WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

False Killer Whale Weak Hook Study Implications and Considerations for Council Position on Future Direction for the False Killer Whale Take Reduction Plan

Prepared for the 190th Council Meeting
March 22-24, 2022

Overview

The False Killer Whale Take Reduction Team (FKWTRT) is expected to meet in person during 2022 to discuss the implications of the weak hook study on the False Killer Whale Take Reduction Plan (FKWTRP). The Council at the 190th meeting in March 2022 will consider providing direction on the Council position in preparation for the FKWTRT meeting. This paper provides considerations for the Council in developing its position on the weak hook study implications as well as future direction for the FKWTRP.

The weak hook study was implemented in 2021 to evaluate the impact of a 4.2 mm diameter hook compared to the existing requirement for 4.5 mm diameter hook on catch weight and value. The study results indicated the following:

- Bigeye tuna weight was significantly heavier on stronger hooks (8.5%), exceeding the 5% threshold that industry representatives indicated would be acceptable for supporting gear change.
- The use of the 2.3mm branch lines (instead of the 2.0mm commonly used in the fleet) resulted in longer gear conversion time and greater crimp failure, according to captains who participated in the study, indicating that further evaluation is needed on appropriate combination of hook and branch lines.
- Due to the small difference in breaking strength (29kg) of the hooks used in the study, it is unclear whether 4.2mm wire diameter hooks (compared to 4.5mm) would provide meaningful conservation benefit in reducing serious injury to FKWs.
    - The difference in the number of hooks straightened on 4.2 mm and 4.5 mm hooks during the study was not statistically significant
    - One hook straightened during a FKW interaction on a 4.2 mm hook during the study, but sample size of observed interactions were small

Based on the above, the recommendations identified in the SSC's September 2021 Issues Paper remain relevant for considering next steps for the weak hook and other alternative strategies under the FKWTRP:

- "Weak hook" mitigation strategies should only be mandated after thorough testing of hook and line strength, target catch retention and thorough training of captain and crews under different hooking scenarios. Emphasis should be placed on gears with standardized characteristics.

- The utility of severing the branch line close to the hook to leave a minimal amount of trailing line should be further assessed in relation to post-release condition and serious injury determinations.
- Efforts to develop novel line cutting devices that also protect from gear flyback should be promoted.

The Council and its advisory bodies may consider and provide direction on the following at their March meetings:

- Whether the recent weak hook study provides sufficient evidence to support changes to the existing weak hook requirement by adopting weaker hooks and/or stronger branch lines;
- Whether additional testing for making the hook the weakest point in the gear is warranted;
- Whether future direction for the FKWTRP other than those previously identified and supported by the Council (focus on minimizing trailing gear; removal of Southern Exclusion Zone) should be considered; and
- Whether additional analyses could inform Council's consideration for the above items.

Implications of the Weak Hook Study

NMFS Pacific Islands Regional Office (PIRO) implemented a weak hook study in the Hawaii deep-set longline fishery in 2021 that evaluated target and non-target species catch and value of two hook types. The study compared the effects of a 4.5mm wire diameter circle hook meeting the current regulatory requirement under the FKWTRP, and a 4.2mm wire diameter circle hook. The study also used 2.3 mm monofilament nylon for the branch line and leaders with both hook types, rather than the more commonly used 2.0 mm or 2.1 mm monofilament nylon. The study was conducted in response to FKWTRT discussions and draft recommendations generated at the April 2018 meeting. The draft report was presented to the FKWTRT on October 27, 2021, with discussion focused on clarifications and comments on the draft report. A separate in-person meeting will be scheduled later in 2022 (likely late summer) for the FKWTRT to discuss the implications of the weak hook study for the modifications to the FKWTRP.

This section highlights the key issues related to the weak hook study for Council's consideration in providing direction for the upcoming FKWTRT deliberations. The full weak hook study report is included in the SSC and Council briefing documents.

TRT draft recommendation on threshold for considering weaker hooks

The weak hook study design was based on FKWTRT draft recommendations for modifying FKWTRP measures, as discussed at the April 2018 in-person meeting and subsequent follow-up teleconference meetings. FKWTRT considered potential adoption of a weaker 4.2 mm hook (subject to review of study results) as part of a package of measures, which included voluntary adoption of 2.3 mm monofilament nylon branch lines, suspension or elimination of the Southern Exclusion Zone (SEZ) conditional to additional gear modifications, and crew training. FKWTRT ultimately was not able to come to consensus on recommendations for modifying the measures, but generally agreed that a new weak hook study was needed to evaluate the potential impact of

a 4.2 mm diameter hook compared to the existing requirement for 4.5 mm diameter hook. Specifically, FKWTRT members considered a draft recommendation that included a threshold for determining whether the economic value of retained catch would occur:

> *The Team recommends that NMFS undertake a rigorous study that compares 4.2 mm and 4.5 mm wire diameter circle hooks. The goal of the study would be to determine whether there would be a decrease in the economic value of retained catch…if the 4.2 mm hook is implemented in the deep-set fishery.*
>
> *…a decrease in the economic value of retained catch occurs if (i) the* ***ex-vessel weight of bigeye tuna*** *caught on 4.2 mm circle hooks is more than* ***5% less*** *than the ex-vessel weight of bigeye tuna caught on 4.5 mm circle hooks or (ii) the* ***ex-vessel monetary value of total catch*** *landed on 4.2 mm circle hooks is more than* ***5% less*** *than the ex-vessel monetary value of total catch landed on 4.5 mm circle hooks.*
> [draft recommendation version January 27, 2020]

At the FKWTRT teleconference on November 29, 2018, PIFSC reported on a power analysis to determine the sample size needed for the weak hook study. The power analysis indicated that 680 longline sets (approximately 40 trips) would be needed to significantly detect a 5% reduction in bigeye tuna catch rate, whereas 170 longline sets would be sufficient to detect a 10% reduction in bigeye tuna catch rate.[1] PIRO PRD reported that they would be ready to implement a study at the 10% power level with a field season starting in April 2019 (to target summer months when larger bigeye tuna are typically caught).

At the FKWTRT teleconference on April 5, 2019, PIRO PRD indicated that the study would be pushed back until spring 2020 due to unexpected delays in securing both the stronger branch line and 4.2mm hooks needed to carry out the study.

At the FKWTRT teleconference on November 18, 2019, Lynker (PIRO contractor for the weak hook study) presented on the hook study design for team member input. TRT members supported the decision to use 15/0, 4.5mm round circle hook as the control and 15/0, 4.2mm round circle hook as the treatment. Industry representatives reiterated that their threshold for supporting gear change based on the study would be no more than a 5% variance in ex vessel weight and economic value.

The weak hook study final report makes reference to a threshold set by the FKWTRT of less than 10% reduction in price or weight, which appears to be inaccurate based on the review of the FKWTRT deliberations summarized above. While the FKWTRT did not reach consensus on a threshold, the draft recommendations indicate that the FKWTRT had considered a 5% reduction as a threshold.

[1] Bigelow, K. 2018. PIFSC report on sample size considerations for a longline hook study. PIFSC Internal Report IR-18-020

Key findings from the final report

The study was postponed until spring 2021 due to COVID-19, with field trials conducted during March –July 2021, and final report delivered in December 2021. FKWTRT convened October 27, 2021, to review and provide input on the draft report. The key findings from the final report are as follows:

- "Though not statistically significant, catch risk of bigeye tuna was higher on weak hooks but mean body length (3.3 cm) and dressed weight (6.8 lb or 3.1 kg) was significantly larger and heavier on strong hooks, respectively. Bigeye caught on strong hooks also fetched a significantly higher mean price per fish at auction ($52.89) but the analysis did not take into account exogenous (i.e., time spent hooked, temperature, dissolved oxygen) and endogenous factors (e.g., stress, parasites, shark damage, bad gaff placement) known to influence flesh quality. Using a meta-analytic approach synthesizing effect sizes on catch rates, body sizes, dressed weights and prices for species at auction, we demonstrated ex-vessel revenue was virtually similar on the two hook types."
- "On average, bigeye tuna captured on strong hooks were significantly heavier (6.834 lb; 3.10 kg) than those caught on weak hooks. Yellowfin tuna were also heavier on strong hooks (3.222 lb; 1.46 kg) but the difference was non-significant."
- "Bigeye tuna captured on strong hooks averaged significantly more per fish ($52.891) than those caught on weak hooks. Species in the Target subgroup fetched, on average, $12.281 more per fish at auction on weak hooks but the analysis was significantly influenced by the inclusion of swordfish that brought in $408.334 more on weak hooks but the samples were skewed… For all marketable species, ex-vessel gross revenue indicates fish captured on strong hooks brought in $204.45 more than fish caught on weak hooks."
- "Three FKW were captured (2 on 4.5 mm ø hooks and 1 on a 4.2 mm ø hook) and one bottlenose dolphin was caught on a 4.2 mm ø hook."
- "In total, 39 4.5 mm ø hooks and 58 4.2 mm ø hooks were considered straightened by vessel captains (Table 2; Figs. S7-S8)." – difference was not statistically significant

In terms of the 5% threshold of bigeye tuna weight considered in the draft FKWTRT recommendation, bigeye was significantly heavier on stronger hooks with a 8.5% difference between the hook types. In terms of the 5% threshold of ex-vessel value of total catch, the two hook types resulted in similar total value. However, swordfish catch is likely overrepresented in the study results due to one of the vessels fishing north. The number of swordfish caught in the study was approximately 12% of the number of bigeye tuna caught in the study, whereas swordfish catch typically is about 2% compared to bigeye tuna on an annual basis, and less than 5% during the second quarter (April-June).[2] When swordfish is removed, total catch value on the weaker hooks was lower by 4.7% than the stronger hook (Table 1). When considering only the ex-vessel value of the two target species (bigeye and yellowfin tunas), the catch value on weaker hooks was lower by 9.4% (Table 1).

[2] *See* Pelagic FEP 2020 Annual SAFE Report: https://www.wpcouncil.org/annual-reports/
See also Hawaii longline fishery logbook summary reports: https://www.fisheries.noaa.gov/resource/data/hawaii-and-california-longline-fishery-logbook-summary-reports

Table 1. Total ex-vessel revenue (gross) for species sold at auction and difference by hook type. (Adapted from Table 5 of the weak hook study report)

Species	Stronger hooks (4.5 mm) ($)	Weaker hooks (4.2 mm) ($)	Difference between stronger and weaker hooks	
			Value	Percentage
abacore	426.9	1095.6	668.7	156.6%
bigeye tuna	213406.3	200282.5	-13123.8	-6.1%
blue marlin	2229.3	3271.3	1042	46.7%
blue shark	154	N/A	-154	-100.0%
dolphinfish	4543.51	4713.66	170.15	3.7%
escolar	458.2	609.9	151.7	33.1%
oilfish	3.2	N/A	-3.2	-100.0%
opah	15676.3	18661.3	2985	19.0%
spearfish	1940.6	1721.7	-218.9	-11.3%
sickle pomfret	8267.4	13826	5558.6	67.2%
skipjack tuna	1276.3	560.3	-716	-56.1%
striped marlin	9247.4	8762.1	-485.3	-5.2%
swordfish	21776.9	36709.1	14932.2	68.6%
wahoo	10183.8	11729.5	1545.7	15.2%
yellowfin tuna	63345.1	50388.1	-12957	-20.5%
Grand Total	**$352,935.20**	**$352,331.10**	**-$604.1**	**-0.2%**
Exclude sword	*$331,158.31*	*$315,621.96*	***-$15,536.35***	***-4.7%***
BET & YFT only	*$276,751.4*	*$250,670.6*	***-$26,080.8***	***-9.4%***

Additionally, the following considerations from the weak hook study, identified through the FKWTRT discussions on the draft report and Council review of the report are relevant in considering the management implications:

- Use of 2.3 mm mono (instead of the 2.0 mm commonly used in the fishery) resulted in longer gear conversion time and greater crimp failure, according to captains who participated in the study.
- The Hawaii fleet and other fisheries throughout the Pacific generally experienced anomalously low catch rates during the study period. The current La Nina conditions have persisted longer than normal (2020-2022) and are known to affect the distribution of fish by species and their size distributions. The report did not consider whether catch composition during the study period was representative of a typical year.
- Of the four odontocete interactions observed during the study, the FKW interaction on the 4.2mm hook resulted in the hook partially straightening and released without any trailing gear (see additional details of the four interactions in Table 2).

Table 2. Summary of the four odontocete interactions observed during the weak hook study.

Species	Hook type	Interaction description	Preliminary Injury determination
FKW	4.5mm	The whale surfaced in a tangle of line, and the observer saw the line leading to the whale's mouth. The captain advised the crew to tie off the branch line to the railing, but the whale was struggling as they crew was trying to tie off, and the crimp between the leader and branch line broke. The hook, 1-m leader, and weight remained on the whale.	SI
FKW	4.2 mm	Deck boss had a very heavy pull on the mainline. Observer saw a false killer whale and observed it to be hooked in the lip or jaw – hook was seen near the back left corner of the mouth. The observer did not see any blood or other injuries. The engines were stopped and the crew tied off the line. The whale swam forward and then under the boat, and the **line went slack, and the whale was gone**. The **crew pulled in all the gear including a partially straightened hook**. The whale was not seen again. No gear remained on the animal. The hook was saved, and one other straightened hook was retrieved during the haul.	NSI
FKW	4.5 mm	Crew and observer noticed a whale on the line under water. When they started pulling in the line, the whale started to struggle. It was blowing bubbles when submerged under water. At first, under the captain's direction, the crew wrapped the line around the rail and applied tension by maneuvering the boat. Eventually they stopped, and cut the line, likely due to the amount of time handling was taking (the interaction lasted 10-15 minutes) and amount the whale was struggling. The observer could not see the hook, but could see the hook crimp right outside the mouth. No other marine mammals were sighted. The hook, weight, 1m of leader, and 4 feet of branch line remained on the animal after the line was cut.	SI
Bottlenose	4.2 mm	Dolphin came up in a tangle of line. Crew tied off the branch line to the rail, and waited (for hook straightening) but after about 5 minutes, noticed the hook and leader were ingested. Therefore, the captain cut the line. 4 feet of branch line, weight, leader and hook remained on/in the animal.	SI

SSC Issues Paper Excerpt on Weak Hooks

The SSC's false killer whale issues paper adopted in September 2021 reviewed various mitigation strategies, including the weak hook. The following is an excerpt of the issues paper as it pertains to the weak hook strategy and related issues:

> *The "weak hook" straightening strategy using current gear regulations has not proved useful in releasing bycaught FKW in the Hawaii fishery since the regulated adoption of the weak hook strategy in 2013. In only a handful of cases has the hook straightened to release the animal free of hooks and trailing gear. It has been noted that securing the branchline and applying active tension is highly stressful to the animal and creates a dangerous situation for*

the crew with potential for gear flyback and can contribute to more serious injuries to the whale if the hook is ingested. The debate continues as to whether the health and condition of false killer whales is improved by cutting the leader as close to the hook as possible or by the current strategy to apply tension on the line in an attempt to straighten hooks.

The impact of different amounts of retained or trailing gear on the post release condition of false killer whales needs to be assessed to better inform and update the process for distinguishing serious from non-serious injury of marine mammals. The guidelines currently in place were developed from a 2007 workshop convened by NMFS and published in a set of procedural directives in 2012 that provides the process and criteria for distinguishing human-caused serious from non-serious injury to marine mammals (NMFS 2012). Under the guidelines for small cetaceans, animals with a hook retained in the head, mouth or ingested is assessed as a serious injury. An interaction with a small cetacean released with trailing gear of varying lengths is generally assessed as a serious injury based in part on Anglis and DeMaster (1998). While removal of the hook is desirable, the relative benefit of reducing stress and injury by leaving the hook in place and removing as much gear as possible with a long-handled cutting device should be evaluated. Research on other protected species such as sea turtles and oceanic whitetip sharks have shown that removal of trailing gear can significantly increase post-release survival (Chaloupka, 2004, Hutchinson, 2021). It is recommended that NMFS devote significant agency resources to research the post-hooking condition and mortality of FKWs and similar odontocetes and the impact of retained hooks and trailing gear on the animal's condition.

The replacement of wire trace with monofilament leaders in the Hawaii deep-set fishery opens up options for new designs of relatively simple line cutting devices compared to a device capable of severing wire trace. The development of improved line cutting gear designed to remove line very close to the hook and the weighted swivel while designed to minimize flyback should be promoted in collaboration with fishery participants. One area of development could be for a small device that could be slid down the branchline to sever the monofilament leader when underwater and close to the hook but below the weighted swivel. Gear spring back should be low if the line is cut underwater. Such a device would also be useful for releasing oceanic sharks with minimal trailing gear.

A hook study is being conducted in 2021 to further inform the "weak hook" strategy and is designed to evaluate the economic cost of target catch retention by different hook strengths. It is possible that a different ratio of hook strength to branchline diameter could provide better results from the current situation. However, other mitigation approaches need to be considered. It should be noted that hook strength and straightening characteristics will vary depending on many criteria such as the steel alloy, hook manufacturer model and shank cross-section type (round or flat) (Mclellan et al 2015). The strength of monofilament leader of the same diameter will also vary by make and type. All available hook and line characteristics should be considered and tested when developing gear-based regulations.

Based on the review, the issues paper identified the following recommendations for future direction of mitigation strategies, which remain relevant in light of the weak hook study results:

1. The "move on" strategy where boats travel long distances or wait extended periods after a depredation is inappropriate for a fishery marketing fresh, iced product with limited storage time.
2. Catch shielding gears have many logistical issues related to their storage, potential for tangling and time, and effort required to add or remove gear to mitigate such a rare event.
3. Acoustic deterrents can quickly become ineffective and contribute to the "dinnerbell effect." However, the identification of key acoustic signals that FKWs use to depredate catch should be identified to make a vessel less detectable than others.
4. "Weak hook" mitigation strategies should only be mandated after thorough testing of hook and line strength, target catch retention and thorough training of captain and crews under different hooking scenarios. Emphasis should be placed on gears with standardized characteristics.
5. The utility of severing the branchline close to the hook to leave a minimal amount of trailing line should be further assessed in relation to post-release condition and serious injury determinations.
6. Efforts to develop novel line cutting devices that also protect from gear flyback should be promoted.

Recommendation 6 has added significance given the replacement of wire trace with monofilament leader by the fishery which will allow simpler, less costly line cutting devices but presents added potential hazard from gear flyback.

Considerations for Future Direction of the FKWTRP

The FKWTRT is expected to meet in person during 2022 to discuss the implications of the weak hook study on the FKWTRP. The Council at the 190th meeting in March 2022 will consider providing direction on the Council position in preparation for the FKWTRT meeting.

The Council previously adopted the following position statements at the 172nd meeting in March 2018, in advance of the April 2018 FKWTRT meeting:

1. The Council finds that minimizing trailing gear on false killer whales may provide greater reduction in impacts than the weak hooks, which have exhibited low success rates in hook straightening. The Council recommends that NMFS increase its efforts to develop gear-based solutions to release false killer whales without hooks and/or with minimal amounts of trailing gear, including development of mechanisms that assist quick and safe removal of trailing gear.
2. The Council will not support any changes to gear or additional closures under the FKWTRP until the updated abundance estimates resulting from the 2017 HICEAS survey is available for review by the SSC and Council.
3. The Council finds that the Southern Exclusion Zone should be considered for removal when the TRP measures are revised as it is not necessary to achieve the goals of the TRP.
4. The Council requests NMFS to forward any TRT recommendations regarding changes to the operation of the fishery (e.g., gear, effort, spatial measures) to the Council for SSC and Council consideration to ensure consistency with the Pelagic FEP and ongoing deliberations of Council actions.

As previously noted, the FKWTRT did not reach consensus on recommendations to modify the FKWTRP at the April 2018 and subsequent deliberations. In lieu of consensus recommendations on management measures, FKWTRT in December 2020 adopted recommendations on non-regulatory aspects focusing on 1) crew training; 2) depredation research; 3) post-hooking mortality research; and 4) data synthesis, which were consistent with the previous Council position statements.

The following sections provide updates and considerations for several key issues that were identified in the Council's previous position adopted in March 2018.

Minimizing trailing gear as a mitigation strategy

The primary impediment to considering trailing gear minimization as a mitigation strategy for false killer whale interactions is the NMFS Serious Injury Determination Policy Directive. Under the current directive, NMFS considers most interactions that result in the animal being released alive with gear remaining in their mouth as a serious injury, which is considered to have the same population impact as a dead animal. NMFS is in the process of reviewing the Serious Injury Determination Policy Directive, which was implemented in 2012 and developed based on a technical workshop convened in 2007.

NMFS recently solicited informal input from FKWTRT members on information to be considered in the review. The Council submitted input in a letter dated January 31, 2022 (Appendix A), which highlighted the following:

- New information is available that would warrant development of a developing SI determination criteria specific to false killer whale interactions in the Hawaii deep-set longline fishery that takes into account gear characteristics, handling methods, and various interaction outcome scenarios based on the latest information, which include:
    - Management measures implemented after the 2007 technical workshop, such as weak circle hooks, associated handling strategies, and transition of wire leaders to monofilament nylon leaders
    - Detailed observer data on false killer whale interactions in the Hawaii deep-set longline fishery, which show that hook is visible around the mouth for a considerable portion of interactions (e.g., 40% in 2021) and suggests that injury could be minimized if tools are available to cut the leader below the weight
- Requested that NMFS review all available literature on odontocete fishery interaction and gear ingestion, as well as all relevant stranding data and necropsy data from Hawaii and worldwide to evaluate the risk of gear ingestion in false killer whales
- Requested that NMFS convene a workshop with the FKWTRT, the Council, and relevant external subject matter experts

Revision of the Serious Injury Determination Policy Directive remains a priority for considering trailing gear minimization as a mitigation strategy for false killer whale interactions.

Updated abundance estimates

At the time of the initial FKWTRT deliberations in 2010, the abundance estimate of the pelagic stock of false killer whales within the EEZ was 484, based on a reanalysis of the 2002 Hawaiian Islands Cetacean and Ecosystem Assessment Survey (HICEAS) data. The resulting potential biological removal (PBR) was 2.5, and the mean annual mortality and serious injury (MSI) inside the EEZ was estimated at 7.3.

The 2010 HICEAS resulted in a higher abundance estimate of 1,540 pelagic false killer whales inside the EEZ, resulting in an increased PBR of 9.3. These estimates became available after the initial deliberations of the FKWTRT in 2010 but before NMFS published the final rule to implement the FKWTRP. At the time of the FKW TRP implementation in December 2012, the 5-year mean annual MSI for the pelagic false killer whale stock was 13.6 individuals inside the EEZ, and 11.2 on the high seas. By early 2018, the latest 5-year (2011-2015) mean estimated annual MSI was 7.5, and the mean estimated annual MSI since the TRP implementation (2013-2015) was 4.1, indicating that the current MSI levels of pelagic false killer whale stock had been reduced below the PBR.

The latest HICEAS survey was conducted in 2017. The newest abundance estimates from the 2017 survey, published in 2020, indicates that the current best estimate of the false killer whale pelagic stock abundance based on a 2017 survey is 2,086 animals, resulting in a PBR of 16 (Oleson 2020). The assessment also updated the abundance from the previous two surveys conducted in 2002 and 2010, now estimated at 2,086 and 2,144, respectively, although the assessment did not explicitly test for population trend (Bradford, 2020). This suggests that the pelagic stock has had a PBR of around 16 since at least 2002, and the Hawaii deep-set longline fishery likely had not exceeded the PBR in the past.

Southern Exclusion Zone

The draft FKWTRT recommendations considered at the April 2018 meeting included a suspension clause for the Southern Exclusion Zone (SEZ) for the duration of the weak hook study, and a potential removal of the SEZ if weaker hooks were adopted as a management measure following the study. However, these draft recommendations did not reach consensus, and the SEZ remains in place.

The SEZ trigger was met for the first time in 2018 since its implementation in 2013. The first SEZ closure lasted from July to December 2018, and the second SEZ closure lasted from February 2019 to August 2020 (Table 3). The SEZ trigger of two MSI was revised in December 2020 based on the new PBR, and the current trigger is four MSI.

Table 3. Southern Exclusion Zone closures.

Closure date	Closure FR notice	Reopening date	Reopening FR notice
July 24, 2018	83 FR 33848 (July 18, 2018)	Dec 31, 2018	n/a (automatic reopening)
Feb 22, 2019	84 FR 5356 (Feb 21, 2019)	Aug 25, 2020	85 FR 50959 (Aug 19, 2020)

In 2021, the deep-set fishery met and exceeded the SEZ trigger, with a total of five MSI observed inside the EEZ. The interactions that met and exceeded the trigger occurred in November and December 2021, respectively, but the SEZ did not close during the calendar year because the serious injury determination process was not completed before the end of the year.

At a FKWTRT teleconference held February 3, 2022, to review the 2021 interactions, several FKWTRT members expressed concern regarding the delay in closing the SEZ and the apparent increase in interactions inside the EEZ. It is likely that FKWTRT will discuss SEZ issues further at the 2022 in-person meeting.

Prior to the FKWTRP implementation, the SSC had recommended implementing the SEZ trigger as a simple cumulative sum scheme, in which MSI and PBR would be expressed as cumulative sum values, and the SEZ closure would be triggered if the cumulative MSI exceeds the cumulative PBR in any given year. Based on this concept, the cumulative MSI inside the EEZ since 2013 has not exceeded the cumulative PBR, either in terms of the historical PBR, or assuming the updated PBR of 16 applies retrospectively given the revised historical abundance estimates (Figure 1).

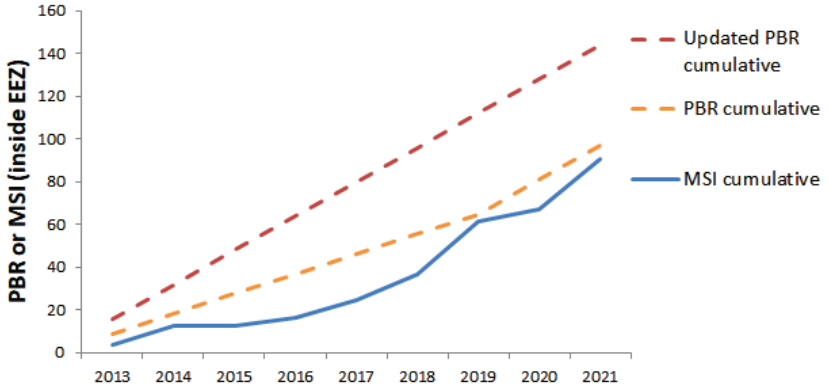

Figure 1. Observed MSI inside the EEZ, historical PBR, and updated PBR expressed as cumulative values since the FKWTRP implementation in 2013.

Western
Pacific
Regional
Fishery
Management
Council

January 31, 2022

Ms. Kristy Long
Office of Protected Resources
1315 East-West Highway
13th Floor
Silver Spring, MD 20910

Dear Ms. Long,

The Western Pacific Regional Fishery Management Council appreciates the opportunity to provide input to the National Marine Fisheries Service (NMFS) on the ongoing review of the Serious Injury (SI) Determination Policy Directive.[1] NMFS solicited input from the members of the False Killer Whale Take Reduction Team (FKWTRT) through a verbal request during a virtual meeting of the FKWTRT convened on October 27, 2021.

As articulated by the Council's representative on the FKWTRT during the October 2021 meeting, we are disappointed that NMFS will not be convening a workshop to review the existing SI Determination Policy Directive. The briefing provided to the FKWTRT was a short update on the process, with no substantial information presented on the review or potential revisions. This falls short of NMFS' commitment to provide opportunities for additional input prior to releasing a draft for public comment for interested constituents through webinars or question and answer sessions.[2] We request that NMFS schedule a webinar or virtual workshop with the FKWTRT, Fishery Management Councils, and relevant external subject matter experts to review the best available scientific information gathered by NMFS staff and discuss potential changes so that meaningful deliberation can take place prior to the release of draft revisions. Broad review and input in the process of revising the SI Determination Policy Directive is warranted given that it has been 15 years since NMFS last convened a technical workshop on marine mammal SI determination in 2007, which provided the basis for the existing policy issued in 2012.

We are also disappointed that NMFS has not prioritized conducting additional research and analyses to improve the understanding of species-specific survival rates of false killer whales following interactions with the Hawaii longline fishery. The FKWTRT identified this need as the second highest priority when it updated the False Killer Whale Take Reduction Plan (FKWTRP) Research Priorities[3] in 2014. FKWTRT again recommended post-hooking mortality research in December 2020, with extensive discussion on this issue at the April 2018 in-person meeting when a draft version of this recommendation was supported by FKWTRT members.

The Council also recommended in 2018 and again in 2019 that NMFS support additional research to obtain scientific information on species-specific post-hooking mortality information to inform revision of the Policy Directive and consider a prorated approach for SI Determination for

[1] Policy Directive 02-038 and Procedural Directive 02-038-01.
[2] Letter from Chris Oliver, NOAA Assistant Administrator for Fisheries, to Council Executive Director, July 10, 2019. *See enclosure.*
[3] https://media.fisheries.noaa.gov/dam-migration/fkwtrt_research_priorities_mar2014_508_opr2.pdf

false killer whales.[4] In response to this recommendation, NMFS indicated that it lacks data to develop prorated outcomes for most small cetaceans, including false killer whales.[5] This response is unacceptable considering that it has been nearly a decade since the FKWTRT prioritized research to evaluate survival of false killer whales and other similar species following fishery interactions.

Notwithstanding the lack of progress in addressing this critical data gap to inform management of false killer whale interactions in the Hawaii longline fishery, we believe that there is sufficient information and expertise available to inform meaningful revisions to the SI Determination Policy Directive. As described below in further detail, NMFS should consider developing SI determination criteria specific to false killer whale interactions in the Hawaii deep-set longline fishery that takes into account gear characteristics, handling methods, and various interaction outcome scenarios based on the latest information that have become available since the 2007 technical workshop. Further we request NMFS to review all available literature on odontocete fishery interaction and gear ingestion, as well as all relevant stranding data and necropsy data from Hawaii and worldwide to evaluate the risk of gear ingestion in false killer whales. These tasks would be best accomplished through a workshop with the FKWTRT, the Council, and relevant external subject matter experts. We would be glad to assist with the coordination of such workshop.

Develop Injury Criteria Considering Gear and Handling Requirements and the Diversity of False Killer Whale Interaction Scenarios in the Hawaii Deep-set Longline Fishery

According to the existing SI Determination Policy Directive, small cetaceans released alive are assigned to SI or non-serious injury (NSI) categories based on the type of injury, amount of gear remaining, and other conditions specific to each interaction. NMFS interprets SI as injury that is more likely than not to result in mortality. Based on this definition, the estimated post-interaction mortality rate for false killer whales that are released alive and the injury level determined to be serious would range between 50 and 100 percent. However, for the purpose of evaluating the impacts of SI against the potential biological removal level, SI is considered 100 percent removal from the population regardless of the injury type and other available information for that interaction, and thus the population-level impact of a SI is considered equivalent to a mortality. It is unlikely that all false killer whales released alive and categorized as SI die from their injuries.

Current guidelines for small cetaceans classify most gear remaining on the animal's head region as SI. Over 90 percent of the interactions since the FKWTRP implementation have resulted in the animal released alive, yet nearly 70 percent of those interactions were categorized as SI and considered to have equivalent impacts to an observed mortality due to varying amount of gear remaining on the animal, mostly in the head region.

The existing SI determination criteria for small cetaceans are limiting development of practical solutions for improving post-hooking survival of false killer whales. For example, if the "weak hook" does not straighten as intended, removing as much gear as possible prior to release to minimize trailing gear that may become wrapped around the body would likely reduce the chances that the animal will die as a result of the injury. However, the policy as currently written provides no incentive to captains and crew members to remove as much gear as possible, because a hook remaining in the mouth (or a hook that is not visible) would likely result in the interaction being categorized as a SI. This concern was echoed by many of the FKWTRT members at its April 2018

[4] Letter from Council Executive Director to Chris Oliver, June 22, 2018; and letter from Council Executive Director to Chris Oliver, April 3, 2019. *See enclosure.*
[5] Letter from Chris Oliver to Council Executive Director, July 10, 2019. *See enclosure.*

meeting. The existing criteria has also hampered development of alternatives to the weak hook strategies for removing as much trailing gear as possible, because the hook would need to be removed from the animal in most cases for an interaction to be categorized as a NSI.

The existing SI Injury Determination Policy Directive was developed based on the technical workshop convened in 2007. At the time, the FKWTRT had not been convened, and interaction details from observer data were limited. As a result, a number of factors specific to the Hawaii deep-set longline fishery that could affect interaction and injury outcomes were not considered during the 2007 workshop. For example:

- The Hawaii deep-set longline fishery has been required to use circle hooks under the FKWTRP since 2013. Circle hooks, compared to tuna hooks previously used in the fishery, are less likely to become hooked in the gut or esophagus, and are more likely to result in mouth hookings.[6]
- The Hawaii deep-set longline fishery uses 15/0 or smaller size circle hooks, which was found to be too small for the gape to hook around the jaw in pilot whales,[7] suggesting that any hook visible around the mouth is likely hooked in soft tissue.
- FKWTRP weak hook requirement necessitates crew to pull on the line to attempt to straighten the hook. The hook may become lodged in the animal's throat or goosebeak as a result of this handling, which may result in a different outcome for the animal compared to if the line was cut close to the mouth without applying tension on the line.
- In 2021, the deep-set longline vessels voluntarily transitioned from wire leaders (0.5-1 meter metal wire placed above the hook and below the weighted swivel) to monofilament nylon leaders. This gear change is also expected to become a regulatory requirement in the near future based on the Council's recommended action,[8] and may facilitate removal of trailing gear from false killer whales. Additionally, ingestion of wire leaders may have different survival outcomes than ingestion of monofilament nylon leaders.

We urge NMFS to convene an expert workshop (including fishery interaction and gear experts) to develop a SI determination criteria specific to false killer whale interactions in the Hawaii deep-set longline fishery that considers gear characteristics, handling methods, and various interaction outcome scenarios based on the latest information including those described above. Particular focus should be placed on cases that currently fall under the "hook(s) in head" (S5a) and "hook(s) confirmed in lip only" categories, which represent most of the false killer whale interactions in the Hawaii deep-set longline fishery, and consider prorated SI categories depending on the handling methods, gear used, or other factors that could increase the animal's chances of survival.

As an example, in six of the 15 observed false killer whale interactions in 2021 (40%), the observer noted that the hook or the crimp located immediately above the hook was visible around the mouth of the animal (Table 1). In all of these cases, the vessels were using 15/0 circle hooks which are likely too small to hook around the jaw, and thus the hook was likely embedded in soft tissue around the mouth. Out of the six interactions, only one resulted in the hook partially straightening and the animal being released without any gear remaining. The remaining five false killer whales were released with trailing gear that could create constricting wraps around the body or could be

[6] Clarke, S., Sato, M., Small, C., Sullivan, B., Inoue, Y. & Ochi, D. 2014. Bycatch in longline fisheries for tuna and tuna-like species: a global review of status and mitigation measures. FAO Fisheries and Aquaculture Technical Paper No. 588. Rome, FAO. 199 pp.

[7] McLellan, B., Authur, L., Pabst, D.A. Testing hook-tissue interactions in pilot whale mouths. Presentation to the False Killer Whale Take Reduction Team, April 2015.

[8] *See* 87 FR 2742 (January 19, 2022)

dangerous if ingested, resulting in SI determinations. In each of these cases, the animal could have been released with minimal training gear if the handling guidance had been to cut the line as close to the mouth as possible, and a specialized line cutter that travels down the branchline was available on board.[9] Such an approach to handling would also simplify the messaging for captain and crew training and consistent with other large protected species and sharks that cannot be brought on board, which is likely to reduce the chances that crew would cut the line in a manner that leaves long trailing gear, as was the case in two of the interactions. However, such outcomes for false killer whales are not likely to be achieved under the current SI Injury Determination Policy Directive that does not consider these fishery-specific circumstances based on the latest scientific and observer data.

Table 1. Interaction details of the six false killer whale interactions in 2021 for which hook or the crimp above the hook was visible around the mouth. Source: Pacific Islands Regional Observer Program data (2021 interaction summary sent to FKWTRT members)

Interaction date	Interaction details	Amount of gear remaining	Injury determination
6/1/21	Deck boss had a very heavy pull on the mainline. Observer saw a false killer whale and observed it to be **hooked in the lip or jaw – hook was seen near the back left corner of the mouth**. The observer did not see any blood or other injuries. The engines were stopped and the crew tied off the line. The whale swam forward and then under the boat, and the **line went slack, and the whale was gone**. The crew **pulled in all the gear including a partially straightened hook**. The whale was not seen again.	No gear remained on the animal	NSI (preliminary)
6/17/21	Crew and observer noticed a whale on the line under water. At first, under the captain's direction, the crew wrapped the line around the rail and **applied tension by maneuvering the boat**. Eventually they stopped, and cut the line, likely due to the amount of time handling was taking (the **interaction lasted 10-15 minutes**) and amount the whale was struggling. The observer could not see the hook, but could **see the hook crimp right outside the mouth**. No other marine mammals were sighted.	The hook, weight, 1-m leader, and 4 feet of branchline remained on the animal after the line was cut.	SI (preliminary)
8/11/21	The crew notified the observer that a whale was on the line. The mainline was very tangled, but there was only one line (the branchline) leading to the whale, the whale was not entangled, only hooked. The observer could **see the shank of the hook in the lower right of the whale's mouth, either in the jaw or lip**. The crew got the captain at the observer's direction, who came on deck and directed the crew to cut the line. No attempt at handling or straightening the hook was made.	The line was cut with the hook, leader, 45g weight, and 2 meters of branchline remaining on the whale.	SI (preliminary)
8/24/21	A false killer whale was observed on the line. It surfaced twice and then dove as deep as it could based on the length of the branchline. It **appeared to be hooked in the mouth, in the lip or jaw area**. The crew cut the line without permission from the captain.	All of the branchline (approx. 12.5m), leader, weight, and hook, remained on the animal.	SI (preliminary)

[9] Caleb McMahan, Hawaiian Fresh Seafood, under a NMFS Bycatch Reduction Engineering Program award, has developed a line cutter prototype that could accomplish this task. Further development on this prototype is warranted to develop a specialized line cutter suitable for use in false killer whale interactions.

9/13/21	The observer and crew saw the whale on line, **hooked in the lip area**. The observer told the crew to notify the captain, meanwhile, the **crew tied off the line**. When they tied off the line, the whale dove and the line snapped at the sleeve.	The leader (0.6m) and hook remained on the whale.	SI (preliminary)
11/19/21	A false killer whale was observed on the line, **hooked in the mouth**. The crew stopped the vessel and pulled the whale alongside the vessel. The captain directed that the branchline be secured to a floatline, and tied off to the vessel. He then **used the vessel to apply tension to the line**. The **line broke at the swivel** before the hook straightened.	The hook, 0.5m of leader, and the weight remained on the animal.	SI (final)

Review All Available Information on Odontocete Fishery Interactions and Gear Ingestion to Refine Key Injury Criteria Relevant to Longline Fishery Interactions

Most false killer whale interactions in the Hawaii longline fishery result in the animal observed with some amount of fishing gear in the mouth, with the location of the hook often not visible. These interactions fall in the category of S5a (hook in head, regardless of presence of gear) or S5b (hook confirmed in lip only) in the existing policy. Current injury determinations for these categories were based mostly on bottlenose dolphin data, and no species-specific data were available for false killer whales at the time the 2007 technical workshop was convened.

The main source of bottlenose dolphin data considered at the 2007 technical workshop are summarized in Wells et al. (2008).[10] The paper reviews 12 cases of fishing gear ingestion. These cases can be summarized as follows:

- 11 cases from stranded carcasses, 1 case from scarring on a free-ranging animal
- In 7 out of the 12 cases, fishing gear ingestion was considered to be cause of death, and of which:
    - 3 had line wrapped around goosebeak (laryngeal spout)
    - 4 involved hook embedded in the mouth, throat, or goosebeak
- In 2 cases, primary causes of death were a shark attack or a stingray barb in lung, but gear was considered to have contributed to mortality
- In 1 case involving a free-ranging animal, it was first observed with large well-healed scars in the angle of the gape of the mouth at age 36 (suggest either ingestion or gear wrapped around the gape); at age 55 (2008) still observed and had records of reproduction
- In 4 cases, non-embedded small hooks were found in the stomach but not considered to be cause of death, suggesting that if hooks are not embedded in tissue, they may not be fatal
- Line wrapping around goosebeak suspected to occur as a result from attempts at regurgitation of gear (repeated cycle or unsuccessful swallowing followed by regurgitation could lead to wrapping)
- Embedded gear has not been observed in free-ranging dolphins in the study area (only in carcasses), suggesting that hooks embedded in throat or goosebeak are typically fatal
- Ingested gear has never been found in more than 600 veterinary examinations of wild-captured bottlenose dolphins during health assessments (including exam of oral cavity, and in recent years insertion of a tube into the stomach to collect small samples of stomach contents for cytology), suggesting that ingested gear are typically fatal

[10] Wells, R. S., J. B. Allen, S. Hofmann, K. Bassos-Hull, D. A. Fauquier, N. B. Barros, R. E. DeLynn, G. Sutton, V. Socha, and M. D. Scott. 2008. Consequences of Injuries on Survival and Reproduction of Common Bottlenose Dolphins (*Tursiops truncatus*) Along the West Coast of Florida. Marine Mammal Science. 24(4): 774–79.

Considering that it has been 15 years since the last technical workshop, we urge NMFS to conduct an expert workshop to review all available literature on odontocete fishery interaction and gear ingestion, as well as all relevant stranding data and necropsy data from Hawaii and worldwide to evaluate the risk of gear ingestion in false killer whales. Such a review should consider, at minimum:

- Hawaii's false killer whale necropsy data, which includes:
    - An animal stranded on the Big Island that had five fishing hooks ingested but determined to have died from natural causes; and
    - A false killer whale that was retrieved dead on a Hawaii deep-set longline fishery that had was found with fishing gear in its stomach that was not from the Hawaii fishery;
- Whether any stranding data of false killer whales or similar sized odontocetes have shown fishing gear ingestion to be the cause of death or emaciation;
- Whether false killer whales, which are larger than bottlenose dolphins, could swallow some amount of fishing gear without having the line wrapped around the goosebeak;
- The effects of gear handling that may cause a fishing hook to become embedded (e.g., as a result of an attempt to straighten a weak hook), compared to cutting the line as close to the mouth as possible in a manner that minimizes the potential of the hook becoming embedded in its throat or goosebeak;
- Whether any stranding records of odontocetes included fishing line in addition to non-embedded hooks (which could suggest that some amount of line could be swallowed without fatal outcomes)

Conclusions

The Council appreciates this opportunity to provide informal input. However, we request that NMFS hold to its prior commitment to provide a more meaningful platform for input that facilitates deliberation and discussion among relevant experts, including FKWTRT and the Council. Further, we request that NMFS convene an expert workshop to review the latest fishery-specific and species-specific information that has become available since the 2007 technical workshop, to inform development of SI determination criteria specific to false killer whale interactions in the Hawaii deep-set longline fishery. We are prepared to assist NMFS with convening an expert workshop in 2022 to inform the revisions to the SI Determination Policy Directive. Please contact the Council's protected species coordinator, Asuka Ishizaki (asuka.ishizaki@wpcouncil.org) to discuss these comments in further detail.

Sincerely,

Kitty M. Simonds
Executive Director

Enclosures

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