo (Pacific), Opah (Pacific), Pomfret (family *Bramidae*, W. Pacific), Kawakawa (Pacific), Oilfish (family *Gempylidae*, Pacific), other tuna relatives *(Auxis* spp., *Allothunnus* spp., and *Scomber* spp, Pacific), Squids (Pacific)

3.1.1 Bigeye Tuna

The Secretariat of the Pacific Community (SPC) prepared the most recent stock assessment for WCPO bigeye tuna August 2020, which covers bigeye tuna from Indonesia in the far western Pacific, to the 150° W. meridian in the central Pacific Ocean (Ducharme-Barth, 2020). The WCPFC Scientific Committee (SC) reviewed and endorsed the 2017 bigeye stock assessment at its Sixteenth Regular Session (SC16) as the most advanced and comprehensive assessment yet conducted for this species. SC16 also endorsed the use of the assessment model uncertainty grid as best available scientific information to characterize stock status and management advice. SC16 recommended retaining only model runs with newest growth information, comprising 36 model configurations and noted variance in the assessment results with respect to regional stock structure. The resulting uncertainty grid was used to characterize stock status, to summarize reference points and to calculate the probability of breaching the Commission-adopted spawning biomass limit reference point ($0.2*SB_{F=0}$) and the probability of F_{recent} being greater than F_{MSY} (WCPFC 2018).

Based on the uncertainty grid adopted by SC16, the WCPO bigeye tuna spawning biomass is likely above the MSST of the Pelagic FEP and the WCPFC's biomass LRP. Additionally, recent F is likely below F_{MSY} (MFMT). The assessment suggests the WCPO bigeye stock is not experiencing overfishing (100% probability, 36 of 36 models) and is not overfished (100% probability) with respect to Commission-adopted LRP in 2015 (SB_{latest}/SB_{MSY}).

The majority of fishing effort by the U.S. longline fishery operating out of Hawaii occurs north of 20° N in stock assessment Region 2, where stock depletion is among the lowest in regional estimates (Ducharme-Barth, 2020). Moreover, 98% of bigeye tuna caught by this fishery occurs north of 10° N, which is above the core equatorial zone of the heaviest purse seine and longline fishing (NMFS unpublished data). SC16 noted that the region where the U.S. fishery operates has some of the lowest relative regional depletion and serves as a 'buffer' for the stock. According to the Pelagic FEP, the WCPO bigeye tuna stock is not overfished or experiencing overfishing.

The IATTC assessed bigeye tuna in the EPO in 2018 and the assessment results indicate $F/F_{MSY} = 1.15$ and $SB_{2014\text{-}2016}/SB_{MSY} = 1.02$ (Xu et al. 2018). This substantial change in the reference points from the previous year's assessment, which were $F/F_{MSY} = 0.87$ and $SB_{2014\text{-}2016}/SB_{MSY} = 1.23$ (Aires-da-Silva et al. 2017), triggered IATTC to investigate the cause of the change. The authors attribute the change in status to new data for the indices of relative abundance, based on longline catch-per-unit-effort (CPUE), which resulted in lower estimates of recent biomass. Such changes caused by the addition of new data indicate that the model is miss-specified (Maunder et al. 2018a).There is substantial uncertainty in the estimate of current fishing mortality and in the model assumptions used (Xu et al. 2018) and the relative contribution of assessment uncertainty and variability in the relationship between fleet capacity and fishing mortality to the overfishing reference point are also unknown (Maunder et al. 2018b). NMFS has not accepted the Xu et al.

(2018) assessment as suitable for making stock status determinations for EPO bigeye tuna (NMFS 2018b).

The EPO bigeye tuna stock assessment (Xu et al. 2018) assumes a single stock that is randomly mixed within the EPO. Tagging data do not support this assumption. The pattern of recruitment evident in the EPO bigeye assessment in which recruitment suddenly increases in the mid-1990s, corresponding to a substantial increase in purse-seine catches in the equatorial region, could also indicate that this assumption contributes to assessment uncertainty (Valero et al. 2018).

IATTC scientists (Valero et al. 2018) explored the spatial structure of the EPO BET stock using a systematic division of the EPO and an integrated model. The integrated model divided the EPO based on a central area (between 5°N and 5°S from 110°W to 85°W) and re-defined the fisheries used in the most current assessment by their spatial overlap with this central area. Where enough data were available for the systematic division, larger biomass declines were modeled in the equatorial areas while other areas showed either flat biomass trajectories or smaller declines. In the integrated model, the spawning biomass ratio showed a steeper declining trend and a more depleted stock status in the central area than the current assessment estimates for the entire EPO (Valero et al. 2018).

Because the longline CPUE is the main driver of the stock's abundance estimate, increased purse-seine catch in the equatorial regions in the mid-1990s appears to force the model to increase recruitment to support the increase in catch without a reduction in the abundance index. Models that reflect the localized dynamics of the longline and purse seine catches and the associated local longline CPUE indices do not show the increased recruitment in the mid-90s, and show greater depletion of the stocks in the equatorial regions (Valero et al. 2018). These results suggest that alternative spatial management measures should be evaluated (Valero et al. 2018).

Purse seiners rarely catch bigeye tuna north of 10°N in the EPO (Xu et al. 2018), and the majority of the U.S. longline fleet's fishing pressure occurs north of 20° N. The impact of the purse-seine fishery on the bigeye stock is far greater than that of the longline fishery (Xu et al. 2018). Because the usefulness of the current bigeye assessment (Xu et al. 2018) has been questioned, IATTC staff developed a suite of stock indicators for bigeye based on purse seine data (Maunder et al. 2018b). These indicators show increasing fishing mortality and reduced abundance over time, and are at or above their reference levels. The results indicate that additional purse seine measures are required (Maunder et al. 2018b).

NMFS has noted that the EPO bigeye tuna stock is under increasing fishing pressure, especially from the purse seine fish aggregating device (FAD) fishery. The report on indicators for bigeye stock status, however, does not provide the information required by the Pelagic FEP for making a status determination (NMFS 2018b). In 2017, total bigeye tuna landings in the EPO by the longline fisheries in Hawaii, American Samoa, Guam, and the CNMI was 2,690 t (WPFMC 2018a) or 2.8 percent of the estimated MSY of 95,491 t (Xu et al. 2018) and 2.8 percent of the total 2017 catch (IATTC 2018).

The U.S. deep-set longline fishery catch of bigeye tuna is limited by annual catch limits consistent with conservation and management measures of the WCPFC and IATTC. The fishery has additional opportunities for catching BET under specified fishing agreements with U.S. territories (50 CFR 665.819(c)) which are managed to ensure catches of WCPO bigeye tuna remain sustainable. The Hawaii deep-set longline fishery is not harvesting its maximum catch under the current management and so there is room for catch to increase and not adversely affect the stock.

3.1.2 Yellowfin Tuna

Vincent et al. (2020) conducted the most recent stock assessment for yellowfin tuna in the WCPO. Yellowfin is not subject to overfishing or overfished. Similar to the bigeye assessment, the WCPFC Scientific Committee (SC) endorsed a weighted assessment model uncertainty grid to characterize stock status. The SC, at their 16th regular session in 2020, noted that the central tendency of relative recent spawning biomass was median ($SB_{recent}/SB_{F=0}$) = 0.53 with a probable range of 0.40 to 0.61 (80% probable range), and that there was a roughly 0% probability that the recent spawning biomass had breached the WCPFC limit reference point. The central tendency of relative recent fishing mortality was median (F_{recent}/F_{MSY}) = 0.74 with an 80% probability interval of 0.62 to 0.97, and there was a roughly 4% probability (2 out of 48 models) that the recent fishing mortality was above F_{MSY} (WCPFC 2017). In 2020, total yellowfin tuna landings by the longline fisheries in Hawaii and American Samoa was 2,531 t or less than 1 percent of the estimated MSY (WCPFC 2021). Of the 2,531 t of yellowfin tuna caught by U.S. longline fisheries in 2020, the longline fleet based in Hawaii accounted for 2,313 t with the remainder, 219 t or 8.7%, landed by the American Samoa longline fishery (WCPFC 2021).

3.1.3 Albacore

The International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean (ISC) in 2020 completed the most recent stock assessment of North Pacific albacore, which uses data through 2018 (ISC 2020). The assessment indicates that: a) the stock is likely not overfished relative to the limit reference point adopted by the WCPFC (20%$SSB_{current}$, F=0), and b) no F-based reference points have been adopted to evaluate overfishing, but stock status was evaluated against seven potential LMRs and current fishing intensity ($F_{2012\text{-}2014}$) is below six of the seven reference points except for $F_{50\%}$. Total albacore tuna landings in the North Pacific by the longline fisheries in Hawaii, American Samoa, Guam, and the CNMI was 90 t, or less than 1 percent of the estimated MSY. The Hawaii longline fishery made nearly all of the landings.

For South Pacific albacore, Tremblay-Boyer et al (2018) estimated that the median level of spawning biomass depletion from the uncertainty grid was SBrecent/$SB_{F=0}$ = 0.52 with a probable range of 0.37 to 0.63 (80% probability interval). Tremblay-Boyer et al (2018) indicated no individual model configurations estimated spawning biomass, ($SB_{recent}/SB_{F=0}$) < 0.2, breaching the limit reference point of the stock. The assessment indicated that the probability that recent spawning biomass being below the LRP was zero. However, US longline fisheries operating out of American Samoa continue to experience a precipitous decline in catch: 1,050 t in 2019 and 507 t in 2020 (WPFMC 2021). Total catch of South Pacific albacore was estimated to be 86,706 t in 2019, with American Samoa longline fisheries contributing 1.2% of South Pacific catch in that year. In order to reduce the impacts of regional depletion on fishery performance of island-associated fisheries targeting South Pacific albacore, a target reference point was adopted by the WCPFC for spawning biomass of the stock to be 57% $SB_{F=0}$, with the intention of increasing fishery performance for small island states.

In summary, the U.S. longline fishery out of American Samoa is not depleting SP Albacore, and is managed sustainably.

3.1.4 Skipjack

McKechnie et al. (2016) conducted the most recent assessment of skipjack tuna in the WCPO using data up to 2015. The median estimates of the ratio of current fishing mortality to fishing mortality at MSY (F_{2011}/F_{MSY}) =0.48 indicate that overfishing of skipjack is not occurring in the WCPO. Nor is the stock in an overfished state with spawning biomass to spawning biomass at MSY $(SB_{2011}/SB_{MSY}) = 2.15$. Fishing pressure and recruitment variability (influenced by environmental conditions) will continue to be the primary influences on stock size and fishery performance (McKechnie et al. 2016). McKechnie et al. (2016) estimate MSY at 1,875,600 t. In 2020, total skipjack tuna landings by the longline fisheries in Hawaii and American Samoa, was 311 t, or much less than 1 percent of the estimated MSY (WPFMC 2021). Of the 311 t, the Hawaii longline fishery accounted for 251 t with the remainder, 60 t or 19.3% landed by the American Samoa longline fishery.

3.1.5 Swordfish

Based on the best scientific information available, the swordfish population in the North Pacific is comprised of two stocks, separated by a roughly diagonal boundary extending from Baja California, Mexico, to the Equator. These are the WCNPO stock, distributed in the western and central Pacific Ocean, and the EPO stock, distributed in the eastern Pacific Ocean.

Hawaii-permitted deep-set fishing operations north of the Equator may land no more than 25 swordfish per trip if only circle hooks are used and 10 swordfish per trip if any other type of hook is used. These limits do not apply if an observer is on board (50 CFR 665.813(j)).

The results of the most recent WCNPO assessment (ISC 2018b) support the conclusion that the WCNPO stock is not subject to overfishing as $F_{2013-2015}/F_{MSY} = 0.45$, and is not overfished as SB_{2016}/SB_{MSY} =1.87. The 2018 stock assessment estimated MSY for the WCNPO stock at 14,941 t (ISC 2018b). In the terminal year of the stock assessment, total landings of swordfish by all U.S. longline fisheries in the NPO, which may include a small percentage of EPO swordfish, was 1,617 t (WPFMC 2018a) or approximately 11 percent of the estimated MSY. The Hawaii longline fishery made nearly all of the landings. In 2019, catch of North Pacific swordfish by Hawaii-based U.S. longline fisheries declined to 812.5 t, lowest in over a decade (WPFMC, 2020). This can be attributed to closures of the shallow-set sector of the fishery due to reaching its limit on loggerhead sea turtle interactions, which was re-evaluated by Pelagic FEP Amendment 10.

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

2018 (NMFS unpublished data). This amount (<5 t) is less than 1 percent of the estimated MSY; therefore, the relative impact of the U.S. longline fisheries on the stock is negligible.

3.1.6 Striped Marlin

Internationally, striped marlin in the Pacific is comprised of three stocks: southwest Pacific Ocean, WCNPO, and north east Pacific Ocean (NEPO). Stock assessments are available for the WCNPO stock (ISC 2019) and the NEPO stock (Hinton and Maunder 2011).

In the WCNPO, results of a 2019 stock assessment (ISC 2019) indicate the WCNPO stock of striped marlin continues to be subject to overfishing (F/F_{MSY} is =1.49) and overfished (SB/SB_{MSY} = 0.39). The 2019 stock assessment estimated MSY at 4,946 t. CMM 2010-01 for North Pacific striped marlin adopted by the WCPFC requires members and cooperating non-members to limit striped marlin landings by all gears from their highest catches from 2000-2003, and then further reduce catches by 10 percent in 2011, 15 percent in 2012, and 20 percent in 2013. The Small Island Developing States and Participating Territories are exempt from catch limits under the measure. The highest striped marlin catch by U.S. fisheries between 2000 and 2003 was 571 t. Thus, a 20 percent reduction from 571 t is 457 t. The Hawaii longline fishery accounts for more than 90 percent of the total U.S. catch of this stock, with the remainder made by Hawaii small-scale troll fisheries. The total landings of WCNPO striped marlin by all U.S. fisheries combined have never exceeded 425 t (NMFS 2018c).

In 2019, total WCNPO striped marlin (or striped marlin caught in the WCPO) landings by all U.S. fisheries was 336 t, with the Hawaii longline fisheries accounting for 286 t, the American Samoa longline fishery accounting for 48 t, and the Hawaii troll fisheries accounting for 8 t (NMFS 2018c) or about 6 percent of MSY for all U.S. fisheries. Thus, overfishing of the stock is due to excessive international fishing pressure and the IATTC and WCPFC have inadequate measures in place to address the issue. On June 4, 2020, the Council was notified by NMFS of the overfished and overfishing status of WCPO striped marlin based on best scientific information available and of its obligations to take action within one year of that notice, pursuant to the MSA Section 304(e) and 304(i). This notification indicated the average relative impact of U.S. fisheries, from 2011 to 2017, was 15% of total WCPFC catch. NMFS continues to work with the Pacific and Western Pacific Fishery Management Councils, and the State Department to ensure that the WCPFC and IATTC adopt effective management measures to end overfishing.

In the NEPO, results of the 2011 stock assessment (Hinton and Maunder 2011) indicate that the NEPO striped marlin stock is not overfished or experiencing overfishing. The stock biomass has increased from a low of about 2,600 t in 2003, and was estimated to be about 5,100 t in 2009. There has been an increasing trend in the estimated ratio of the observed annual spawning biomasses to the spawning biomass (SB) in the unexploited stock, which has doubled from about 0.19 in 2003 to about 0.38 in 2009. The estimated ratio of spawning biomass in 2009 to that expected to provide catch at the level of MSY, SB_{2009}/SB_{MSY}, was about 1.5, which indicates that the spawning biomass was above the level expected to support MSY. The estimated recent levels of fishing effort (average 2007-2009) were below those expected at MSY (Hinton and Maunder 2011). As this assessment is dated, the current status of the NEPO stock is unknown. Between 2013 and 2019, Hawaii longline catches of NEPO striped marlin (or striped marlin caught in the

EPO) ranged between 63 and 77 t annually, which was no greater than 3 percent of the stock's biomass as of the previous assessment (WPFMC 2020).

3.1.7 Blue Marlin

The 2016 stock assessment by the ISC Billfish Working Group (ISC 2016) which uses data through 2014 indicates Pacific blue marlin is not experiencing overfishing (F_{2014}/F_{MSY} = 0.88). Applying the 2014 spawning biomass estimates of 24,809 t, and the spawning biomass at MSY of 19,858 t, the ratio of SB/SB_{MSY} = 1.25 indicating the stock is not overfished. In 2020, total blue marlin landings by longline fisheries in Hawaii and American Samoa was 648 t, or approximately 3% of the estimated MSY. Of the 684 t, the Hawaii longline fishery accounted for 623 t with the remainder, 55 t or 3.8%, caught by the American Samoa longline fishery (WPFMC 2021).

3.1.8 Bluefin Tuna

Scientists consider Pacific bluefin tuna as a single North Pacific-wide stock (ISC 2018a). The most recent assessment of the status of Pacific bluefin tuna used data through 2016, and concluded that the stock is still experiencing overfishing and is overfished (ISC 2018a). Spawning Potential Ratio (SPR), a preferred metric to estimate exploitation impacts on the stock, is the ratio of the cumulative spawning biomass that an average recruit is expected to produce over its lifetime when the stock is fished at the current fishing level to the cumulative spawning biomass that could be produced by an average recruit over its lifetime if the stock was unfished (ISC 2020). The ISC assessment estimated that fishing mortality ($F_{\%SPR}$) declined from a level producing about 1% of SPR in 2004-2009 to a level producing 14% of SPR in 2016- 2018. Current spawning biomass is estimated at 28,000 t in 2018, up significantly from near a near historical low in 2010 (ISC 2020). However, the ISC Bluefin Tuna Working Group noted that the stock has over a 75% probability of achieving its rebuilding target (6.7% $SSB_{F=0}$) by 2024 and over 80% probability of achieving a secondary target (6.7% $SSB_{F=0}$) ten years later. Spawning stock biomass has increased from 3.3% $SSB_{F=0}$ to 4.46% $SSB_{F=0}$ since the previous stock assessment.

The U.S. longline fleet seldom catches Pacific bluefin tuna (NMFS 2018c). From 2018 to 2020, the average total North Pacific bluefin tuna landings by all U.S. longline fisheries was 1.6 t (WPFMC, 2021), about one percent of current spawning biomass. At such a low percentage of fishing mortality, the relative impact of the U.S. longline fisheries on the stock is negligible and therefore overfishing of the stock is due to excessive international fishing pressure. NMFS continues to work with the Pacific and Western Pacific Councils and the State Department to ensure that WCPFC and IATTC adopt effective management measures to end overfishing and rebuild the stock.

3.1.9 Blue Shark

The results of the 2017 assessment (ISC 2017a) indicate the North Pacific blue shark is not subject to overfishing ($F_{2012\text{-}2014}/F_{MSY}$ = 0.37), and is not overfished ($SB_{2012\text{-}2014}/SB_{MSY}$ =1.71). The 2017 stock assessment estimated SB_{MSY} at 179,539 t. In 2020, total blue shark landings by all U.S. longline fisheries was 0 t. Nearly all blue sharks caught in US longline fisheries are returned to the sea alive, with some discarded dead as well.

3.1.10 North Pacific Shortfin Mako Shark

In 2018, ISC concluded the first full stock assessment of shortfin mako shark in the North Pacific Ocean (ISC 2018c). Previous abundance indices showed conflicting trends from which stock status could not be determined (ISC 2015). The new assessment used data through 2016, and assumed a single stock in the NPO (ISC 2018c). The results indicate that the stock is likely (>50%) not subject to overfishing because $F_{2013\text{-}2015}/F_{MSY} = 0.62$, and is likely (>50%) not overfished because $SA_{2016}/SA_{MSY} = 1.36$. Spawning abundance (SA) was used instead of spawning biomass because the size of mature female sharks does not appear to affect the number of pups produced (ISC 2018c). ISC estimated the MSY at 3,127 t (ISC 2018c). In 2020, total mako shark landings by all U.S. in the North Pacific Ocean was 71 t, or 2.3 percent of the MSY.

On April 15, 2021 NMFS announced a 90-day finding on a petition to list the shortfin mako shark as threatened or endangered under the ESA and to designate critical habitat concurrent with the listing, so NMFS is developing a status review of the species to determine whether listing under the ESA is warranted (86 FR 19863). As this status review is as of yet incomplete, we will not include shortfin mako shark in Section 3.2 "Protected Resources."

3.1.11 Oceanic Whitetip Shark stock status overview

The 15th Science Committee of the WCPFC (SC15) reviewed the 2019 stock assessment of the Western and Central Pacific (WCPO) oceanic whitetip shark from an assessment using data from 1995 to 2016 (Tremblay-Boyer et al. 2019). The median values of relative 'recent' (2013-2016) spawning biomass ($SB_{recent}/SB_{F=0}$, SB_{recent}/SB_{MSY}) and relative recent fishing mortality (F_{recent}/F_{MSY}) over a series of model configurations were used to measure the central tendency of stock status. The span of the 'recent' time period was determined to only included years following the adoption of WCPFC CMM-2011-04; CMM-2011-04 was a binding measure prohibiting the retention of oceanic whitetip sharks, or associated parts (including fins) across all fisheries under WCPFC jurisdiction, effective January 1, 2013. The measure also required safe release of oceanic whitetip sharks and for observer programs to record the condition of sharks encountered in WCPFC fisheries. Tremblay-Boyer et al. (2019) was the first assessment since the adoption of CMM-2011-04.

Prior to the 2019 assessment, Rice and Harley (2012) assessed the stock using data from 1995 to 2009, noting uncertainty in historical catches and the initial condition of the stock prior to 1995 and the reliance on sparse observer data. Rice and Harley (2012) found the stock to be overfished relative to MSY, with spawning stock to be 15.3% of the spawning stock at MSY levels and overfished with relative fishing mortality to be 6.5 times fishing mortality at MSY levels.

Tremblay-Boyer et al. (2019) found that the recent median level of spawning biomass depletion from the ensemble of stock assessment model configurations was $SB_{recent}/SB_{0} = 0.04$ with a probable range of 0.03 to 0.05 (80% probability interval), with median values of spawning biomass to be well below commonly used WCPFC limit reference points. The median level of recent spawning biomass relative to that leading to MSY was $SB_{recent}/SB_{MSY} = 0.09$ (range: 0.05–

0.17). The assessment found that overfishing is still occurring and the stock is still in an overfished state relative to MSY reference points (as prescribed by the Pelagic FEP) and depletion-based reference points commonly used by the WCPFC. Like Harley and Rice (2012), Tremblay-Boyer et al. (2019) noted there was extinction risk if fishing mortality rates remain high. The most recent assessment estimated fishing mortality to be, on average, 4.2 times MSY levels, still much higher than sustainable, but a decrease in fishing mortality estimates since the last assessment (Rice and Harley 2012).

On May 4, 2020, the Council was notified by NMFS of the overfished and overfishing status based on best scientific information available and of its obligations to take action within one year of that notice, pursuant to the MSA Section 304(e) and 304(i). This notification indicated the relative impact, based on catch history from 2013 to 2017 relative to estimates of total WCPO catch and effort from Peatman et al (2018), estimated average annual catch over this period in the American Samoa longline fishery to be 617 individuals, or 1.7% of deep-set catch in the WCPO. In the Hawaii deep-set longline fishery, average annual catch from 2013 to 2017 was 1,725 individuals, or 4.8% of the estimated total deep-set catch in the WCPO. In the Hawaii shallow-set longline fishery, catch was 26 individuals, or 0.15 percent of estimated shallow-set longline catch in the WCPO.

Stock projections under future catch scenarios (up to 2032) were conducted Rice et al. (2021) to estimate future biomass, spawning potential, and future US impacts on the stock based on possible catch scenarios. Stock projections considered a myriad of biological parameterization scenarios – including initial fishing mortality, natural mortality, steepness (recruitment response at low population size), and life history (age/growth and maturity) as utilized by Tremblay-Boyer et al. (2019). The projections also consider plausible catch histories and post-release mortality rates, with 43% of catch mortality being determined to be the most plausible per Hutchinson and Bigelow (2019). Future catch trajectories include 2016 (‘status quo’) catches, catches corresponding to 10% reduction from 2016 to 2020, catches corresponding to 20% reduction from 2016 to 2020, and no catch into the future. Catch trajectories corresponding to 10% and 20% reductions from 2016 catch levels correspond to independent estimates of catches for 2017 and 2018 (Peatman and Nicol, 2020). Rice et al (2021) indicated that projected biomass trajectories under scenarios of 10% and 20% catch reductions from 2016 are likely to lead to stock recovery.

It was noted that data in the assessment includes all WCPFC sources, including US fishery data. Rice et al (2021) also examined the impact of the US longline fisheries, including the American Samoa longline fishery, the Hawaii based deep-set fishery, and Hawaii shallow-set fishery by running the projection model with 2016 catches projected forward subtracting estimates of the mortalities due to US catches into the future. The estimates of the US total catches came from the PIFSC Data Reports (McCracken 2018, 2019a, 2019b), and total approximately 2,400 individuals with significant interannual variability. These values are based on the total US longline catches, would be subject to a total mortality rate of 42.23%. The total estimate of the mortalities due to US longline fisheries is therefore 1014 (= 2400 * 0.4223), of which 721 is estimated as due to the Hawaiian deep set longline fishery. US longline impacts on spawning potential in projections in the future to 2031 were about 1.2% with 0.8% attributed to the Hawaii deep-set fishery. Zero mortality of oceanic whitetip sharks in all US fisheries for 17 years may lead to a 4% increase in stock biomass by 2034. This underlines the small relative impact of the US compared to other fisheries and relative to stock size.

Rice et al. (2021) indicated the implementation of CMM-2011-04 has led to decreased fishing mortality, thus likely leading to future stock recovery based on probable catch scenarios. Rice et al. (2021) also concluded US impacts, under more pessimistic scenarios of future catch, are projected to be 4% of total mortality.

3.1.12 Silky Shark

Silky sharks have a restricted habitat range compared to the other highly migratory species but within this range, they dominate both longline and purse seine catches (Rice and Harley 2013). Stock boundaries within the species are not clearly resolved, which complicates development of a pan-Pacific assessment model (Clarke et al. 2018a). Additionally, CPUE indices from WCPO and EPO fisheries show correlations with oceanographic conditions, so may not represent reliable indices of abundance and may bias indicators of stock status (Clarke et al. 2018a; Lennert-Cody et al. 2018). Based on apparent declines and in the absence of better scientific information, both the WCPFC and the IATTC implemented precautionary measures to prohibit vessels from retaining any part or carcass of a silky shark, except to assist WCPFC observers in collection of samples. A pan-Pacific assessment was completed in 2018, but the authors cautioned that estimates of stock status reference points for determining whether the stock is experiencing overfishing or is overfished are unreliable and should not be used as the basis for management advice (Clarke et al. 2018a), and a separate assessment for the WCPO stock only was developed and accepted at the 2018 WCPFC Science Committee meeting (Clarke et al. 2018b). That assessment (Clark et al 2018b) concluded that the WCPO silky shark stock is not currently overfished, but is experiencing overfishing.

On September 28, 2020, NMFS declared the WCPO-specific stock assessment (Clark et al. 2018b) as best scientific information available for WCPO silky shark. On October 20, 2020, NMFS notified Council to, within one year, to 1) develop and submit recommendations for domestic regulations to address the relative impact of U.S. fishing vessels on silky shark in the WCPO and 2) develop and submit recommendations for international actions that will end overfishing of WCPO silky shark, taking into account the relative impact of vessels of the United States and other nations. Domestic non-retention regulations have been in place since 2015 (80 FR 8807).

Estimates of total WCPO silky shark catch from observer data (Peatman et al. 2018) and market data (Clarke et al. 2018a) suggest that the proportion of WCPO catch attributable to U.S. longline fisheries is less than 1% (range 0.2 – 2.0%).

3.1.13 Summary of Hawaii Longline Fisheries Catch Statistics

Released catch, retained catch, and total catch for the Hawaii deep-set longline fishery in 2020 are summarized in Table 8. These and other catch statistics for these three longline fisheries can be found in the 2020 SAFE report (WPFMC 2021).

Table 8. Released catch, retained catch, and total catch for the Hawai`i-permitted deep-set longline fishery, 2020.

	Deep-set longline fishery			
	Released catch	Percent released	Retained catch	Total Catch
Tuna				
Albacore	410	5.0	8,126	8,536
Bigeye tuna	4,542	2.2	202,596	207,138
Bluefin tuna	0	0.0	11	11
Skipjack tuna	165	0.8	20,544	20,709
Yellowfin tuna	1,164	2.2	53,231	54,395
Other tuna	0	0.0	0	0
Total tunas	**6,281**	**2.2**	**284,508**	**290,789**
Billfish				
Swordfish	147	4.0	3,716	3,863
Blue marlin	59	0.7	8,118	8,177
Striped marlin	157	1.2	12,621	12,778
Spearfish	279	2.9	9,696	9,975
Other marlin	10	2.1	469	479
Total billfish	652	1.9	34,620	35,272
Other PMUS				
Mahimahi	182	0.8	21,767	21,949
Wahoo	115	0.5	24,246	24,361
Moonfish	424	2.6	16,182	16,606
Oilfish	3,001	37.8	7,931	10,932
Pomfret	329	0.9	35,748	36,077
Total other PMUS	**4,051**	**3.8**	**105,874**	**109,925**
Non-PMUS fish	**6,414**	**97.3**	**175**	**6,589**
Total non-shark	**17,398**	**3.9**	**425,177**	**442,575**
PMUS Sharks				
Blue shark	104,427	100.0	1	104,428
Mako shark	4,422	99.1	39	4,461
Thresher shark	8,678	99.7	23	8,701
Oceanic Whitetip shark	463	100.0	0	463
Silky shark	234	100.0	0	234
Total PMUS sharks	**118,224**	**99.9**	**63**	**118,287**
Non-PMUS sharks	**257**	**99.6**	**1**	**258**
Grand Total	**135,879**	**24.2**	**425,241**	**561,120**

Source: WPRFMC (2021).

3.2 Protected Resources

The Hawaii deep-set longline fishery has the potential to interact with a range of protected species (such as sea turtles, marine mammals, sharks and rays, and seabirds). This section provides background on protected species management authorities and associated monitoring, trends in species status, the recent annual estimated or observed interactions of the longline fisheries with protected species, and a summary of the effects of the standard operation of the deep-set fishery with a comparison to incidental take statements (ITS) where relevant. We will consider trends in species status and recent interaction levels to be the baseline condition for comparison of environmental effects of the alternatives in Section 4.

More detailed information on protected species interactions in the Hawaii and American Samoa longline fisheries are available in the 2020 Annual SAFE Report (WPRFMC 2021), incorporated here by reference.

3.2.1 Species Protected under the Endangered Species Act

The purpose of the Endangered Species Act (ESA) is to protect and recover imperiled species and the ecosystems upon which they depend. Section 7(a)(2) of the ESA requires each federal agency to insure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat of such species. To “jeopardize” means to reduce appreciably the likelihood of survival and recovery of a species in the wild by reducing its numbers, reproduction, or distribution. When a federal agency’s action “may affect” an ESA-listed species, that agency is required to consult formally with NMFS (for marine species, some anadromous species, and their designated critical habitats) or the U.S. Fish and Wildlife Service (FWS) for terrestrial and freshwater species or their designated critical habitat. The product of formal consultation is the relevant service’s BiOp.

The ESA also prohibits the taking of listed species without a special exemption. Taking that is incidental to and not intended as part of a federal action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of an ITS. The reasonable and prudent measures are nondiscretionary, and must be undertaken by the federal agency for the take exemption to apply. For BiOps reaching a jeopardy or adverse modification conclusion, NMFS develops reasonable and prudent alternatives that would avoid the likelihood of jeopardy or adverse modification of critical habitat. Western Pacific fisheries authorized under the Pelagic FEP operate in accordance with ITSs set by ESA consultations, including applicable reasonable and prudent measures, and their associated terms and conditions, intended to minimize the potential effects of incidental take.

Table 9. ESA-listed species with the potential to interact with longline vessels permitted under the Pelagic FEP

Species	ESA status
Sea Turtles	
Central North Pacific green turtle distinct population segment (DPS) (*Chelonia mydas*)	Threatened
East Pacific green turtle DPS (*Chelonia mydas*)	Threatened
Central South Pacific green turtle DPS (*Chelonia mydas*)	Endangered
Central West Pacific green turtle DPS (*Chelonia mydas*)	Endangered
East Indian-West Pacific green turtle DPS (*Chelonia mydas*)	Threatened
Southwest Pacific green turtle DPS (*Chelonia mydas*)	Threatened
Hawksbill turtle (*Eretmochelys imbricata*)	Endangered

Species	ESA status
Leatherback turtle (*Dermochelys coriacea*)	Endangered
North Pacific loggerhead turtle DPS (*Caretta caretta*)	Endangered
South Pacific loggerhead turtle DPS (*Caretta caretta*)	Endangered
Olive ridley turtle *(Lepidochelys olivacea*)	Threatened
Olive ridley turtle Mexico Pacific nesting population (*Lepidochelys olivacea*)	Endangered
Marine Mammals	
Blue whale (*Balaenoptera musculus*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Hawaiian monk seal (*Neomonachus schauinslandi*)	Endangered
Main Hawaiian Islands insular false killer whale DPS (*Pseudorca crassidens*)	Endangered
North Pacific right whale (*Eubalaena japonica*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Sperm whale (*Physeter macrocephalus*)	Endangered
Guadalupe fur seal (*Arctocephalus townsendi*)	Threatened
Seabirds	
Hawaiian dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*)	Endangered
Newell's shearwater (*Puffinus auricularis newelli*)	Threatened
Short-tailed albatross (*Phoebastria albatrus*)	Endangered
Sharks and Rays	
Scalloped hammerhead Indo-West Pacific DPS (*Sphyrina lewini*)	Threatened
Scalloped hammerhead Eastern Pacific DPS (*Sphyrina lewini*)	Endangered
Oceanic white tip (*Carcharhinus longimanus*)	Threatened
Giant manta ray (*Manta birostris*)	Threatened
Corals and Marine Invertebrates	
Acropora globiceps	Threatened
Acropora jacquelineae	Threatened
Acropora retusa	Threatened
Acropora speciose	Threatened
Euphyllia paradivisa	Threatened
Isopora crateriformis	Threatened
Seriatopora aculeata	Threatened
Chambered nautilus (*Nautilus pompilius*)	Threatened

Source: https://www.fisheries.noaa.gov/species-directory accessed October 2, 2018.

This section summarizes much of the information contained in these documents to describe baseline conditions. The following list identifies the valid BiOps under which western Pacific longline fisheries currently operate.

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

NMFS. 2014. Biological Opinion on Continued Operation of the Hawaii-based Deep-set Pelagic Longline Fishery.

NMFS. 2017. Supplement to the 2014 Biological Opinion on Continued Operation of the Hawaii-based Deep-set Pelagic Longline Fishery.

For further information, refer to the following documents on the NMFS website:

(https://www.fisheries.noaa.gov/resources/documents?title=&field_category_document_value%5Bbiological_opinion%5D=biological_opinion&field_species_vocab_target_id=&region%5B1000001116%5D=1000001116&sort_by=created)

Alternatively, contact NMFS using the contact information at the beginning of the document.

NMFS reinitiated consultation for the Hawaii deep-set fishery on October 4, 2018, due to reaching several reinitiation triggers. The fishery exceeded the ITS for east Pacific green sea turtle DPS in mid-2018. Listing of the oceanic whitetip shark (83 FR 4153) and giant manta ray (83 FR 2916) as threatened species, and designation of MHI insular false killer whale critical habitat (83 FR 35062) also triggered the requirement for reinitiated consultation. On October 4, 2018, April 15, 2020 and again on December 18, 2020, NMFS determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d).

3.2.2 Species Protected under the Marine Mammal Protection Act

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

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

According to the 2021 List of Fisheries (86 FR 3028, January 14, 2021), the Hawaii deep-set longline fishery is a Category I fishery. Among other requirements, owners of vessels or gear engaging in a Category I fishery are required under 50 CFR 229.4 to obtain a marine mammal authorization to lawfully take incidentally, non-ESA listed marine mammals by registering with NMFS' marine mammal authorization program.

Section 118 of the MMPA requires NMFS to prepare a take reduction plan for each strategic marine mammal stock that interacts with a Category I or Category II fishery. NMFS established the False Killer Whale Take Reduction Team in 2010 (75 FR 2853) and implemented the False killer whale take reduction plan (FKWTRP) in 2012 (72 FR 71260) to reduce mortalities and serious injuries (M&SI) of false killer whales in the Hawaii deep-set longline fishery.

Section 101(a)(5)(E) of the MMPA requires the Secretary of Commerce to allow the incidental, but not intentional, taking of individuals from marine mammal stocks that are designated as depleted because of a listing as threatened or endangered under the ESA in the course of commercial fishing operations if certain criteria are met.

On May 6, 2021, NMFS issued a permit under the MMPA section 101(a)(5)(E), addressing the Hawaii deep-set fishery's interactions with ESA-listed species or depleted stocks of marine mammals (86 FR 24384). The permit authorizes the incidental, but not intentional, taking of ESA-listed humpback whales (central North Pacific or CNP stock) and MHI insular false killer whales to vessels registered in the Hawaii deep-set fishery. In issuing the permit, NMFS determined that incidental taking by the deep-set fishery will have a negligible impact on the affected stocks of marine mammals. The humpback whale CNP stock delineation under the MMPA includes both ESA-listed and non-ESA-listed distinct population segments. However, any potential overlap of the deep-set fishery with humpback whales is with the Hawaii distinct population segment, which is no longer listed under the ESA (81 FR 62259, September 8, 2016).

Additional information on the marine mammals that interact with Pelagic FEP fisheries are described in Section 3.2.7, below.

3.2.3 Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) makes it illegal to intentionally take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nests, or eggs of such a bird except under the terms of a valid Federal permit. In 2012, the FWS issued a special permit for the shallow-set fishery under the MBTA. This permit authorizes incidental take of certain seabirds in the Hawaii shallow-set fishery over a period of three years (USFWS 2012). On December 27, 2017, the U.S. Ninth Circuit Court of Appeals issued a split decision that reversed the lower district court's decision upholding the MBTA permit. *Turtle Island Restoration Network v. NMFS & FWS*, 13-17123 (9th Cir. 2017). The Ninth Circuit Court majority opinion found that FWS improperly relied upon the special use permit to authorize the incidental take of sea birds by a commercial fishery. The permit expired on its own terms in March 2018 and NMFS determined that it would not reapply for the permit. On January 7, 2021, the USFWS published a final rule (effective February 8, 2021) defining the scope of the MBTA as it applies to conduct resulting in the injury or death of migratory birds protected by the MBTA (86 FR 1134). In that January 2021 rule, USFWS determined that the MBTA's prohibitions on pursuing, hunting, taking, capturing, killing, or attempting to do the same, apply only to actions directed at migratory birds, their nests, or their eggs. On October 4, 2021, FWS published a final rule (effective December 3, 2021) revoking the January 2021 rule, and returning the implementation of the MBTA as prohibiting incidental take and applying enforcement discretion consistent to FWS practice prior to 2017 (86 FR 54642). NMFS and the Council continue to monitor interactions with seabirds and have implemented take mitigation measures.

Additional information on the seabirds that interact with Pelagic FEP fisheries are described in Section 3.2.5, below.

3.2.4 Monitoring

NMFS monitors fishery interactions with protected species using at-sea observers, among other means. NMFS PIROP monitors interactions on approximately 20% of all Hawaii deep-set longline trips, 100% of Hawaii shallow-set longline trips, and approximately 20% of American Samoa longline trips. PIFSC generates fleet-wide estimates of interactions for each longline fishery, when available (see WPFMC 2021). When these data are not available, NMFS estimates fleet-wide interactions by expanding observed takes using an expansion factor based on the observer coverage rate. For example, if the Hawaii deep-set longline fishery was observed at a 20.4 percent coverage rate, NMFS would multiply each observed interaction by 4.9 to estimate interactions at a 100 percent coverage rate.

3.2.5 Seabirds

The endangered short-tailed albatross, threatened Newell's shearwater, and endangered Hawaiian dark-rumped petrel have ranges that overlap the fishing grounds of the Hawaii deep-set longline fishery. A comprehensive description of the species' distribution, population status, threats, and recovery strategy can be found in the species' recovery plans at: https://ecos.fws.gov/ecp0/reports/ad-hoc-species-report-input.

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

As described in Section 3.2.3, all seabirds are protected under the MBTA. In addition to the ESA-listed seabirds, the Hawaii longline fisheries occasionally interact with other seabirds such as albatrosses, Northern fulmar, sooty shearwaters, and gulls.

Seabirds are vulnerable to fisheries through hooking and entanglement, which may result in injury or mortality. Albatrosses that forage by diving are some of the most vulnerable species to bycatch in fisheries (Brothers et al. 1999). These species are long-lived, have delayed sexual maturity, small clutches and long generation times, resulting in populations that are highly sensitive to changes in adult mortality. Twenty of the world's 21 albatross species are now at least near threatened with extinction according to the International Union for Conservation of Nature (IUCN 2017), and incidental catch in fisheries, especially longline fisheries, is considered one of the principal threats to many of these species (Veran et al. 2007).

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for seabird interactions and injury to seabirds if interactions occur. These measures include the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually.

Deep-set fishing operations north of 23º N latitude and all shallow-set vessels are required to comply with seabird mitigation regulations that the Council and NMFS intended to reduce interactions between seabirds and Hawaii longline fishing vessels (50 CFR 665.815), implemented in 2002 with regulatory adjustments effective in 2006. Longline fishermen must employ measures that are specific to side-setting or stern-setting, and may include blue-dyed bait, weighted branch lines, strategic offal discards, setting from the side of the vessel, using a “bird curtain” or a hydraulic line-setting machine, among others. These measures help deter birds from becoming hooked or entangled while attempting to feed on bait or catch. The WCPFC agreed to similar mitigation measures for longline vessels greater than 24 meters or more in overall length north of 23°N, effective June 30, 2008 (WCPFC 2007) and for one mitigation method required for vessels shorter than 24 m in 2017 (WCPFC 2017a).

These measures resulted in a reduction of over 90% in total seabird interactions by 2006 in the deep-set and shallow-set fisheries combined (Fossen 2007). Seabirds likely drown if the interaction occurs during gear deployment (setting), but during gear retrieval (hauling), seabirds may be released alive when fishermen promptly apply seabird handling and release techniques as specified at 50 CFR 665.815(b) and 665.815(c).

Since NMFS initiated the observer programs in Hawaii longline fishery in 1994, there have been no observed interactions between ESA-listed seabird species. After considering a range of potential effects to seabirds, U.S. FWS, in its 2012 BiOp, determined that the Hawaii deep-set and shallow-set fisheries of the western Pacific operating in accordance with the Pelagics FEP and implementing regulations, would not jeopardize the survival or recovery of any listed seabirds. U.S. FWS has authorized a certain level of interactions (incidental take) of short-tailed albatross which the fishery may adversely affect through ITS for these fisheries.

Table 10 contains the numbers of Laysan and black-footed albatross that have interacted with the Hawaii deep-set longline fisheries from 2011 through 2020 based on observed interactions by the NMFS Observer Program. On average, over 90% of the interactions are observed dead, which represent interactions that occur during the setting operations. In addition, from 2011 through 2020, the deep-set fishery has interacted with a small number of booby, shearwater, and gull species (WPFMC 2021). ESA-listed seabirds including short-tailed albatross have not been observed interacting in the Hawaii deep-set longline fishery.

Table 10. Observed total and dead interactions, estimated total interactions, and percent of dead observed interactions with Laysan and black-footed albatrosses in the Hawaii deep-set longline fisheries, 2011-2020.

	Laysan Albatross				Black-footed Albatross			
Year	Obs. total	Obs. dead	Est. Total	% dead	Obs. total	Obs. dead	Est. Total	% dead
2011	32	31	187	96.9%	13	12	73	92.3%
2012	30	25	136	83.3%	35	35	167	100.0%
2013	48	46	236	95.8%	50	47	257	94.0%
2014	13	10	77	76.9%	32	29	175	90.6%
2015	24	22	119	91.7%	107	92	541	86.0%
2016	34	32	166	94.1%	104	99	485	95.2%
2017	38	38	226	100.0%	97	85	475	87.6%

2018	33	29	157	87.9%	194	168	931	86.6%
2019	45	44	231	97.8%	146	139	767	95.2%
2020	59	55	387	93.2%	96	87	630	90.6%
5 yr average	**41.8**	**39.6**	**219**	**94.6%**	**127.4**	**115.6**	**648.8**	**91.0%**
10 yr average	**35.6**	**33.2**	**185**	**91.8%**	**87.4**	**79.3**	**445.7**	**91.8%**

Source: WPFMC (2021), McCracken and Cooper (2021)

In response to higher observed black-footed albatross interactions in the deep-set fishery since 2015, the Council has convened two workshops to explore the factors influencing the increase and to review seabird mitigation measures for the fishery. These efforts led to the trials of tori lines in the deep-set longline fishery, and is the focus of the current action. Additional details on these recent developments are described in Section 1.1 and the 2020 Annual SAFE Report (WPFMC 2021).

International status of both black-footed and Laysan albatross is monitored by the Agreement on the Conservation of Albatrosses and Petrels (ACAP), and currently black-footed albatross populations trends continue to be positive (increasing from 1995-2019) and Laysan albatross populations are stable (1982-2019) (ACAP 2021). The black-footed albatross population exhibits an increasing trend from 1996 to 2016, with a breeding population of approximately 69,969 pairs in 2017 (ACAP 2017). The Laysan albatross population was stable over the time period 1996 to 2016, with a breeding pair population of 666,658 pairs in 2017 (ACAP 2017). Both Hawaii longline fisheries have a low level of interactions with the black-footed and Laysan albatross species compared to the number of breeding pairs. Based on the population estimates, the fisheries likely have very little effect on these populations (NMFS 2018a).

The Council has explored the recent observed increase in interactions with seabirds in the Hawaii deep-set longline fishery. In November 2017, the Council convened a workshop to review recent increased albatross interactions in the Hawaii fishery; explore possible factors responsible for this increase; evaluate albatross population impacts; and provide input for future data collection, analysis, and models (WPFMC 2018a). 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 Hawaii longline fishery or is episodic (WPFMC 2018a). While reliable North Pacific-wide bycatch estimates are not available, available information on Alaska fisheries bycatch suggest that the 2015-2016 increase in black-footed albatross interactions is unlikely to be basin-wide (WPFMC 2018b). The full workshop report is not yet available.

NMFS consulted with the U.S. FWS on effects to endangered species from the Hawaii longline fisheries in a 2012 BiOp (U.S.FWS 2012). U.S. FWS considered that the deep-set fishery might affect short-tailed albatross and authorized the take of two short-tailed albatrosses, even though there were no documented interactions with this species. For purposes of analysis, U.S. FWS used the black-footed albatross as a proxy species, modeling annual take based on the average 2004-2010 rate of black-footed albatross interactions. U.S. FWS estimated 76.9 annual injuries and mortalities of black-footed albatrosses.

Accounting for a fall-off rate (seabirds present observed hooked during gear setting but not upon retrieval) of 31% (Gilman et al. 2003; Gilman et al. 2008), U.S. FWS converted the average interactions to a proportion of the overall black-footed albatross population. U.S. FWS adjusted this proportion for the short-tailed albatross population using the fraction of the short-tailed albatross range that overlaps with the Hawaii-based longline fishery and the most recent population assessment comparable to black-footed albatross data. The estimated take of short-tailed albatrosses based on historical data, scaled to the area of overlap between the species' range and the fishery, is 0.21 albatross per year or more than one (1.07) albatross over five years (U.S.FWS 2012). This is 0.0066 percent of the population (proportion of the population = 0.21/3181 = .000066).

U.S. FWS conducted a population viability analysis in 1999, which found that an annual loss of about 82 subadults and 12 adults would lead to eventual extinction of the species based on a population size at that time of 1,362 birds. The population had increased to 3,181 birds at the time of the 2012 BiOp, and the current total annual estimated loss of reproductive contribution due to adverse effects by US fisheries fell short of 94 birds (three birds over five years in Hawaii fisheries and three per year in Alaska). Based on this information, U.S. FWS concluded that the deep-set longline fishery in Hawaii may slow population growth of short-tailed albatross, but is not anticipated to jeopardize the continued existence of the species (U.S.FWS 2012). The fishery has not had an observed interaction with a short-tailed albatross.

3.2.6 Sea Turtles

All sea turtles, being air-breathers, are typically found closer to the surface, i.e., in the upper 100 m of the ocean's surface. Some turtles, however, are also susceptible to deep-set longlining because of deeper foraging behaviors. Sea turtles are vulnerable to longline fishing gear in the Hawaii deep-set longline fishery through hooking and entanglement. Other pelagic fisheries effects are primarily limited to the potential for collisions with sea turtles.

In addition to the BiOps listed in the previous section, more detailed information, including the range, abundance, status, and threats of the listed sea turtles, can be found in the status reviews, 5-year reviews, and recovery plans for each species on the NMFS species pages found at the following website: http://www.fpir.noaa.gov/PRD/prd_esa_section_4.html. This section describes the baseline status of the sea turtle populations that the proposed action may affect, to facilitate an analysis of the effects of the alternatives under consideration.

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for turtle interactions and injury if interactions occur. These measures include training and handling requirements for reducing the severity of interactions, the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually. Additionally, federal regulations require closure of the Hawaii shallow-set fishery once the fishery reaches loggerhead or leatherback hard cap limits and require the use of large circle hooks and mackerel-type fish bait when shallow-setting north of the Equator. As a non-regulatory measure, NMFS PIRO funds marine sea turtle management and recovery projects to contribute to recovery efforts for ESA-listed sea turtles. One of the priorities used for ranking and evaluating candidate proposals is projects that monitor and promote conservation of sea turtle aggregations that are relevant to populations with Pacific Islands Region connections due to commercial fishery interactions (NMFS 2014b).

After considering a range of potential effects to sea turtles, NMFS, in the 2014 BiOp as supplemented (2017) determined that the Hawaii deep-set longline fishery operating in accordance with the Pelagic FEP and implementing regulations, would not jeopardize the survival or recovery of any listed sea turtles. Within each BiOp's ITS, NMFS has exempted the ESA's prohibition on take for a certain level of interactions (incidental take) of species which the fishery may adversely affect for these fisheries.

Table 11 summarizes the fleet-wide sea turtle interaction estimates for the Hawaii deep-set longline fishery from 2010 through 2020.

Table 11. Annual sea turtles interactions (takes) expanded from observed data to fleet-wide estimates for the Hawaii deep-set longline fishery, 2010-2020.

	Sea Turtle Species				
Year	Green	Leatherback	N. Pacific Loggerhead	Olive Ridley	Unidentified hardshell
2010	1	6	6	10	0
2011	5	14	0	36	0
2012	0	6	0	34	0
2013	5	15	11	42	0
2014	16	38	0	50	0
2015	4	18	9	69	0
2016	5	15	7	162	5
2017	15	0	15	127	0
2018	15	10	5	88	0
2019	2	15	0	141	0
2020	2	26	20	72	0

Source: WPRFMC (2021).

On September 19, 2014, NMFS issued a no-jeopardy BiOp (2014 BiOp) for the deep-set longline fishery, which authorizes over a three-year period, the incidental take of green, leatherback, North Pacific loggerhead, and olive ridley sea turtles (NMFS 2014a). ITS for green, loggerhead and olive ridley turtles were subsequently exceeded, and NMFS issued a no-jeopardy supplemental BiOp (2017 BiOp) on March 24, 2017, exempted the ESA's prohibition on take of these species or DPSs over a three-year period. NMFS in its 2014 BiOp as supplemented (2017) concluded that the Hawaii deep-set longline fishery as managed under the Pelagic FEP is not likely to jeopardize the continued existence or recovery of any sea turtle species.

The new ITS for green turtle DPS's, olive ridley turtle populations and North Pacific DPS of loggerhead turtles in the supplement (2017) to the 2014 BiOp has a monitoring period starting in July 1, 2016. From July 2017 through July 2018, the NMFS Observer Program reported seven fishery interactions with green sea turtles. These interactions, when expanded to the unobserved fishery and applying a genetic proration of 0.70 percent for the East Pacific DPS, exceeds the ITS of 12 interactions for the East Pacific DPS. NMFS reinitiated ESA Section 7 consultation for the Hawaii deep-set longline fishery on October 4, 2018 (NMFS 2018a).

In the October 4, 2018, request for reinitiation of ESA Section 7 consultation on the operation of the Hawaii deep-set longline fishery, NMFS found that the continued operation of the deep-set longline fleet is likely to adversely affect the east Pacific, central North Pacific, east Indian-west Pacific, southwest Pacific, central west Pacific, and central South Pacific DPS of the green turtle, western Pacific population of the leatherback, North Pacific loggerhead DPS, and eastern and western Pacific populations of olive ridley sea turtles in the biological evaluation (BE) supporting reinitiation.

In order to estimate the potential effects of the operation of the Hawaii deep-set longline fleet on sea turtle species, NMFS estimated the annual interaction levels with 50, 80, and 95th percentile of the predicted distribution. NMFS conservatively used the 95th percentile value and estimated the Hawaii deep-set longline fishery could interact with up to 40 green, 43 leatherback, 28 loggerhead, and 179 olive ridley sea turtles in any given year. These predictions, generated by PIFSC using Bayesian data analysis methods appropriate for count data (McCracken 2019a), used observed interactions in the fishery from 2002-2017. The unidentified hardshell interactions in 2016 (**Table 11**) are accounted for proportionately amongst the green, loggerhead, and olive ridley 2016 interaction estimates. In the 2018 BE, we considered the number of green sea turtles likely to die from boat collisions and found the number of mortalities to be effectively zero (0.09) and therefore discountable (NMFS 2018a).

Using post-hooking mortality criteria described in Ryder et al. (2006), NMFS estimated that 91.6 percent of all green turtle, 40.7 percent of leatherback, 62.4 percent of loggerhead, and 93.9 percent of olive ridley interactions would result in mortality (NMFS 2018a). NMFS applied these post-hooking mortality rates to the interaction estimates to yield the annual number of mortalities that may occur for each affected sea turtle population from the continued operation of the deep-set longline fleet (**Table 12**). Because NMFS used the 95th percentile value, we would not expect this level of mortalities each year.

NMFS used methodologies appropriate for the available data to estimate interactions or mortalities for relevant populations of the sea turtle species. In order to estimate the interactions for each of the six green sea turtle DPS, NMFS allocated a portion of the conservative take estimate to each DPS in the same proportion present in historical observer samples attributed to each DPS. NMFS used the upper 95% confidence interval for each proportion to account for a small sample size of 14 turtles (NMFS 2018a). The proportion attributed to each DPS was rounded up to the nearest whole number to calculate the anticipated interactions for each green sea turtle DPS. The estimated take is 32 in the east Pacific, 18 in the central North Pacific, 12 in the east Indian-west Pacific, 10 each in the southwest Pacific and central South Pacific, and 8 in the central west Pacific DPS (NMFS 2018a).

NMFS expects almost all (95 percent) leatherback turtles directly affected by the operation of the fishery to belong to the western Pacific population with the remaining 5 percent attributed to the eastern Pacific population, based on genetic samples from 21 leatherbacks (NMFS 2018a). The North Pacific DPS is the only loggerhead DPS which has the potential to interact with the deep-set longline fishery (NMFS 2018a), so NMFS attributes all interactions and mortalities to this DPS.

For olive ridley sea turtles, NMFS estimated from genetic samples that 73 percent of the take occurs from the eastern Pacific DPS and 27 percent from the Western Pacific. NMFS used these proportions to attribute mortalities to the eastern and western Pacific DPSs. NMFS used the ratio from a sample size of 153 olive ridley turtles, which was substantially larger than the green turtle sample size. NMFS did not adjust the olive ridley DPS mortality estimates based on the upper 95% confidence interval. Table 8 shows interaction and mortality estimates for sea turtles.

In order to analyze the effect of sea turtle interactions at the population level, NMFS compares the number of turtles that are predicted to die from the operation of the deep-set longline fleet that would have otherwise be expected to reach breeding age (adult nesting equivalency or ANE) to the total number of breeding females in each population. Counts of adult females on nesting beaches are the only abundance data available for sea turtles. In order to calculate the ANE, three adjustment factors are required: 1) adult equivalence of juveniles (probability of juveniles naturally surviving to become adults), 2) ratio of females in the population (female to male sex ratio), and 3) probability that a turtle will die if it interacts with the fishery. Risk to the population is also expressed in the number of years it takes to kill the equivalent of one adult female in each DPS. Where breeding female abundance is not available for a population, DPS or nesting population, NMFS determines the population effects for the purposes of this EA based on the frequency of expected adult nester mortality.

Table 12 also shows the ANE, number of breeding females, proportion of nesting population where available, and years to kill the equivalent of one female in each turtle species, population, breeding population, or DPS. For more details on the process and rationale used to develop population level impacts, please see the 2014 BiOp as supplemented (2017) (NMFS 2014a; 2017) and biological evaluation prepared for the reinitiation (NMFS 2018a).

NMFS estimates that the fishery may kill between 0.001 percent (east Indian-west Pacific, southwest Pacific, and central west Pacific green turtle DPS) to 0.1 percent (western Pacific leatherback) of the population every year, with population impacts for the remaining nine sea turtle DPS falling in between. For context, a change in the population of 0.1% represents a change in the population growth rate (*r*) equivalent to 0.001; $r = 0.03$ is a typical growth rate for an increasing population. NMFS does not expect the fishery to cause more than a single adult female mortality ranging between every half year (for the north Pacific loggerhead DPS) to every 11 years (for the central west Pacific DPS) for green and loggerhead species. When considered at the population level for leatherbacks, NMFS does not expect adult female mortalities to occur greater than between once every four months and 4.5 years. No more than 13 (western Pacific DPS) and 35.7 (eastern Pacific DPS) olive ridley adult female mortalities are expected as a result of the fishery's operation every year, and the proportion of nester abundance remains low. The information indicates that for each sea turtle species, adult female mortalities associated with the estimated annual level of interactions do not substantially affect the population growth rate.

Under the 2014 BiOp as supplemented (2017), the overall population for each sea turtle species was expected to remain large enough to maintain genetic heterogeneity, broad demographic representation, and successful reproduction, and to retain the potential for recovery. This conclusion remains valid for the impacts of the Hawaii deep-set longline fleet on all species and DPS of sea turtles. On October 4, 2018, when NMFS reinitiated consultation on the deep-set longline fishery, NMFS also determined that the conduct of the fishery during the period of consultation will not violate ESA Sections 7(a)(2) and 7(d)); that is, the operation of the fishery will not result in making irreversible or irretrievable commitments of resources during the period of consultation that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative.

NMFS develops mitigation measures to minimize the potential effects of incidental take on populations of ESA-listed species through the ESA Section 7 consultation process. Additionally, NMFS modifies the operation of the fishery to avoid the likelihood of jeopardizing listed species or adversely modifying critical habitat. There is a low likelihood (5%) that NMFS has underestimated the level of annual fleet-wide interactions. There is also a low proportion of mortalities compared to the nesting population abundances that the conservation estimates represent for each year, and a low frequency of adult female mortalities expected from the conservative predictions. In addition, the management process designed to minimize adverse effects to listed species greatly reduces the annual effects of the operation of the Hawaii deep-set longline fishery on all sea turtle species.

Table 12. Sea turtle interactions, mortalities, and population level impacts in the Hawaii deep-set longline fleet.

DPS	Annual Interactions	Annual Mortalities	ANE	Nester abundance	Proportion of nesting population	Years to adult female mortality
Green	40	37				
East Pacific DPS	32	NA	0.4	20,112	0.00002	2.5
Central North Pacific DPS	18	NA	0.2	3,846	0.00005	5
East Indian-West Pacific DPS	12	NA	0.14	77,009	0.00001	7.14
Southwest Pacific DPS	10	NA	0.11	83,058	0.00001	9.09
Central West Pacific DPS	8	NA	0.09	6,518	0.00001	11.11
Central South Pacific DPS	10	NA	0.11	2,677	0.00004	9.09
Leatherback						
Western Pacific	41	17	3.04	2,750	0.00111	0.33
Eastern Pacific	3	1	0.22	1,000	NA	4.55
North Pacific Loggerhead DPS	28	18	1.77	8,632	0.00019	0.56
Olive Ridley						
Eastern Pacific DPS	132	124	35.7	1,000,000	0.00004	0.03
Western Pacific DPS	48	45	13.0	205,000	0.00006	0.08

Source: NMFS (2018a)

3.2.7 Marine Mammals

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

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

Detailed information on these species' geographic range, abundance, bycatch estimates, and status can be found in the most recent stock assessment reports (SARs), available online at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region. Additional, recent information may be found on the NMFS species pages found at: http://www.fpir.noaa.gov/PRD/prd_esa_section_4.html.

On September 8, 2016 (81 FR 62259), NMFS published a final rule to reclassify the humpback whale into 14 DPS under the ESA, of which four DPSs were listed as threatened or endangered. The remaining ten DPSs were not listed under the ESA, including the Hawaii DPS and the Oceania DPS, which occur in areas where the Hawaii and American Samoa longline fisheries operate, respectively. Based on research, observer, and logbook data, marine mammals not listed under the ESA that may occur in the region and that may be affected by the fisheries managed under the Pelagic FEP include the following species:

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

- Risso's dolphin (*Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Spinner dolphin (*Stenella longirostris*)
- Striped dolphin (*Stenella coeruleoalba*)

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

Marine mammals are primarily vulnerable to Hawaii deep-set longline fishery through hooking and entanglement. Although blue whales, North Pacific right whales, and sei whales occur within the action area and could potentially interact with the Pelagic FEP fisheries, fishermen and observers have not reported any incidental hooking or entanglements of these species in these fisheries. Other potential impacts to marine mammals from the operation of fisheries include collisions with vessels, exposure to waste and discharge, and disturbance from human activity and equipment.

The Council and NMFS manage the longline fisheries permitted under the Pelagic FEP through several measures that mitigate the potential for marine mammal interactions and injury if interactions occur. These measures include the requirement to carry an observer on a fishing trip if requested, and a requirement for owners and operators of longline vessels to attend a protected species education workshop annually on interaction mitigation techniques. Longline vessel owners and operators must post a NMFS-approved placard with marine mammal handling and/or release procedures in a conspicuous location on their vessels and crew must be supervised by the longline vessel operator during marine mammal handling and release procedures. In the Hawaii deep-set longline fishery, circle hooks must have a wire diameter not exceeding 4.5 mm and leaders and branch lines must have a diameter of 2.0 mm or larger if made of monofilament nylon or, if another material, have a breaking strength of at least 400 lb. These Hawaii deep-set longline fishery gear requirements are meant to allow marine mammals to straighten the hook and release themselves if accidentally hooked. All incidental mortality and injury of marine mammals during commercial fishery operations must be reported within 48 hours after the end of a fishing trip where mortality or injury occurs. Additionally, longline closed areas generally within 30 to 75 nm of each U.S. island archipelago serve as de facto protection for island-associated stocks of marine mammals.

After considering a range of potential effects to marine mammals, NMFS, in the 2014 BiOps as supplemented (2017) determined that the Hawaii deep-set longline fishery operating in accordance with the Pelagic FEP and implementing regulations would not jeopardize the survival or recovery of any listed marine mammals. Within the BiOp, NMFS has authorized a certain level of interactions (ITS) of species which the fishery may adversely affect through ITS for these fisheries. NMFS determined that incidental taking by the Hawaii longline fisheries will have a negligible impact on the affected stocks of marine mammals and subsequently issues its MMPA section 101(a)(5)(E) permit to fishermen.

Table 13 shows the fleet-wide marine mammal interaction estimates for the Hawaii deep-set longline fishery from 2009 through 2018.

Table 13. Estimated annual marine mammal interactions (including mortalities, and serious and non-serious injuries) with the Hawaii deep-set longline fishery from 2009-2018.

Species	2009	2010	2011	2012	2013	2014	2015	2016	2017[1]	2018[1]
Risso's dolphin	0	3	0	0	0	0	10	0	5	0
Short-finned pilot whale	0	0	0	0	4	0	4	0	0	0
False killer whale	55	19	10	15	22	55	21	35	39	59
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	4	0	0	0	4	0	0	0
Bottlenose dolphin	5	4	0	0	11	0	0	5	5	5
Pigmy killer whale	0	0	0	0	5	0	0	0	0	0
Kogia species	0	0	0	0	0	10	0	0	0	0
Humpback whale	0	0	0	0	0	5	0	0	0	0
Sperm whale	0	0	6	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	5	0	0	5	0	0
Unidentified cetacean[2]	0	0	10	10	10	10	5	10	20	20
Unidentified whale[2]	15	14	0	0	0	0	0	0	0	0
Unidentified dolphin[2]	0	0	0	0	0	0	5	0	0	0

[1]2017 and 2018 estimates expanded by multiplying observed interactions by 4.9 as there was 20.4% observer coverage in 2017 and 2018. Fractional estimates are rounded up to nearest whole number. Because preliminary observed interactions are reported by date of trip arrival and observer coverage rates are reported by date of trip departure, interaction data may vary from other sources.
[2]Unidentified species identification based on PIROP classifications. Unidentified cetacean species refers to a marine mammal not including pinnipeds (seal or sea lion); unidentified whale refers to a large whale; and unidentified dolphin refers to a small cetacean with a visible beak. Further classifications based on observer description, sketches, photos and videos may be available from PIFSC.
Source: WPFMC (2018b), NMFS (2019g)

NMFS monitors the effects of the fishery on non-ESA listed marine mammals through comparison of the average level of interactions which result in M&SI to a stock's potential biological removal (PBR). 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 U.S. EEZ around Hawaii is well below the PBR in the time period covered by the most current stock assessment report (Table 14).

Table 14. Mean estimated annual M&SI and PBR by marine mammal stocks with observed interactions in the Hawaii deep-set longline fishery.

Stock	Years Included in Draft 2020 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	2014-2018	2.2	0	undetermined
Pantropical spotted dolphin, HI Pelagic	2014-2018	0	0	265
Rough-toothed dolphin, HI	2014-2018	1.0	0	548
Risso's dolphin, HI	2014-2018	2.9	0	61
Striped dolphin, HI	2014-2018	0.4	0	291

Blainville's beaked whale, HI	2014-2018	0	0	5.6
False killer whale, MHI Insular	2014-2018	N/A	0.2	0.3
False killer whale, HI Pelagic	2014-2018	28.8	6.5	16
False killer whale, NWHI	2014-2018	N/A	0.01	1.4
False killer whale, Palmyra Atoll	2006-2010	N/A	0.3	6.4
Kogia spp. whale (Pygmy or dwarf sperm whale), HI	2014-2018	Pygmy = 0 Dwarf = 0	Pygmy = 0 Dwarf = 0	Pygmy = 257 Dwarf = undetermined
Pygmy killer whale, HI	2014-2018	0	1.1	56
Short-finned pilot whale, HI	2014-2018	1.4	0.9	87
Humpback whale, Central North Pacific	2014-2018[d]	0.9		83[c]
Sperm whale, HI	2014-2018	0	0	18

[a] PBR estimates are not available for portions of the stock outside of the U.S. EEZ around Hawaii, 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 Hawaii.
[c] PBR for the Central North Pacific stock for humpback whales apply to the entire stock.
[d] 2019 SAR.
Source: WPRFMC (2021)

False killer whales have interacted with deep-set longline gear more than other marine mammal species and NMFS has implemented changes to the operations of the fishery based on the recommendations of the False Killer Whale Take Reduction Team to reduce incidental interactions. The mitigation requirements include the use of circle hooks, as well as leader and branch lines of specific sizes or breaking strengths as described previously, a permanently closed area around the main Hawaiian Islands, and an EEZ interaction limit, which, when reached, triggers a southern longline fishing exclusion zone (see 50 CFR 229.37). This interaction limit (two observed false killer whale serious injuries or mortalities within the U.S EEZ around Hawaii in a calendar year) was reached in 2018, triggering a temporary closure of the Southern Exclusion zone (SEZ), an area in the EEZ south of Hawaii, to deep-set longline fishing for the remainder of 2018 (83 FR 33484, July 18, 2018). The SEZ was again opened on January 1, 2019 but two additional false killer whales were hooked in January 2019 (January 10 and January 15, 2019) and the SEZ was again closed effective February 22, 2019 (84 FR 5356) as this met the established trigger in the subsequent calendar year following an SEZ closure. The SEZ was reopened on August 25, 2020 as criteria iv in the False Killer Whale Take Reduction Plan regulations at 50 CFR 229.37(e)(5), the incidental M/SI within remaining open areas of the EEZ around Hawaii for the five most recent years was determined to be below the PBR level for the Hawaii Pelagic stock of false killer whales, was met. On December 15, 2020, NMFS published a new SEZ trigger of four observed false killer whale serious injuries or mortalities within the U.S EEZ around Hawaii in a calendar year (85 FR 81184). Readers seeking more information may read the 2012 Take Reduction Plan (77 FR 1260).

3.2.8 Sharks and Rays

ESA-listed shark or ray (elasmobranch) species that have been observed or may occur in the area where Pelagic FEP fisheries operate include the scalloped hammerhead shark, oceanic whitetip shark, and giant manta ray. Sharks and rays are vulnerable to longline fisheries through hooking and entanglement. Additional information on oceanic whitetip sharks is in Section 3.1.10.

Table 15 shows the fleet-wide interaction estimates for the Hawaii deep-set longline fishery with ESA-listed sharks and rays from 2010-2020.

Table 15. Estimated total ESA-listed shark and ray interactions with the Hawaii deep-set longline fishery for 2010-2019.

Year	Scalloped Hammerhead	Oceanic Whitetip	Giant Manta Ray
2010	0	1,198	95
2011	0	1,176	5
2012	0	878	11
2013	0	973	5
2014	0	1,670	11
2015	0	2,654	10
2016	0	2,188	22
2017	0	1,257	0
2018	0	1,092	3
2019	0	2,125	0
2020	0	1,980	7

Source: WPRFMC (2021)

Scalloped hammerhead shark

Scalloped hammerhead shark interactions in the Hawaii deep-set fishery are rare, unpredictable events. Between 2004 and 2010, there were three observed interactions with scalloped hammerhead sharks in the Hawaii deep-set fishery in the area of the threatened Indo-West Pacific DPS (NMFS 2014a) with no observed interactions since 2010. NMFS has no records of any interactions with scalloped hammerhead sharks from the Eastern Pacific DPS (NMFS Observer Program, unpublished data). NMFS in its no-jeopardy 2014 BiOp authorized the take of six Indo-West Pacific scalloped hammerhead sharks, with up to three mortalities over a three year period (NMFS 2014a).

In the request for reinitiation of ESA Section 7 consultation for the Hawaii deep-set longline fishery, NMFS estimated that there could be up to 5 interactions with scalloped hammerhead sharks annually in the fishery. At a 65.7% post-release survival rate, we anticipate that 4 (5 x 0.657 = 3.2, rounded to 4) of the 5 sharks would be released alive while one would be released dead (NMFS 2018a). Based on a population estimate of 11,280 adults, NMFS estimates one annual mortality represents 0.009% (1/11,280*100=0.00886) of the population. In the 2014 BiOp, NMFS determined the number of takes of scalloped hammerhead sharks associated with the operation of the fishery are not expected to cause an appreciable reduction in the likelihood of both the survival and recovery of the DPS (NMFS 2014a). In its 2018 BE, NMFS considered the fishery's the small level of take on the Indo-West Pacific scalloped hammerhead shark DPS from the Hawaii deep-set longline fishing operations to be negligible (NMFS 2018a).

Oceanic whitetip shark

Consultation for the oceanic whitetip shark and giant manta ray were included in the ongoing consultation reinitiated on October 4, 2018 (NMFS 2018a). In that reinitiation request, NMFS estimated the fishery could interact with a mean of 1,708 and up to 3,185 oceanic white tips sharks in any given year (NMFS 2018a).

The current stock assessment for the WCPO oceanic whitetip shark stock (Tremblay-Boyer et al. 2019) estimated median current spawning biomass of oceanic whitetip sharks in the WCPO to be 393 t, about 4% of the unfished biomass, and current catch at 2,464 t annually. Based on the most recent assessment, the median estimate of the total size of the oceanic whitetip shark in the WCPO stock is about 775,000 individuals (NMFS 2020b). At an average 76.9% post-release survival rate, NMFS estimates that the anticipated level of interactions in any given year of equal to or less than 3,185 oceanic whitetip sharks represents 735 mortalities or about 0.09% (735/775,000*100) of the estimated number of individuals in the WCPO (NMFS 2020b). Population estimates of oceanic whitetip sharks in the EPO are unavailable, and thus this population-level impact is a conservative estimate. NMFS determined in its 2018 BE that, based on this information, the small proportion of the oceanic whitetip shark population that is in the fishing area, and the high proportion of sharks released alive, the Hawaii deep-set longline fishery may affect but is not likely to jeopardize continued existence of the oceanic whitetip shark population, but because the stock remains overfished and subject to overfishing, additional management is needed.

Giant manta ray

NMFS (2018a) estimates that the anticipated level of interactions for giant manta rays in any given year is equal to or less than 84 and would lead to 6 giant manta ray mortalities, based on a 92.7% post-release survival rate. The anticipated level of interactions include a proportion of rays identified as “unidentified ray” and “manta/mobula,” and thus the anticipated annual number of giant manta ray interactions is potentially high. As described for oceanic whitetip shark, the upper bound values are based on the 95th percentile of the predicted distribution generated by PIFSC using Bayesian data analysis methods appropriate for count data (McCracken 2019a). From October 2018 to December 2020, there was one reported interaction, suggesting that fleet wide interactions with giant manta ray have been well under the anticipated level.

There are no historical or current global abundance estimates or stock assessments for giant manta rays. Most estimates of subpopulations are based on anecdotal observations, and range from around 100-1,500 (Miller and Klimovich 2016). Little information is available on the abundance of giant manta rays in the high seas area in the central north Pacific where the Hawaii deep-set longline fishery operates. Nevertheless, the 2016 NMFS Status Review Report for the giant manta ray concluded that the incidental catch of this species in U.S. longline fisheries are likely to be having minimal effects on the population (Miller and Klimovich 2016). NMFS determined in its 2018 BE that, based on low recent interactions and the high likelihood that giant manta rays will be released alive when captured in this fishery, the fishing may affect but will not jeopardize the continued survival of the giant manta ray population.

3.3 Socioeconomic Setting

The socioeconomic setting for the Hawaii deep-set longline fishery is described below. A more detailed description of the fishery and the latest socio-economic statistics can be found in the Pelagic FEP Annual SAFE Reports at: http://www.wpcouncil.org/annual-reports/.

Longline is a type of fishing gear consisting of a mainline that exceeds 1 nm (6,076 ft) in length that is suspended horizontally in the water column, from which branch lines with hooks are attached. Longline deployment is referred to as “setting,” and the gear, once deployed, is referred to as a “set.” Sets are normally left drifting for several hours before they are retrieved, along with any catch. In deep-set longline fishing, the gear is configured so that hooks fall below 100 m to target deeper-dwelling tunas.

Domestic longline fishing around Hawaii consists of the shallow-set sector and the deep-set sector, subject to separate mitigation measures based on the characteristics of the fishing activity. The deep-set fishery targets bigeye tuna in the EEZ around Hawaii and on the high seas at an average target depth of 167 m (WPFMC 2009a). The shallow-set fishery targets swordfish to the north of the Hawaiian Islands. NMFS and the Council manage the fisheries under a single limited-access permit program. Some Hawaii-permitted vessels also hold American Samoa longline permits. The number of dual-permitted vessels has ranged between 17 and 26 over the last five years (NMFS unpublished data). Dual-permitted vessels land their catch in Hawaii or American Samoa.

The deep-set fishery operates in the deep, pelagic waters around the Hawaiian archipelago and on the high seas throughout the year, mostly within 300-400 nm (556-741 km) of the MHI. However, federal regulations and other applicable laws prohibit longline fishing inside the 200 nm U.S. EEZ around the Northwestern Hawaiian Islands. Longline fishing within 50 to 75 nm from the shoreline in the MHI is prohibited to minimize the potential for gear conflicts with small boat fisheries and interactions with protected species.

Federal regulations can temporarily prohibit longline fishing in the Southern Exclusion Zone (SEZ), an area in the EEZ south of Hawaii (see 50 CFR 229.37). An SEZ closure is triggered under regulations implementing the False Killer Whale Take Reduction Plan if there are four or more observed serious injuries or mortalities of false killer whales in the EEZ around Hawaii in a given year. As described in Section 3.2.7, the SEZ was closed to deep-set longline fishing between July 18 – December 31, 2018 and February 22, 2019 – August 25, 2020.

Some limited longline fishing occurred in the U.S. EEZ around the PRIA of Kingman Reef and Palmyra Atoll (5° N) prior to 2016. Figure 4 shows the distribution of fishing effort by the Hawaii deep-set longline fleet as the annual average number of hooks per 5 degree square in millions of hooks over 2019. The distribution of fishing operations over the fishing grounds varies seasonally and from year-to-year (Figure 4).

In general, deep-set longline vessels operate out of Hawaii ports, with the vast majority based in Honolulu. Infrequently, deep-set trips originate from other ports such as Long Beach or San Francisco, California, or Pago Pago, American Samoa, and then fishermen land their catches in Hawaii. Fishermen departing from California begin fishing on the high seas, outside the EEZ.

Fishermen departing from American Samoa usually begin fishing near the Equator or farther north where they expect higher catch rates of bigeye tuna.

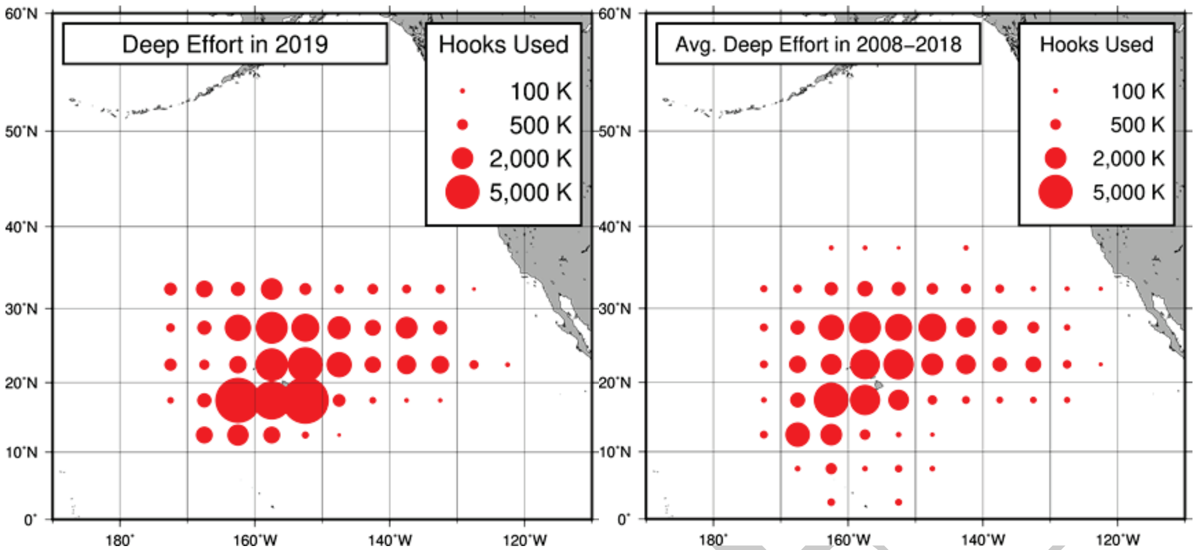

Figure 4. Distribution of deep-set fishing effort (hooks deployed) in 2019 (left panel) and for the 2008-2018 period (right panel). Source: R. Ito report to Council, March 2020.

Fishing effort in the Hawaii deep-set longline fishery has increased over the years. From 2004-2012, the annual number of vessels that participated in the deep-set fishery remained relatively stable, ranging from 124 to 129. The number of active vessels has increased since 2012, with an average of 145 vessels operating over the last five years (2016-2020). In 2020, 146 deep-set longline vessels made 1,644 trips with 20,785 sets and deployed 59.7 million hooks (Table 16).

Table 16. Number of active longline vessels and fishing effort in the Hawaii deep-set fishery, 2010-2020.

Year	Vessels making deep-sets	Deep-set fishing effort (millions of hooks)	Deep-set fishing effort (trips)	Deep-set fishing effort (sets)
2010	122	37.2	1,206	16,075
2011	129	40.8	1,308	17,192
2012	128	44.1	1,361	18,115
2013	135	46.9	1,383	18,754
2014	139	45.6	1,350	17,777
2015	142	47.5	1,447	18,470
2016	142	51.1	1,480	19,391
2017	145	53.6	1,539	19,674
2018	143	58.6	1,643	21,012
2019	150	63.2	1,724	22,513
2020	146	59.7	1,644	20,785

Source: WPFMC (2021)

In 2020, Hawaii-based deep-set longline vessels landed approximately 27.1 million pounds of pelagic fish valued at $71.5 million, with revenue declining about 24% from $94.3 million in 2019 (Table 17). Average price per pound of pelagic species also declined by $0.14 from 2019 to 2020 while total pelagic fishery ex-vessel revenue declined from $107.2 million to $80.2 million. Given that 2020 had strong temporary economic impacts on prices and demand due to COVID-19 restrictions in Hawaii and elsewhere in the U.S. and worldwide, the decline in average price per pound of pelagic species on an annual basis masks short term price drops for bigeye tuna and other species of as much as 75% in the months following March 2020 (WCPFC 2021). The average catch of pelagic species in the Hawaii deep-set longline fishery over 2011-2020 was 28.51million pounds valued at $94.4 million in inflation-adjusted dollars (WPFMC 2021).

Table 17. Hawaii commercial pelagic catch, revenue, and average price by fishery, 2019-2020.

	2019			2020		
Fishery	Catch (1,000 lbs)	Ex-vessel revenue ($1,000)	Average price ($/lb)	Catch (1,000 lbs)	Ex-vessel revenue ($1,000)	Average price ($/lb)
Deep-set longline	31,865	$94,322	$3.15	27,061	$71,503	$3.01
Shallow-set longline	829	$1,972	$3.07	838	$1,293	$3.68
MHI trolling	2,479	$7,331	$3.57	1,486	$4,245	$3.35
MHI handline	687	$2,196	$3.59	579	$1,882	$3.39
Offshore handline	477	$1,037	$2.57	326	$959	$2.56
Other gear	132	$352	$3.10	110	$121	$2.86
Total	**36,468**	**$107,210**	**$3.18**	**30,399**	**$80,221**	**$3.04**

Source: WPFMC (2021)

3.4 Management Setting

The deep-set and shallow-set longline fisheries are managed under a single limited access fishery with a maximum of 164 vessel permits. The deep-set fishery is monitored at approximately 20% observer coverage. All Hawaii permitted vessels are required to provide 72-hour advance notification prior to leaving port on a fishing trip to declare trip type (shallow-setting or deep-setting) and to receive observer placement. Vessels may not switch gear type during a trip once a trip is declared and underway. NOAA Office of Law Enforcement (NOAA OLE) and U.S. Coast Guard (USCG) enforce these regulations for all Hawaii permitted vessels. A summary of current management requirements are as follows:

Fishing Permits and Certificates Required (on board each fishing vessel)

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

Reporting, Monitoring, and Gear Identification

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

Notification Requirement and Observer Placement

- Notify NMFS before departure on a fishing trip to declare the trip type (shallow-set or deep-set).
- Each fishing trip is required to have a fishery observer on board if requested by NMFS; NMFS places observers on every shallow-set longline trip, resulting in 100% coverage, and approximately 20% coverage on deep-set trips.
- Fisheries observer guidelines are used.

Prohibited Areas in Hawaii

- NWHI Longline Protected Species Zone.
- MHI Longline Fishing Prohibited Area.
- Papahanaumokuakea Marine National Monument: Prohibited commercial in the Monument, which has boundaries that align with the NWHI Longline Protected Species Zone.

Protected Species Workshop (PSW)

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

Sea Turtle, Seabird, and Shark Handling and Mitigation Measures

- Vessel owners and operators are required to adhere to regulations for safe handling and release of sea turtles and seabirds.
- Vessel owners and operators must have on board the vessel all required turtle handling/dehooking gear specified in regulations.
- Vessel owners and operators can choose between side setting and stern setting, with additional requirements to reduce seabird interactions when deep-set longline fishing north of 23° North.
- When shallow-set longline fishing north of the Equator:
  - Use 18/0 or larger circle hooks with no more than 10° offset.
  - Use mackerel-type bait.
  - Set at night for stern set vessels.

- Vessel owners, operators, and crew are required to release any oceanic whitetip shark or silky shark and take reasonable steps for its safe release.

Marine Mammal Handling and Release

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

Unless otherwise noted, the above regulations are at 50 CFR Part 665. A summary of regulations for Hawaii longline fisheries (shallow-set and deep-set combined) is provided by the Summary of Hawaii Longline Fishing Regulations (NMFS 2018c). A detailed description of the management setting for the deep-set fishery can also be found in the Pelagic FEP (WPFMC 2009a). Current seabird mitigaion meausres applicable to the Hawaii deep-set longline fishery are described in section 1.1.1.

NMFS also conducts management activities relevant to managing the longline fisheries as a whole. These include the ESA listing process, the ESA consultation process, and conducting status reviews and recovery planning under the ESA. NMFS also manages the Hawaii longline fishery through a take reduction team to reduce interactions with false killer whales. This management processes would continue under the proposed action without change.

3.4.1 Seabird Mitigation Measures under the Regional Fishery Management Organizations

The Western and Central Pacific Fisheries Commission (WCPFC) and the Inter-American Tropical Tuna Commission (IATTC) have adopted measures to mitigate seabird bycatch in longline fisheries. Both commissions have adopted a “menu approach” whereby vessels may choose measures from two columns, and in the North Pacific, both commissions require measures to be applied north of 23°N.

WCPFC’s Conservation and Management Measure (CMM) 2018-03 have separate requirements by the overall length of vessels. Vessels equal to or greater than 24 meters are required to use at least two mitigation methods from , with at least one from column A, and vessels that are less than 24 m in length are required to use at least one mitigation method from column A in . IATTC’s Resolution C-11-02 applies to longline vessels greater than 20 m in overall length. The resolution requires longline vessels to use at least two mitigation methods listed in , with at least one coming from column A, but not using the same measure from Column A and Column B.

Table 18. Seabird Mitigation Measure Table in WCPFC CMM 2018-03.

Column A	Column B
Side setting with a bird curtain and weighted branch lines[1]	Tori line[2]
Night setting	Blue-dyed bait
Tori line	Deep setting line shooter

Weighted branch lines	Management of offal discharge
Hook-shielding devices[3]	

[1] If using side setting with a bird curtain and weighted branch lines from Column A, this will be counted as two mitigation measures
[2] If a tori line is selected from both Column A and Column B, this equates to simultaneously using two (i.e. paired) tori lines.
[3] Hook-shielding devices can be used as a stand-alone measure.

Table 19. Seabird Mitigation Measure Table in IATTC Resolution C-11-02.

Column A	Column B
Side-setting with bird curtains and weighted branch lines[1]	Tori line[2]
Night setting with minimum deck lighting	Weighted branch lines
Tori line	Blue-dyed bait
Weighted branch lines	Deep-setting line shooter
	Underwater setting chute
	Management of offal discharge

[1] This measure can only be applied in the area north of 23° N until research establishes the utility of this measure in waters south of 30° S. If using side setting with a bird curtain and weighted branch lines from Column A, this will be counted as two mitigation measures.
[2] If a tori line is selected from both Column A and Column B, this equates to simultaneously using two (i.e. paired) tori lines.

3.5 Resources Eliminated from Detailed Study

There are presently no known districts, sites, highways, cultural resources, structures or objects listed in or eligible for listing in the National Register of Historic Places in the EEZ around Hawaii or in adjacent areas of the high seas in international waters where pelagic longline fishing activities are conducted. Additionally, longline fishing activities are not known to result in adverse effects to scientific, historic, archeological or cultural resources because fishing activities occur generally miles offshore. Shipwrecks would be the only known cultural objects potentially within the affected environment. The location of most shipwrecks is unknown. However, longline fishing operations do not come into contact with the seafloor, so the deep-set fishery would not be expected to affect any material from shipwrecks, embedded in the ocean bottom. Therefore, the proposed action is not likely to affect historic resources.

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

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

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

4 ENVIRONMENTAL EFFECTS OF THE ALTERNATIVES

This chapter describes the potential environmental consequences that could result from the Alternatives considered. The analysis relies on the information described in Chapter 3 as the baseline to evaluate the impacts of the management alternatives considered herein. The environmental resources that are potentially affected include the following: target and non-target species (including bycatch), protected resources, socioeconomic setting and management setting. A summary of potential effects is presented in Table 22.

4.1 Potential Effects of Alternative 1: No Action (Status Quo)

Under Alternative 1, the No Action Alternative, the Council would not recommend changes to management measures intended to mitigate seabird interactions in the Hawaii deep-set longline fishery. All existing measures to mitigate interactions with seabirds would be maintained, including blue-dyed bait and strategic offal discards, and no new measures would be required. Given the existing status quo trends, BFAL and LAAL albatross interactions would be expected to remain at the higher levels observed since 2015 as no changes would be made to improve the effectiveness of the required mitigation measures. Additionally, NMFS would continue to experience administrative burden to monitor and enforce the blue-dye bait and strategic offal discard measures, both of which require observer program staff resources to consistently review and provide information on potential violations to the NOAA Office of Law Enforcement. The Hawaii deep-set longline fishery's effort, target and non-target catch, and other protected species interactions would be expected to remain similar to the historical baseline under Alternative 1.

Therefore, this alternative does not meet our any element of our stated purpose to minimize seabird bycatch mortality to the extent practicable as required under National Standard 9, reflect the results of the recent cooperative research and relieve cost and time burdens associated with less effective mitigation measures.

4.1.1 Effects on Physical Resources

There are no known significant impacts to air quality, noise, water quality, view planes or terrestrial resources from past or current seabird mitigation measures under the no action alternative. The current suite of measures in place was determined to not have significant impacts prior to their respective and collective regulatory adoption.

4.1.2 Effects on Biological Resources

The requirements for owners and operators of Hawaii deep-set longline vessels to use seabird mitigation techniques will continue to apply when fishing north of 23°N. An analysis of observer data indicates that seabird interaction rates north of 23°N are an order of magnitude higher than to the south (Gilman et al. 2016) even with the presence of required seabird mitigation measures, and no new information is available that suggest additional protections are warranted to the south. Additionally, owners and operators of all Hawaii longline vessels will continue to be required to follow existing seabird handling and release requirements (50 CFR 665.815(b)-(c)) regardless of where they fish to maximize the chances of post-release survival of any seabirds that are caught alive, as well as attend and be certified for completion of an annual protected species workshop conducted by NMFS (50 CFR 665.814).

This alternative would not implement any changes to improve the mitigation efficacy of seabird measures for the Hawaii deep-set longline fishery. Under Alternative 1, BFAL and LAAL albatross interactions would be expected to remain at higher levels observed since 2015 as no changes would be made to improve the effectiveness of the required mitigation measures. The Hawaii deep-set longline fishery's other protected species interaction would be expected to remain similar to the historical baseline under Alternative 1.

Therefore, this alternative does not meet our stated purpose to minimize seabird bycatch mortality to the extent practicable as required under National Standard 9 and reflect the results of the recent cooperative research.

4.1.3 Effects on Socioeconomic Setting

Under Alternative 1, there would be no operational change required in any of the longline vessels operating under the Pelagic FEP, and the socioeconomic setting, including the cost and revenue for each fishery, is expected to remain at similar levels as the baseline described in Section 3.3. As described in Section 2.2.1, the no action alternative assumes that the Hawaii deep-set longline fishery would continue to be managed under the existing seabird mitigation measures under the Pelagic FEP, and fishery participants would be required to use blue-dyed bait and strategic offal discards when stern-setting north of 23°N. Current annual estimated cost of dying bait blue is approximately $334 per stern-setting vessel, based on the cost of blue-dye at $5 per set, and average DSLL vessel annual effort of 68.6 sets north of 23°N (Table 20). There is minimal direct cost associated with the strategic offal discharge requirement. This alternative would not implement any measures to improve the operational practicality and mitigation efficacy of seabird measures for the Hawaii deep-set longline fishery.

Table 20. Estimated annual cost of blue-dye per vessel in the Hawaii deep-set longline fishery.

Item	Value	Data source
Price per 1lb box of blue-dye	$38.95	*Personal communication,* Pacific Ocean Producers, October 13, 2021
Number sets dyed per 1lb box of blue-dye	8 sets	*Personal communication,* Pacific Ocean Producers, October 26, 2021
Blue-dye cost per set	$4.87	
Average effort per vessel per year (2016-2020)	142 sets	2020 SAFE report (WPRFMC 2021)

Proportion of DSLL fleet effort north of 23N (average of 2016-2020)	0.483	Unpublished observer data
Estimated annual per vessel effort north of 23 N	68.6 sets	
Cost of blue-dye per vessel per year	**$333.93**	

4.1.4 Effects on Management Setting

None of the alternatives, including this no action Alternative, are anticipated to adversely impact the marine habitat, particularly critical habitat, essential fish habitat, habitat areas of particular concern, marine protected areas, marine sanctuaries, or marine monuments. The Hawaii deep-set longline fishery is not known to have large adverse impacts to habitats, thus none of the Alternatives are likely to lead to substantial physical, chemical, or biological alterations to the habitat. Fishing activity would not occur in identified critical habitat, so no critical habitat would be impacted by the alternatives considered. Longline fishing does not occur in marine protected areas, marine sanctuaries or marine monuments.

The requirements for owners and operators of Hawaii deep-set longline vessels to use seabird mitigation techniques will continue to apply when fishing north of 23°N.

NMFS would continue to monitor the Hawaii deep-set longline fishery under statistically reliable observer coverage. The deep-set fishery has had consistent coverage exceeding 20% of all trips since 2001, with the exception of 2020, when COVID-19 restrictions resulted in a reduced annual coverage of approximately 15%. NMFS collects data on seabird interactions (e.g., species, capture/release condition) as well as seabird mitigation measures used.

Table 21. NOAA Office of Law Enforcement Offal and Blue Dye Enforcement Actions, 2009-2020.

Type of Action	Cases
Monetary Penalties	18
Warnings	5
Compliance Assistance Provided	34
Lack of Evidence, Unfounded, Other	23
Total Fines Assessed	$54,750

Under this alternative, NMFS would continue to experience administrative burdens associated with monitoring and enforcing the blue-dye bait and strategic offal discard measures. Both of these measures require observer program staff resources to consistently review and provide information on potential violations to the NOAA Office of Law Enforcement. In particular, the existing regulations that requires offal to be strategically discharged "when seabirds are present" creates monitoring and compliance challenges, because seabirds present in the vicinity of the fishing vessel triggers the discharge requirement while crew may not spot all seabirds present if they are focused on the fishing operation occurring on or immediately around the vessel. Table 21 provides a summary of the enforcement actions related to the strategic offal discard and blue-dyed bait requirement in the Hawaii longline fishery over the 2009-2020 period. This level of administrative burden is expected to remain under the no action alternative.

Therefore, this alternative does not meet our stated purpose which includes consideration of the results from recent cooperative research and relieving cost and time burdens associated with any less effective mitigation measures.

4.2 Potential Effects of Alternative 2 (Council preliminary preferred) and Alternative 3:

The analysis for the subsections of this chapter presents the effects of both alternatives. Given their large similarity, many of the subsections below uniformly present effects. When different effects resulted during analysis effects are documented separately. The latter instance only occurs in the management setting effects analysis presented in subsection 4.2.4.

The distinct difference between these two alternatives is whether the updated offal discard management measure would be implemented through a non-regulatory best practices training (Alternative 2) or a regulatory requirement (Alternative 3). Otherwise, all other elements between these action alternatives remain consistent, i.e., the removal of blue-dyed and addition of the tori line requirement.

Alternative 2 and Alternative 3 are as follows:

Under Alternative 2, seabird mitigation measures for the Hawaii deep-set longline vessel owners and operators that stern-set would be modified as listed in (Table 4):

- Replace existing requirements to use blue-dyed thawed bait and strategically discharge offal (fish, fish parts, of spent bait) with a new requirement to use a tori line during the setting operation; and
- As a non-regulatory measure, include best practices training on offal management as part of the annual protected species workshop that is already required for Hawaii longline vessel owners and operators.

Under Alternative 3, seabird mitigation measures for the Hawaii deep-set longline vessel owners and operators that stern-set would be modified as follows (Table 5):

- Replace existing requirement to use blue-dyed thawed bait with a new requirement to use a tori line during the setting operation; and
- Modify the existing requirement for strategic discharge offal (fish, fish parts, of spent bait) to an offal management requirement as follows:
    - Prohibit offal discard during set; and
    - Refine haul requirement to discharge offal (fish, fish parts, spent bait) on opposite side from where gear is hauled when "any seabirds are actively pursuing baited hooks"

Neither alternative would modify the other existing seabird mitigation requirements for deep-set vessels that stern-set (i.e., weighted branch lines and line shooter).

Alternative 2 would tailor the regulatory and related administrative burdens in an optimal way by implementing the offal management measures as a non-regulatory suite of measures linked to a regulatory requirement- the annual protected species workshop. For offal, this approach would afford increased management flexibility and adaptability. Alternative 2 would require updates to the protected species workshop content to reflect the offal measures.

Alternative 3 would maintain offal management measures in the regulations, maintaining current regulatory burdens for both enforcement and observer data collection. This approach is much less flexible and adaptable than Alternative 2 as the measures would be prescribed in regulation.

Both alternatives would require updates to the protected species workshop content to reflect the offal measures. Both of these alternatives meet the stated action purpose that includes minimizing seabird bycatch mortality to the extent practicable as required under National Standard 9, reflecting the results of the recent cooperative research and relieving cost and time burdens associated with less effective mitigation measures. Action Alternative 2 would also optimize the related enforcement requirements analyzed within the management setting effects analysis section. The observer data collection and enforcement burdens associated with the updated offal discard management measure are either optimized, or remain burdensome depending on these two alternatives based on their associated implementation strategies.

4.2.1 Effects on Physical Resources

With respect to the physical resources, the effects analysis for the proposed suite of measures is consistent for both alternatives. There are no known significant impacts to air quality, noise, water quality, view planes or terrestrial resources from both of these action alternatives. These measures would all occur at sea, disconnected from land and any public view planes and outside of the marine environment, thus no concerns nor impacts are anticipated to these physical environment features. Being that the blue-dye currently entering the marine environment use to is food grade, removing this management measure is anticipated to have a null impact for the marine environment. Furthermore, these proposed measures were operationally tested during the Tori Line Cooperative Research Project detailed in Section 1.1.4 of this document. No unanticipated effects on physical resources were observed during that effort.

4.2.2 Effects on Biological Resources

With respect to the biological resources, the effects analysis for the proposed suite of measures is consistent for both alternatives.

Seabirds

In response to higher observed black-footed albatross interactions in the deep-set fishery since 2015 (Table 10), the Council has convened two workshops to explore the factors influencing the increase and to review seabird mitigation measures for the fishery. These efforts led to the trials of tori lines in the deep-set longline fishery, and is the focus of the current action. Additional details on these recent developments are described in Section 1.1 and the 2020 Annual SAFE Report (WPFMC 2021).

The Tori Line Cooperative Research Project detailed in Section 1.1.4 provides robust scientific evidence that tori lines are significantly more effective in mitigating seabird interactions in the DSLL than the existing blue dye bait measure. The results showed that that albatross attempts and contacts are 4 times less likely, and captures 14 times less likely on tori line sets compared to blue dyed bait sets (Chaloupka et al. 2021). The reduction in capture was estimated based on a limited number of recorded captures during the study, with no seabirds captured on sets using tori lines, and thus the actual extent of reduction in albatross captures under Alternative 2 may vary from the experimental results. However, the 2021 study provides a robust scientific basis indicating that replacing blue-dyed bait with tori lines in the Hawaii deep-set longline fishery would have a significant reduction in albatross attempts and contacts on bait and associated captures.

These alternatives would replace the less effective existing requirement to use blue-dyed thawed bait with a new requirement to use a tori line during the setting operation. Given the results of the Tori Line Cooperative Project, this action would further minimize seabird interactions in the DSLL fishery. Contacts were 4 times less likely and captures were shown to be 14 times less likely which suggests a significant decrease in seabird interaction with either of these alternatives.

The difference between the alternatives is whether the updated offal management measure would be implemented through a non-regulatory best practices training (Alternative 2) or a regulatory requirement (Alternative 3). This difference is not expected to significantly affect seabird capture risk because the recommended best practices for offal management would be consistent with deep-set longline fishery's operational practice, especially during the setting operations when seabird capture risk is higher due to the temporal overlap with albatross foraging. Specifically, in the absence of a requirement to strategically discharge offal during setting operations, fishery participants are not likely to retain offal and spent bait from hauling operations, and there would be no offal or spent bait available during setting operations to discharge.

Other Protected Species, Target, and Non-target Fish Species

Blue-dyed bait compared to untreated bait have been shown to have no significant effects on target and non-target fish and shark catch rates (Yokota et al. 2009). Additionally, bait color is not known to affect sea turtle capture rates (Swimmer et al. 2005; Yokota et al. 2009) or other protected species.

Tori lines are not expected to affect target, non-target, and protected species catch rate (other than seabirds), as the tori line is used at the surface at the time of setting operations and do not affect the gear soak. There may be minor beneficial effects on catch rates of target and other retained catch if bait retention on hooks are improved with tori lines deterring seabirds depredating on bait. However, bait retention is also affected by other factors such as false killer whale depredation, and therefore the effect of tori lines on bait retention is not likely to be significant. Due to the lack of evidence that blue-dyed bait and tori lines significantly affect catch rates, this effect was not evaluated in the Tori Line Cooperative Research project in the Hawaii deep-set longline fishery.

4.2.3 Effects on Socioeconomic Setting

With respect to the socio-economic setting, the effects analysis for the proposed suite of measures is consistent for both alternatives.

Based on the Tori Line Cooperative Research Project, the cost of a tori line is approximately $350 (inclusive of materials and labor), and a tori pole constructed of marine-grade stainless steel is approximately $375 (inclusive of materials and labor). The tori line design used in the trials conducted in the DSLL fishery required minimal maintenance during the project period (trials conducted from February-July 2020 and February-June 2021), but it is expected that some maintenance would be required at least on an annual basis, and the line may need to be replaced once every few years. The pole would be considered a fixed cost. Tori lines meeting the design specifications considered under the action alternatives are currently not sold commercially. However, the tori line design used in the project can be assembled by vessel operators and crew participants using materials available for purchase from retailers based in Honolulu or from online retailers. Fishermen may carry backup tori lines on board, so the initial cost per vessel would be $1,075 (one tori pole and two tori lines), with a recurring cost of $375 to replace a tori line once every few years. These cost estimates are based on small scale tori line and tori pole production carried out for the field trials, and may be reduced if the lines and poles are produced at larger scale.

Implementing the replacement of the blue-dye bait measure with the tori line measure would introduce overall minimal setup and maintenance costs for the DSLL fishery operators in comparison to vessel revenue and the cost to implement existing measures. Both alternatives are expected to reduce seabird interactions as detailed in the Tori Line Cooperative Research Project results (Section 1.1.4) which in turn is probable in retaining overall fisheries operational integrity and increasing bait retention.

4.2.4 Effects on Management Setting

Neither of these two alternatives is anticipated to adversely impact the marine habitat, particularly critical habitat, essential fish habitat, habitat areas of particular concern, marine protected areas, marine sanctuaries, or marine monuments. The Hawaii deep-set longline fishery is not known to have large adverse impacts to habitats, thus none of these Alternatives are likely to lead to substantial physical, chemical, or biological alterations to the habitat. Fishing activity would not occur in identified critical habitat, so no critical habitat would be impacted by the alternatives considered. Longline fishing does not occur in marine protected areas, marine sanctuaries or marine monuments.

The requirements for owners and operators of Hawaii deep-set longline vessels to use seabird mitigation techniques will continue to apply when fishing north of 23°N. NMFS would continue to monitor the Hawaii deep-set longline fishery under statistically reliable observer coverage. The deep-set fishery has had consistent coverage exceeding 20% of all trips since 2001, with the exception of 2020, when COVID-19 restrictions resulted in a reduced annual coverage of approximately 15%. NMFS collects data on seabird interactions (e.g., species, capture/release condition) as well as seabird mitigation measures used.

These alternatives present a different effects analysis when considering their associated administrative burden. Each is discussed separately below and notes both commonalities and distinctions.

Alternative 2 would implement the updated offal discard management measure through a non-regulatory best practices training. This Alternative modifies the regulation as follows;

- Replace existing requirements to use blue-dyed thawed bait and strategically discharge offal (fish, fish parts, of spent bait) with a new requirement to use a tori line during the setting operation; and

- As a non-regulatory measure, include best practices training on offal management as part of the annual protected species workshop that is already required for Hawaii longline vessel owners and operators.

This Alternative is distinct from Alternative 3 in that it proposes to remove the offal discard management measures from regulation. The measures would remain intact, and instead be implemented through the annual protected species workshop.

Alternative 3 would implement the updated offal discard management measure through a regulatory requirement. This Alternative modifies the regulation in the following ways; it would replace the existing requirement to use blue-dyed thawed bait with a new requirement to use a tori line during the setting operation; and modify the existing requirement for strategic discharge offal (fish, fish parts, of spent bait) to an offal management requirement as follows:

- Prohibit offal discard during set; and
- Refine haul requirement to discharge offal (fish, fish parts, spent bait) on opposite side from where gear is hauled when "any seabirds are actively pursuing baited hooks"

Enforcement and Observer Program data requirements

Alternative 2 would tailor the regulatory and related administrative burdens in an optimal way by implementing the offal management measures as a non-regulatory suite of measures linked to an existing regulatory requirement of the annual protected species workshop for vessel owners and operators. For offal, this approach would afford increased management flexibility and adaptability should these measures need retooling based on fleet observations and feedback. Alternative 2 would require updates to the protected species workshop content to reflect the best practices training on offal management as described in Section 2.2.4.

Alternative 3 would modify the existing requirement for strategic discharge offal (fish, fish parts, of spent bait) to an offal management requirement, maintaining some regulatory burdens for both enforcement and observer data collection. Compared to the No Action Alternative, Alternative 3 is expected to reduce administrative burden on the observer program by clarifying the language on when offal and spent bait should be discharged on the other side of the vessels from where gear is being hauled. However, some administrative burden to monitor and enforce would remain in place as Alternative 3 would implement the modified offal management measure through regulations. This approach is much less flexible and adaptable than Alternative 2 as the measures would be prescribed in regulation.

Aside from the offal measures, the regulatory changes under Alternatives 2 and 3 would not result in substantial changes to administrative burden, as the seabird mitigation measures could be monitored and enforced through the existing mechanisms associated with current requirements. Both alternatives would require updates to the protected species workshop content to reflect the offal measures. Action Alternative 2 would optimize the related enforcement requirements analyzed within the management setting effects analysis section. The observer data collection and enforcement burdens associated with the updated offal discard management measure would either be optimized, or be reduced but remain in place depending on these two alternatives based on their associated implementation strategies.

4.3 Other Effects

There are no other anticipated effects resulting from the implementation of any of the alternatives. The Tori Line Cooperative Research Project did not reveal any unanticipated effects, as detailed in Section 1.1.4 of this document.

Under all alternatives, the Hawaii longline vessels will continue to be subject to mitigation measures to avoid and reduce protected species interactions and to reduce the severity of interactions when they do occur. The fisheries will be subject to terms and conditions described in ITSs for some listed species as defined in consultations under the ESA. The current ongoing consultation for the Hawaii deep-set longline fishery will consider the effects of this action and potential to reduce adverse effects to protected species. NMFS anticipates no change in the number of interactions with protected species as a result of this action, with the exception of seabird species, which is expected to have beneficial effects under the action alternatives. None of the proposed actions under any of the three alternatives would change fishing intensity, locations, participation or seasonality. The measure would be a mitigation measure change with nominal effects on catch and with no adverse effects on protected species Therefore, there are no anticipated cumulative effects on protected species for any of the action alternatives.

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

- Gear and release requirements to improve post-hooking survivorship of oceanic whitetip sharks in the longline fisheries;
- Modifications to the territorial catch and/or effort and allocation limits measure for bigeye tuna to allow for multi-year limits and establishing allocation limits without catch limits;
- Establishing a framework for domestic catch limits and specifying a striped marlin limit; and
- Revising FEP management objectives and converting the FEPs to living documents.

In general, the alternatives considered here would not have interactive effects with the proposed actions listed as FEP revisions will result in no to negligible change to the fisheries, so there are no cumulative effects to consider from those actions. Territorial allocations will maintain the status quo, so there are no expected cumulative effects. The only expected change would be a minor positive cumulative change to oceanic whitetip shark survival rates due to low impact of these fisheries on this species.

Regardless of which alternative is selected and which fishery outcome occurs, both the WCPFC and IATTC, both of which the United States participates in, will continue to review fishery performance, stock status, and adopt management measures that are applicable to fisheries that catch PMUS.

Potential Cumulative Effects on Target and Non-Target Species

None of the proposed actions under any of the three alternatives would change fishing intensity, locations, participation or seasonality. The measure would be a minor gear change with nominal effects on catch and with no anticipated adverse effects on stock status of target and non-target stocks. Therefore, there are no anticipated cumulative effects on target or non-target stocks for any of the action alternatives.

4.4 Other Planning Considerations

Past, Present and Reasonably Foreseeable Management Actions

Through data collected from observer programs and other sources, the Council and NMFS will continue to monitor interactions between managed fisheries and protected species as well as monitoring the status of those populations. Consultations under the ESA have amounts of exempted take defined in their respective ITSs and the fisheries have either not exceeded those amounts, or when it has occurred, or other triggers have been reached, consultation has been reinitiated (see Section 3.2). The Council and NMFS will continue to conduct workshops with participation from fishermen to develop mitigation methods as appropriate, and NMFS will continue to conduct mandatory annual protected species workshops for all longline permit holders that teach how to identify marine mammals and how to reduce and mitigate interactions.

NMFS and the Council are supporting several projects to address seabird interactions in the Hawaii longline fishery and to improve ecosystem-based fishery management. These include:

- Improving seabird handling and release guides, lesson plans for the annual protected species workshops, and associated outreach material, including through production of video guides and translated materials for crew members;
- Ecosystem-based fisheries management (EBFM) project for protected species impacts assessment for the Hawaii and American Samoa longline fishery to evaluate ecosystem factors influencing bycatch in the longline fishery;
- Council recommended additional research and development of alternative mitigation measures for the Hawaii shallow-set longline fishery.

Climate Change

A climate change impact analysis is a difficult undertaking given its global nature and interrelationships among sources, causes, mechanisms of actions and impacts. We focus our analysis on whether climate change is expected to impact resources that are the focus of this analysis including target stocks, non-target stocks, and on protected species. However considerable uncertainty remain regarding the extent to which such climate change impacts may affect each target, non-target and protected species. We note that the impacts of climate change on these resources may be positive if climate change impacts benefit a species’ prey base or otherwise enhance the species' ability to survive and reproduce, or impacts may be negative if the impacts reduce a species' ability to survive and reproduce. Impacts may also be neutral. Potential effects of climate change are described in further detail in the EA for the Bigeye Tuna Catch Allocation Limits for Pelagic Longline Fisheries in U.S. Pacific Island Territories (NMFS and WPFMC 2019), Amendment 18 to the Pelagics FEP (WPFMC 2009b) and the 2019 Hawaii shallow-set longline fishery BiOp (NMFS 2019), and are incorporated here by reference.

Implication of Climate Change for the Environmental Effects of the Alternatives

Environmental changes associated with climate change are occurring within the action area and are expected to continue into the future. Marine populations that are already at risk due to other threats are particularly vulnerable to the direct and indirect effects of climate change. The 2019 BiOp considered potential effects of climate change on ESA listed species—including alterations in reproductive seasons and locations, shifts in migration patterns, reduced distribution and abundance of prey, and changes in the abundance of competitors or predators—which informed all analysis developed throughout the BiOp. These include the status of listed resources and the PVA for loggerhead and leatherback sea turtles, the environmental baseline, and the exposure, response, and risk analyses.

Because habitat for many shark and ray species is comprised of open ocean environments occurring over broad geographic ranges, large-scale impacts such as climate change may impact these species. Chin et al. (2010) conducted an integrated risk assessment to assess the vulnerability of several shark and ray species on the Great Barrier Reef to the effects of climate change. Scalloped hammerheads were ranked as having a low overall vulnerability to climate change, with low vulnerability to each of the assessed climate change factors (i.e., water and air temperature, ocean acidification, freshwater input, ocean circulation, sea level rise, severe weather, light, and ultraviolet radiation). In another study on potential effects of climate change to sharks, Hazen et al. (2012) used data derived from an electronic tagging project and output from a climate change model to predict shifts in habitat and diversity in top marine predators in the Pacific out to the year 2100. Results of the study showed significant differences in habitat change among species groups but sharks as a whole had the greatest risk of pelagic habitat loss. Because giant manta rays are migratory and considered ecologically flexible (e.g., low habitat specificity), they may be less vulnerable to the impacts of climate change compared to other sharks and rays (Chin et al. 2010). However, as giant manta rays frequently rely on coral reef habitat for important life history functions (e.g., feeding, cleaning) and depend on planktonic food resources for nourishment, both of which are highly sensitive to environmental changes (Brainard et al. 2011; Guinder and Molinero 2013), climate change is likely to have an impact on the distribution and behavior of these animals. Decreased access to cleaning stations may negatively impact the fitness of the giant mantas by hindering their ability to reduce parasitic loads and dead tissue, which could lead to increases in diseases and declines in reproductive fitness and survival rates.

The 2019 SSLL BiOp describes the potential impacts of climate change on sea turtles to include alterations to foraging habitats and prey resources, changes in phenology and reproductive capacity that correlate with fluctuations in sea surface temperature and temperatures at nesting beaches, and potential changes in migratory pathways and range expansion, among others. Over the long-term, climate change-related impacts will likely influence biological trajectories in the future on a century scale (Paremsan and Yohe 2003). The study by Polovina et al. (2011), indicates that primary production in the southern biome and in the California current ecosystem are expected to increase by the end of the century (Rykaczewski and Dunne 2010), which may benefit leatherback sea turtles. Increases in their primary prey source, sea jellies, due to ocean warming and other factors are likely (Brodeur et al. 1999; Attrill et al. 2007; Richardson et al. 2009), although there is no evidence that any leatherback sea turtle populations are currently food-limited. Even though there may be a foraging benefit to leatherback sea turtles due to climate change influence on productivity, we do not know what impact other climate-related changes may have such as increasing sand temperatures, sea level rise, and increased storm events. However, a different picture is predicted for Eastern Pacific leatherback turtles. Modeling of climate projections and population dynamics resulted in an estimated 7% per decade decline in the Costa Rica nesting population over the twenty first century. Whereas changes in ocean conditions had a small effect on the population, the increase of 2.5º C warming of the nesting beach was the primary driver of the modeled decline through reduced hatching success and hatchling emergence rates (Saba et al. 2012). Furthermore, climate change may compound the effects of interannual climate variability, as governed by El Nino Southern Oscillation (ENSO). Saba et al. (2007) showed that nesting females in Costa Rica exhibited a strong sensitivity to ENSO whereas cool La Nina events correspond with a higher remigration probability and warm El Nino events correspond with a lower remigration probability. As a result, productivity at leatherback sea turtle foraging areas in the Eastern Pacific in response to El Nino/La Nina events result in variable remigration intervals and thus variable annual egg production. This phenomenon may render the Eastern Pacific leatherback sea turtle population more vulnerable to anthropogenic mortality due to longer exposure to fisheries than other populations (Saba et al. 2007). While NMFS cannot predict the exact impacts of climate change, sea level rise may present a more immediate challenge to the North Pacific loggerhead because of the proportion of beaches with shoreline armoring that prevents or interferes with the ability of nesting females to access suitable nesting habitat.

Scientists at the PIFSC modeled the effects of climate change on bigeye tuna and other PMUS targeted by the Hawaii deep-set longline fishery, whose action area overlaps that of the shallow-set fishery (Woodworth-Jefcoats et al. 2019). This modeling effort used a size-based food web model that incorporates individual species and captures the metabolic effects of rising ocean temperatures. They found that, taken as individual stressors, climate change and increasing fishing mortality act to reduce fish biomass and size across all species. The effects of reduced fishing mortality are generally of the opposite sign. However, when modeled jointly, there were no scenarios in which yield increased. Results for the ecosystem supporting the fishery are slightly more optimistic, with reduced fishing mortality somewhat offsetting the negative effects of climate change. The findings of this study suggests that proactive fisheries management could be a particularly effective tool for mitigating anthropogenic stressors either by balancing or outweighing climate effects, albeit not completely offsetting those effects. The effect of climate change on the ecosystem depends primarily upon the intensity of fishing mortality. Management measures which take this into account can both minimize fishery decline and support at least some level of ecosystem resilience.

Climate change is expected to have similar impacts to the resources regardless of which Alternative is selected. In the coming years, the Council and NMFS will continue to monitor domestic catches of all pelagic MUS, and continue to consider information from scientifically-

derived stock status reports as future catch and allocation limits are made, and as changes to fishery management are contemplated and implemented. Ongoing and future monitoring and research will allow fishery managers and scientists to consider impacts of climate change, fishing, and other environmental factors that are directly or indirectly affecting the resources.
Potential Effects on Climate Change in terms of Greenhouse Gas Emissions
The alternatives under consideration are not expected to substantially affect the level of fishing effort beyond the range observed since 2004. Neither NMFS, nor the Council controls where fishing vessels fish beyond existing restricted fishing areas, how long a fishing trip lasts, or other decisions that are made by individual fishermen. Some changes in fishing behavior may occur under all Alternatives if the leader material change results in changes to target and non-target catch rates; however, changes to fishing operations as a result of changes in catch rates are likely to be minor, and the overall effort level is not expected to be significantly affected because of the alternatives under consideration. For these reasons, none of the alternatives are expected to result in a noteworthy change to greenhouse gas emissions.

Table 22. Summary of Effects of the Alternatives

Resource	**Alternative 1**	**Alternative 2**	**Alternative 3**
Overview of Alternatives	Status Quo	Replace blue-dyed thawed bait and strategic offal discharge measures required for stern-setting vessels with a new tori line requirement	Replace blue-dyed thawed bait with a new tori line requirement, and modify strategic offal discard requirement to an offal management requirement
Expected outcomes on the DSLL Fishery		Removing blue dye bait could support better fishery efficiencies in the operations due to cumbersome application and temporal overlap of setting operations	Removing blue dye bait could support better fishery efficiencies in the operations due to cumbersome application and temporal overlap of setting operations
Physical resource: Water quality	x	No change	No change.
Biological resource: Target & Non-target stocks	x	Removal of Blue Dye bait is not expected to change the catch rates of target and non target species Tori line and offal discard measures are limited to the immediate and well above the gear soaked depth and are not anticipated to effect the catch rates of target or non target stocks	Removal of Blue Dye bait is not expected to change the catch rates of target and non target species
Biological	Baseline level of	Expected to decrease	Expected to decrease

Resource	Alternative 1	Alternative 2	Alternative 3
Resource: Seabirds	interactions would remain and link back to not meeting purpose	interactions; beneficial; blue dye is food grade so removing is a null health effect.	interactions; beneficial; blue dye is food grade so removing is a null health effect.
Biological Resource: Other protected species	null	No change; blue dye doesn't affect turtles	No change; blue dye doesn't affect turtles
Socio-economic setting	x	Having less seabird interactions could retain operational integrity, ie. bait retention; Mitigation cost analysis here.	Having less seabird interactions could retain operational integrity, ie. bait retention Mitigation cost same as alt 2
Management Setting	x	Regulatory and related administrative burdens optimized with the replacement of XX with Tori line. Update necessary for Protected Sp. Wkshp offal management Increased management flexibility for offal management component.	Regulatory burdens would remain with respect to offal discard Update necessary for Protected Sp. Wkshp offal management
Management Setting: Enforcement		optimized	Observer data collection and enforcement burdens would remain with respect to offal discard.

5 REFERENCES

Abraham, E., Pierre, J., Middleton, D., Cleal, J., Walker, N. Waugh, S. 2009. Effectiveness of fish waste management strategies in reducing seabird attendance at a trawl vessel. Fish. Res. 95, 210–219

ACAP. 2019. ACAP Review and Best Practice Advice for Reducing the Impact of Pelagic Longline Fisheries on Seabirds. Agreement on the Conservation of Albatrosses and Petrels, Hobart, Australia.

Agreement on the Conservation of Albatrosses and Petrels (ACAP). 2021. Report of the Population and Conservation Status Working Group. Tenth Meeting of the Advisory Committee. Virtual meeting, August 31 – September 2, 2021.Ambler-Edwards S, Bailey K, Kiff A, Lang T, Lee R, Marsden T, Simons D, Tibbs H. 2009. Food Futures: Rethinking UK Strategy. London.

Arata, J.A., Sievert, P.R., and Naughton, M.B., 2009. Status assessment of Laysan and black-footed albatrosses, North Pacific Ocean, 1923–2005: U.S. Geological Survey Scientific Investigations Report 2009-5131, 80 p

Ayers AL, Leong K. 2020. Stories of conservation success: results of interviews with Hawai‘i longliners. NOAA Admin Rep. H-20-11, 43 p. doi:10.25923/6bnn-m598

Boggs, C. 2001. Deterring albatrosses from contacting baits during swordfish longline sets. In: Seabird Bycatch: Trends, Roadblocks, and Solutions (eds E. Melvin, K. Parrish). University of Alaska, Fairbanks, AK, pp. 79–94, University of Alaska Sea Grant AK-SG-01-01.

Brothers N, Gales R, Reid T. 1999. The influence of environmental variables and mitigation measures on seabird catch rates in the Japanese tuna longline fishery within the Australian Fishing Zone, 1991-1995. Biol Conserv. 88(1):85-101.

CCAMLR. 2018. *Minimisation of the Incidental Mortality of Seabirds in the Course of Longline Fishing or Longline Fishing Research in the Convention Area*. Conservation Measure 25-02. Commission for the Conservation of Antarctic Marine Living Resources, Hobart, Australia.

Chaloupka, M., Gilman, E., Carnes, M., Ishizaki, A., Brady, C., Swimmer, Y., Wang, J., Ellgen, S., Kingma, E. 2021. Could tori lines replace blue-dyed bait to reduce seabird bycatch risk in the Hawaii deep-set longline fishery? Western Pacific Regional Fishery Management Council. Honolulu, Hawaii. Available online at: https://www.wpcouncil.org/wp-content/uploads/2021/09/Tori-Line-2021-Study-Report_Final.pdf

Cherel Y, Weimerskirch H, Duhamel G. Interactions between longline vessels and seabirds in Kreguelen waters and a method to reduce seabird mortality. Biol Conserv. 1996; 75: 63–70.

Clarke SC, Langley A, Lennert-Cody C, Aires-da-Silva A, Maunder MN. 2018a. Pacific-wide Silky Shark (*Carcharhinus falciformis*) Stock Status Assessment. Paper presented at: 14th Regular Session of the Scientific Committee of the WCPFC. Busan, Republic of Korea.

Cocking, L.J., Double, M.C., Milburn, P.J., Brando, V. 2008. Seabird bycatch mitigation and blue-dyed bait: a spectral and experimental assessment. Biol. Cons., 141: 1354–1364.

Delord, K., Gasco, N., WEimerskirch, H., Barbraud, C. Micol, T. 2005. Seabird mortality in the Patagonian toothfish longline fishery around Crozet and Kerguelen Islands, 2001-2003. CCAMLR Science 12: 53-80.

Ducharme-Barth N., Vincent M., Hampton J., Hamer P., Williams P., and G. Pilling. 2020. Stock assessment of bigeye tuna in the western and central Pacific Ocean. 16th Regular Session of the Scientific Committee of the WCPFC. Electronic Meeting.

Gilman, E., N. Brothers, D. Kobayashi. 2005. Principles and approaches to abate seabird bycatch in longline fisheries. *Fish and Fisheries* 6: 35-49.

Gilman, E., Chaloupka, M., Peschon, J., Ellgen, S. 2016. Risk factors for seabird bycatch in a pelagic longline tuna fishery. PLoS ONE 11(5): e0155477.

Gilman E, Chaloupka M, Dagorn L, Hall M, Hobday A, Musyl M, Pitcher T, Poisson F, Restrepo V, Suuronen P. 2019. Robbing Peter to pay Paul: Replacing unintended cross-taxa conflicts with intentional tradeoffs by moving from piecemeal to integrated fisheries bycatch management. Reviews in Fish Biology and Fisheries 29: 93-123

Gilman, E., Chaloupka, M., Ishizaki, A., Carnes, M., Naholowaa, H., Brady, C., Ellgen, S. and Kingma, E.. 2021b. Tori lines mitigate seabird bycatch in a pelagic longline fishery. *Reviews in Fish Biology and Fisheries*, pp.1-14.

Gilman, E., Chaloupka, M., Wiedoff, B., & Willson, J. 2014. Mitigating seabird bycatch during hauling by pelagic longline vessels. *PLoS One*, *9*(1), e84499.

Gilman E, Kobayashi D, Chaloupka M. 2008. Reducing seabird bycatch in the Hawaii longline tuna fishery. Endangered Species Research 5(2-3): 309–323.

Gilman, E., Ishizaki, A. (Eds.) 2018. Report of the Workshop to Review Seabird Bycatch Mitigation Measures for Hawaii's Pelagic Longline Fisheries, September 18-19, 2018. Western Pacific Regional Fishery Management Council, Honolulu. Available online at: http://www.wpcouncil.org/wp-content/uploads/2018/11/WPRFMC_2018-Seabird-bycatch-mgmt-workshop_FinalReport.pdf

Gilman, E., Naholowaa, H.A., Ishizaki, A., Chaloupka, M., Brady, C., Carnes, M., Ellgen, S., Wang, J., Kingma, E. 2021a. Practicality and Efficacy of Tori Lines to Mitigate Albatross Interactions in the Hawaii Deep-set Longline Fishery. Western Pacific Regional Fishery Management Council. Honolulu, Hawaii, 48pp. Available online at: https://www.wpcouncil.org/wp-content/uploads/2021/02/Hawaii-DSLL-Tori-Line-Cooperative-Research-Report_January2021_FINAL-C.pdf

Hinton MG, Maunder MN. 2011. Status and Trends of Striped Marlin in the Northeast Pacific Ocean in 2009.

IATTC. 2012. Resolution to Mitigate the Impact on Seabirds of Fishing for Species Covered by the IATTC. Resolution C-11-02. Inter-American Tropical Tuna Commission, La Jolla, USA.

ISC. 2016. Stock Assessment Update for Blue Marlin (*Makaira nigricans*) in the Pacific Ocean through 2014. Paper presented at: 16th Meeting of the ISC. Sapporo, Japan.

ISC. 2017a. Stock assessment and future projections of blue shark in the north Pacific Ocean through 2015. Paper presented at: 17th Meeting of the ISC. Vancouver, Canada.

ISC. 2017b. Stock assessment of albacore tuna in the north Pacific Ocean in 2017. Paper presented at: 17th Meeting of the ISC.

ISC. 2018a. Stock Assessment of Pacific Bluefin Tuna (*Thunnus orientalis*) in the Pacific Ocean in 2018. Paper presented at: 18th Meeting of the ISC. Yeosu, Republic of Korea.

ISC. 2018b. Stock Assessment for Swordfish (*Xiphias gladius*) in the Western and Central North Pacific Ocean through 2016. Paper presented at: 14th Regular Session of the Scientific Committee of the WCPFC Busan, Republic of Korea.

ISC. 2018c. Stock Assessment of Shortfin Mako Shark in the North Pacific Ocean through 2016. Paper presented at: 18th Meeting of the ISC. Yeosu, Republic of Korea.

ISC. 2019. Stock Assessment Report for Striped Marlin (*Kajika Audax*) in the Western and Central North Pacific Ocean through 2017. Paper presented at: 19th Meeting of the ISC. Taipei, Taiwan.

The IUCN Red List of Threatened Species. 2017. [accessed 2018 May 23, 2018]. http://www.iucnredlist.org/search.

Lennert-Cody C, Aires-da-Silva A, Maunder MN. 2018. Updated stock status indicators for silky sharks in the eastern Pacific Ocean, 1994-2017. Paper presented at: 9th Meeting of the Scientific Advisory Committee of the IATTC. La Jolla, California.

Lydon, G. Starr, P., 2005. Effect of blue dyed bait on incidental seabird mortalities and fish catch rates on a commercial longliner fishing off East Cape, New Zealand. Unpublished Conservation Services Programme Report. Department of Conservation, Wellington.

Maunder MN, Xu H, Minte-Vera CV, Aires-da-Silva A. 2018a. Investigation of the substantial change in the estimated F multiplier for bigeye tuna in the eastern Pacific Ocean. Paper presented at: 9th Meeting of the Scientific Advisory Committee of the IATTC.

Maunder MN, Lennert-Cody C, Roman M. 2018b. Stock status indicators for bigeye tuna. Paper presented at: 9th Meeting of the Scientific Advisory Committee to the IATTC. La Jolla, California.

McNamara, B., Torre, L., Kaaialii, G. 1999. Hawaii Longline Seabird Mortality Mitigation Project. Western Pacific Regional Fishery Management Council, Honolulu.

McCracken, M., Cooper, B. 2021. Hawaii Longline Fishery 2020 Seabird and Sea Turtle Bycatch for the Entire Fishing Grounds, Within the IATTC Convention Area, and Seabird Bycatch to the north of 23°N and 23°N–30°S. PIFSC Data Report DR-21-005. https://doi.org/10.25923/6ygk-1b64

Minte-Vera C., Maunder M., Xu H., Valero JL., Lennert-Cody C., and A. Aires-da-Silva. 2020. Yellowfin Tuna in the Eastern Pacific Ocean, 2019: Benchmark Assessment. 11th Meeting of the Scientific Advisory Committee of the IATTC.

National Marine Fisheries Service (NMFS). 2021. Seabird Interactions and Mitigation Efforts in Hawaii Longline Fisheries: 2019 Annual Report. National Marine Fisheries Service, Pacific Islands Regional Office, Honolulu.

Ochi, D., Minami, H., Sato, N. 2011. A comparison of two blue-dyed bait types for reducing incedental catch of seabirds in the experimental operations of the Japanese southern bluefin tuna longline. Western and Central Pacific Commission Science Committee, Pohnpei, Federated States of Micronesia, August 9-17, 2011. WCPFC-SC7-2011/EB-WP-09. 14 pp.

Pierre, J., Abraham, E., Middleton, D., Cleal, J., Bird, R., Walker, N., Waugh, S. 2010. Reducing interactions between seabirds and fisheries: responses to foraging patches provided by fish waste batches. *Biol. Conserv*. 143: 2779–2788.

Pierre, J.P., Abraham, E.R., Richard, Y., Cleal, J. and Middleton, D.A., 2012. Controlling trawler waste discharge to reduce seabird mortality. Fisheries Research, 131, pp.30-38.

Pierre, J., Goad, D., Debski, I., Knowles, K. (2016). Improving tori line performance in small vessel longline fisheries. Western and Central Pacific Fisheries Commission Scientific Committee.

Rice J, Harley S. 2012. Stock assessment of oceanic whitetip sharks in the western and central Pacific Ocean. Paper presented at: 8th Regular Session of the Scientific Committee of the WCPFC. Busan, Republic of Korea.

Rice J, Harley S. 2013. Updated stock assessment of silky sharks in the western and central Pacific Ocean. Paper presented at: 9th Regular Session of the Scientific Committee of the WCPFC. Pohnpei, Federated States of Micronesia.

Rice J., Carvalho F., Fitchett M., Harley S., and A Ishizaki. 2021. Future Stock Projections of Oceanic Whitetip Sharks in the Western and Central Pacific Ocean. *In prep for 17th Regular Session of the Scientific Committee of the WCPFC.*

Swimmer, Y., Arauz, R., Higgins, B., McNaughton, L., McCracken, M., Ballestero, J. and Brill, R., 2005. Food color and marine turtle feeding behavior: Can blue bait reduce turtle bycatch in commercial fisheries? Marine Ecology Progress Series, 295, pp.273-278.

Teo SLH, Rodriguez EG, Sosa-Nishizaki O. 2018. Status of common thresher sharks, *Alopius vulpinus*, along the west coast of North America: updated stock assessment based on alternative life history. La Jolla, California. p. 287.

Tremblay-Boyer L, Hampton J, McKechnie S, Pilling G. 2018. Stock assessment of South Pacific albacore tuna. Paper presented at: 14th Regular Session of the Scientific Committee of the WCPFC. Busan, Republic of Korea.

Tremblay-Boyer L., Carvalho F., Neubauer P., and G. Pilling. 2019. Stock assessment for oceanic whitetip shark in the Western and Central Pacific Ocean.15th Regular Session of the Scientific Committee of the WCPFC. Pohnpei, Federated States of Micronesia

Tremblay-Boyer L. and P. Neubauer, P. 2019. Data inputs to the stock assessment for oceanic whitetip shark in the Western and Central Pacific Ocean.15th Regular Session of the Scientific Committee of the WCPFC. Pohnpei, Federated States of Micronesia.

Valero JL, Aires-da-Silva A, Maunder MN, Lennert-Cody C. 2018. Exploratory spatially-structured assessment model for bigeye tuna in the eastern Pacific Ocean. SAC-09-08:60.

Van Fossen L. 2007. Annual report on seabird interactions and mitigation efforts in the Hawaii longline fishery for 2006. Honolulu: National Marine Fisheries Service, Pacific Islands Regional Office.

Veran S, Gimenez O, Flint E, Kendall WL, Doherty Jr PF, Lebreton J-D. 2007. Quantifying the impact of longline fisheries on adult survival in the black-footed albatross. Journal of Applied Ecology. 44(5):942-952.

Vincent, M., Pilling, G., and J Hampton. 2019. Stock assessment of skipjack tuna in the WCPO 15th Regular Session of the Scientific Committee of the WCPFC. Pohnpei, Federated States of Micronesia

Vincent M., Ducharme-Barth N., Hamer P., Hampton J. Williams P., and G Pilling. 2020. Stock assessment of yellowfin tuna in the western and central Pacific Ocean. 16th Regular Session of the Scientific Committee of the WCPFC. Electronic Meeting.

WCPFC. 2007. Conservation and Management Measure to Mitigate the Impact of Fishing for Highly Migratory Fish Stocks on Seabirds. CMM 2007-04. Tumon, Guam, USA. p. 7.

WCPFC. 2017a. Conservation and Management Measure to Mitigate the Impact of Fishing for Highly Migratory Fish Stocks on Seabirds. In: WCPFC, editor. CMM 2017-06. Manila, Phillippines. p. 7.

WCPFC. 2018. *Conservation and Management Measure to Mitigate the Impact of Fishing for Highly Migratory Fish Stocks on Seabirds*. CMM 2018-03. Western and Central Pacific Fisheries Commission, Kolonia, Federated States of Micronesia.

WPFMC. 2009a. Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region. Honolulu, HI. p. 251.

WPRFMC. 2019. Considerations for Developing Draft Minimum Standards for Tori Lines in the Hawaii Longline Fishery. Working Paper Prepared for the 178th Council Meeting.

WPRFMC. 2021. Annual Stock Assessment and Fishery Evaluation Report Pacific Island Pelagic Fishery Ecosystem Plan 2020. Remington, T., Fitchett, M., Ishizaki, A., DeMello, J. (Eds.) Western Pacific Regional Fishery Management Council. Honolulu, Hawaii. https://www.wpcouncil.org/annual-reports/

Wren, J., Polovina, J. 2018. Fleet dynamics and oceanographic drivers behind variations in black-footed albatross sightings in the Hawaii longline fishery. Abstract in Gilman, E., Ishizaki, A. (Eds.) 2018. Report of the Workshop to Review Seabird Bycatch Mitigation Measures for Hawaii's Pelagic Longline Fisheries, September 18-19, 2018. Western Pacific Regional Fishery Management Council, Honolulu.

Wren, J.L.K, Shaffer, S.A., and J.J. Polovina, 2019. Variations in black-footed albatross sightings in a North Pacific transitional area due to changes in fleet dynamics and oceanography 2006–2017. Deep Sea Research Part II: Topical Studies in Oceanography, 169, 104605.

Yokota, K., Kiyota, M. and Okamura, H., 2009. Effect of bait species and color on sea turtle bycatch and fish catch in a pelagic longline fishery. Fisheries Research, 97(1-2), pp.53-58.

Xu H, Minte-Vera C, Maunder MN, Aires-da-Silva A. 2018. Status of bigeye tuna in the eastern Pacific Ocean in 2017 and outlook for the future. Paper presented at: 9th Meeting of the Scientific Advisory Committee to the IATTC. La Jolla, California.

6 DRAFT PROPOSED REGULATIONS

This section contains the draft proposed regulations necessary to implement the conservation and management measures described in the regulatory amendment. The draft changes based on the Council's preliminary preferred alternative (Alternative 2) is shown, with additional insertions applicable to Alternative 3 highlighted in blue. Tori line specifications in the draft version below are based on the preliminary specifications reviewed by the Council at the 186th meeting with the addition of the attachment point exemption recommended at the 187th meeting. Additional specifications on materials and other details may be added to these tori line specifications based on the Council final action, as described in section 2.2.2. Additions to the existing regulatory language are shown in underline, and deletions are shown in strikethroughs.

§ 665.802 Prohibitions.

In addition to the prohibitions specified in § 600.725 of this chapter, it is unlawful for any person to do any of the following:

* * * * *

(z) Fail to fish in accordance with the seabird take mitigation techniques set forth at §§ 665.815(a)~~(1) or 665.815(a)(2)~~ when operating a vessel registered for use under a Hawaii longline limited access permit.

* * * * *

(mm) Fail to use a line setting machine or line shooter, with weighted branch lines, to set the main longline when operating a vessel that is registered for use under a Hawaii longline limited access permit and equipped with monofilament main longline, when making deep sets north of 23° N. lat., in violation of § 665.815(a)(1) or (a)~~(2)~~(3).

(nn) Fail to employ basket-style longline gear such that the mainline is deployed slack when operating a vessel registered for use under a Hawaii longline limited access north of 23° N. lat., in violation of § 665.815(a)~~(2)(v)~~(4).

(oo) Fail to maintain and use blue dye to prepare thawed bait when operating a vessel registered for use under a Hawaii longline limited access permit that is fishing north of 23° N. lat., in violation of § 665.815(a)(2)(vi) through ~~(viii)~~(vii).

(pp) Fail to retain, handle, and discharge fish, fish parts, and spent bait, strategically when operating a vessel registered for use under a Hawaii longline limited access permit that is fishing north of 23° N. lat., in violation of § 665.815(a)(2)~~(i)~~(ii) through ~~(iv)~~(v).

(qq) Fail to be begin the deployment of longline gear at least 1 hour after local sunset or fail to complete the setting process before local sunrise from a vessel registered for use under a Hawaii longline limited access permit while shallow-setting north of 23° N. lat., in violation of § 665.815(a)~~(4)~~(2)(i).

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§ 665.814 Protected species workshop.

* * * * *[*NO CHANGE TO THIS* SECTION]

§ 665.815 Pelagic longline seabird mitigation measures.

(a) *Seabird mitigation techniques.* When deep-setting or shallow-setting north of 23° N. lat. or shallow-setting south of 23° N. lat., owners and operators of vessels registered for use under a Hawaii longline limited access permit, must either side-set according to paragraph (a)(1) of this section, or fish in accordance with paragraph (a)(2), (a)(3), or (a)(4) of this section.

(1) Side-setting. Owners and operators of vessels opting to side-set under this section must fish according to the following specifications:

(i) The mainline must be deployed as far forward on the vessel as practicable, and at least 1 m (3.3 ft) forward from the stern of the vessel;

(ii) The mainline and branch lines must be set from the port or the starboard side of the vessel;

(iii) If a mainline shooter is used, the mainline shooter must be mounted as far forward on the vessel as practicable, and at least 1 m (3.3 ft) forward from the stern of the vessel;

(iv) Branch lines must have weights with a minimum weight of 45 g (1.6 oz);

(v) One weight must be connected to each branch line within 1 m (3.3 ft) of each hook;

(vi) When seabirds are present, the longline gear must be deployed so that baited hooks remain submerged and do not rise to the sea surface; and

(vii) A bird curtain must be deployed. Each bird curtain must consist of the following three components: a pole that is fixed to the side of the vessel aft of the line shooter and which is at least 3 m (9.8 ft) long; at least three main streamers that are attached at regular intervals to the upper 2 m (6.6 ft) of the pole and each of which has a minimum diameter of 20 mm (0.8 in); and branch streamers attached to each main streamer at the end opposite from the pole, each of which is long enough to drag on the sea surface in the absence of wind, and each of which has a minimum diameter 10 mm (0.4 in).

(2) Alternative to side-setting when shallow-setting. Owners and operators of vessels engaged in shallow-setting that do not side-set must do the following:

(i) Begin the deployment of longline gear at least 1 hour after local sunset and complete the deployment no later than local sunrise, using only the minimum vessel lights to conform with navigation rules and best safety practices;

(ii) ~~(i)~~ Discharge fish, fish parts (offal), or spent bait while setting or hauling longline gear, on the opposite side of the vessel from where the longline gear is being set or hauled, when seabirds are present;

(iii) ~~(ii)~~ Retain sufficient quantities of fish, fish parts, or spent bait between the setting of longline gear for the purpose of strategically discharging it in accordance with paragraph (a)(2)~~(i)~~(ii) of this section;

(iv) ~~(iii)~~ Remove all hooks from fish, fish parts, or spent bait prior to its discharge in accordance with paragraph (a)(2)~~(i)~~(ii) of this section;

(v) ~~(iv)~~ Remove the bill and liver of any swordfish that is caught, sever its head from the trunk and cut it in half vertically and periodically discharge the butchered heads and livers in accordance with paragraph (a)(2)~~(i)~~(ii) of this section;

~~(v) When using basket-style longline gear north of 23° N. lat., ensure that the main longline is deployed slack to maximize its sink rate;~~

(vi) Use completely thawed bait that has been dyed blue to an intensity level specified by a color quality control card issued by NMFS;

(vii) Maintain a minimum of two cans (each sold as 0.45 kg or 1 lb size) containing blue dye on board the vessel; and

~~(viii) Follow the requirements in paragraphs (a)(3) and (a)(4) of this section, as applicable.~~

(3) Alternative to side-setting when deep-setting. Owners and operators of vessels engaged in deep-setting using a monofilament main longline north of 23° N. lat. that do not side-set must do the following: ~~Deep-setting requirements. The following additional requirements apply to vessels engaged in deep-setting using a monofilament main longline north of 23° N. lat. that do not side-set. Owners and operators of these vessels must do the following:~~

(i) Employ a tori line system, prior to the first hook being set, that meets the following specifications:

(A) Length. The tori line must have a minimum aerial section length of 50 m (164 ft) and a minimum total length of three times the total length of the vessel.

(B) Streamer configuration. The aerial section of the tori line must have streamers that are a minimum of 30 cm (11.8 inches) length and spaced less than 1 m (3.3 ft) apart. Streamers are not required for the last 20 m (65.6 ft) of aerial section to minimize entanglements with buoys and fishing gear.

(C) Attachment point. The tori line must be attached to the vessel or a fixed structure on the vessel at a minimum height of 5 m (16.4 ft) above the water when the attachment point is located within 2 m (6.5 ft) of the vessel stern. When the attachment point is more than 2 m (6.6 ft) from the stern, the attachment point height must be increased by 0.5 m (1.6 ft) for every 5 m (16.4 ft) distance from the stern.

(D) Attachment point height exemption. In the event that the structure used to attach the tori line breaks during a trip, the operator may use an alternative attachment point on the vessel that is lower than the height specified in paragraph (a)(3)(i)(C) to continue fishing north of 23°N. The exemption is only valid during the trip in which the structure broke.

(ii) ~~(i)~~ Employ a line shooter; ~~and~~

(iii) ~~(ii)~~ Attach a weight of at least 45 g (1.6 oz) to each branch line within 1 m (3.3 ft) of the hook~~.~~;

(iv) Do not discard any fish, fish parts, or spent bait while setting; [*NOTE: para (iv)-(vi) apply to Alternative 3 only*]

(v) Discharge fish, fish parts (offal), or spent bait while hauling longline gear, on the opposite side of the vessel from where the longline gear is being set or hauled, when seabirds are actively pursuing baited hooks; and

(vi) Remove all hooks from fish, fish parts, or spent bait prior to its discharge in accordance with paragraph (a)(3)(v) of this section.

(4) Basket-style longline gear requirement. When using basket-style longline gear north of 23° N. lat., owners and operators of vessels that do not side-set must ensure that the main longline is deployed slack to maximize its sink rate. [*NOTE: enumeration change only*] ~~Shallow-setting requirement. In addition to the requirements set forth in paragraphs (a)(1) and (a)(2) of this section, owners and operators of vessels engaged in shallow-setting that do not side-set must begin the deployment of longline gear at least 1 hour after local sunset and complete the deployment no later than local sunrise, using only the minimum vessel lights to conform with navigation rules and best safety practices.~~

(b) Short-tailed albatross handling techniques.

* * * * *[*NO CHANGE TO THIS* SECTION]

(c) Non-short-tailed albatross seabird handling techniques.

* * * * *[*NO CHANGE TO THIS* SECTION]

APPENDIX A. DRAFT NON-REGULATORY GUIDELINES ON TORI LINE DESIGN AND SAFETY RECOMMENDATIONS

Non-regulatory design guidelines are intended to help supplement the regulatory specifications to standardize the tori line designs used in the Hawaii deep-set longline fishery, ensure the designs are effective in mitigating seabird interactions, and are practical and safe for the fishermen. Some design details may be more appropriate as non-regulatory guidance so that they may be updated with lessons learned from fishermen's experiences while providing flexibility for fishermen to build their own tori lines. Some of these details are under consideration for inclusion in the regulatory guidance, as described in section 2.2.2.

The following draft design guidance is based largely on the recommendations contained in the 2019-2020 cooperative research project final report (Gilman et al. 2021).

- **Include guidance on recommended materials for the tori line components, such as the following:**
  - **Aerial section:**
    - Use material that is light-weight, does not absorb water, does not hold energy, and does not tangle easily.
    - Ultra high molecular weight polyethylene, known as dyneema or spectra, is recommended based on trials conducted in the Hawaii deep-set longline fishery, but other similar materials may be available or become available in the future.
    - Monofilament material should not be utilized for the aerial section due to sagging concerns thereby reducing aerial coverage, nor should monofilament be used for drag sections as substantially more material is needed to create the amount of necessary drag.
  - **Drag section:**
    - Use braided material that does not tangle easily, does not absorb water, material that floats
    - Have a design that minimizes chances of tangles (e.g., rope only)
  - **Tori poles:**
    - Made of solid material that do not flex (marine grade stainless steel is recommended for safety and durability purposes).
    - Fiberglass poles should not be utilized.
    - Alternatively, tori lines can be attached to a sturdy fixed point on the vessel.
- **Attachment point for the tori line should be located on the side of the vessel where baited hooks are deployed**
- **Alternative streamer designs** (adding long streamers)
  - Adding longer streamers to the aerial section of the tori line close to the vessel stern may increase the seabird deterrence efficacy of the tori line.
  - If adding long streamers to an existing short streamer design tori line, the drag section should be extended to ensure the aerial section will remain above water.
- **Design guidance for breakaway mechanism and safety line** (for crew safety)

Reference

Gilman, E., Naholowaa, H.A., Ishizaki, A., Chaloupka, M., Brady, C., Carnes, M., Ellgen, S., Wang, J., Kingma, E. 2021a. Practicality and Efficacy of Tori Lines to Mitigate Albatross Interactions in the Hawaii Deep-set Longline Fishery. Western Pacific Regional Fishery Management Council. Honolulu, Hawaii, 48pp.