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Preliminary Report on the 2019 Swordfish Longline EFP Fishery

Captains David Haworth and John Gibbs

DA Hanan; MG Hinton
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Preliminary Report on the 2019 Swordfish Longline EFP Fishery

Presented to NMFS West Coast Region

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on behalf of Captains David Hayworth and John Gibbs

May 1, 2020

Executive Summary

On April 29, 2019, National Marine Fisheries Service (NMFS) issued two longline Exempted Fishing Permits (EFP) to the fishing vessel owners and operators, for whom we write this report. F/V Southern Horizon began fishing on September 4, 2019, and F/V Pacific Horizon on October 14, 2019. Both boats continued fishing until pausing on December 11, 2019, anticipating the January increase in swordfish (SW) availability off southern California, when we intended to resume longline fishing. The EFPs were granted for two years and allowed for a large number of sets for statistical relevance; however, a court ruling issued on December 20, 2019, vacated the permits, stopped further EFP fishing, and prevented us from completing the two-year EFP. This court order addressed the potential take of a sea turtle.

During three months of fishing, we completed eight trips with a total of 79 sets (59 shallow, 20 deep) fishing 87,292 hooks. The EFP vessels fished in 37 one-degree latitude by one-degree longitudes representing over 169 thousand km^2 (49 thousand nautical-miles^2) outside 50 miles of the coastline but within the US-exclusive economic zone (EEZ). We started fishing to the south and then moved northward off San Francisco to encounter more SW; our last trip ended on December 11, 2019.

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For the analysis, we divided catch into three categories: **target** – one (or more) species that are intended to be caught; **incidental catch** – species that are not targeted but which we kept for market; and **bycatch** – species that were discarded or kept for personal use.

We identified 28 species of fish in the catch. The EFP target species was SW, of which we caught 661 (634 kept, 24 released alive, 3 discarded dead). Incidental catches included 1,033 shortfin mako sharks (379 kept, 615 released alive, 39 discarded dead); 5,227 blue sharks (525 kept, 4,615 released alive, 87 discarded dead); 45 albacore (40 kept, 1 released alive, 4 discarded dead); bigeye tuna (20 kept, none released or discarded); and a combined total of six yellowfin and skipjack tuna (6 kept, none released or discarded). Our bycatch was 255 fish, of which 52 were released alive, 21 kept for personal use, and 70 were discarded dead.

NMFS trained and approved onboard observers monitored all fishing activities. We followed seabird and sea turtle mitigation techniques practiced in the Hawaiian longline fishery. We did not catch any birds, sea turtles, or marlin, but did catch two California sea lions. Although we only fished three months, results suggest a possible fishing method (longline) utilizing west-coast EEZ SW, tuna, and shark resources with reduced bycatch compared to drift gillnet (DGN) fishing.

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Background

A longline is a heavy fishing line often as long as 100 kilometers (60 miles), supported by buoys floating at or near the surface. The depth at which a longline fishes depends on the sag of the mainline between floats, the length of lines attaching the mainline to the floats, and the length of lines (ganion/extender) attaching the hooks to the longline.

The SW stock in the northeast Pacific Ocean (NEPO), which includes the stock in the Exclusive Economic Zone (EEZ) of the United States (US), is harvested by high-seas longline fisheries of Japan and Taiwan, as well as by US-flagged vessels operating out of Hawaii. The results of assessments (ISC 2019, IATTC 2019) of this SW stock are consistent. The SW stock targeted by the EFP and in the US-EEZ is not overfished, it is not being overfished, nor are these conditions likely to occur[3]. Two principal incidental catch species we encountered were blue (BSH, *Prionace glauca*) and shortfin mako (SMA, *Isurus oxyrinchus*) sharks. These stocks also are not overfished, and overfishing is not occurring[4] (ISC 2019).

The 2004 Highly Migratory Species Fishery Management Plan allowed swordfish DGN fishing under partial federal management within the west-coast EEZ off California, but prohibited pelagic longline gear within this region due to bycatch concerns (i.e., mitigation measures employed today in U.S. longlining elsewhere were not proposed in the plan). Despite a healthy west-coast SW stock, managers imposed restrictive time and area fishing regulations on DGN targeting highly migratory species (HMS). They promulgated these regulations to reduce the take of thresher shark, marine mammals, and sea turtles. The regulations had the additional impact of significantly reducing the harvest of SW due to lack of harvest opportunity when they are available to the fishery. As a result, levels of SW catch often do not meet local market demand, and markets import SW from various countries.

When US domestic seafood supply doesn't meet domestic seafood demand, US markets import foreign-caught seafood to meet that demand. Many foreign fisheries do not practice conservation standards required of US fisheries, resulting in a net loss of marine resources

[3] https://www.pcouncil.org/status-of-hms-stocks/

[4] https://docs.google.com/spreadsheets/u/1/d/e/2PACX-1vRFKwwmh09vHj4fYN9V2GasUYruNkatQ7GaJrYFO9zleAbzialH1jOGMln0E80ixkfC7lBdqR8190gF/pubhtml

worldwide. This principle is known as the "transfer effect" and is well quantified and documented (Helvey et al. 2017, Mukherjee 2015, Rausser et al. 2008).

In September 2014, the Pacific Fishery Management Council (PFMC) called for Exempted Fishing Permit (EFP) proposals to test alternative fishing gears to catch SW. The objectives were to evaluate fishing methods that could lead to a fleet of commercial vessels sustainably fishing highly migratory species, while significantly reducing the incidental catch of non-target and protected species in the contemporary DGN fishery.

We submitted an EFP proposal to PFMC that called for the evaluation of both deep- and shallow-set longline gear within the west coast EEZ, but outside 50 miles of shore. We included shallow- and deep-sets to compare catch of SW in the EFP region using traditional SW fishing gear and the deeper-fishing gear used to target large bigeye tuna (BET). The council recommended NMFS issue an EFP to test longline fishing in the U.S. EEZ under a suite of bycatch mitigation measures. NMFS issued the EFPs on April 29, 2019, adding many terms and conditions for the fishing operations (see Appendix I).

Behavior, environmental preferences, and the physiology of swordfish, and some billfish, tuna, and shark species allow the fish to inhabit various depths and water temperatures during day and night. SW have large eyes and brain heating circulation, which enables them to spend time at depth in cold water searching for prey (Fritsches et al. 2005). SW generally make diurnal movements, sounding to several hundred meters just before or at sunrise and rise again at or shortly after sunset. In most regions that they inhabit, there is a significant difference in water temperature between the colder depths at which they spend the day feeding (~4°-6°C [~39°-43°F]) and the much warmer surface mixed layer, where at night they bask and digest food (Takahashi et al. 2003; Sepulveda et al. 2010). In a few regions of the world oceans, the difference in temperature of feeding and surface waters is too small to allow complete digestion during the night-hours. It is in these regions that SW at the surface during daylight hours are most vulnerable to daytime harpoon fisheries (Coan et al. 1998).

For decades the longline fisheries in the Pacific targeted tuna with shallow sets during daylight hours when tuna are actively feeding in the mixed layer. SW catches made with this gear would be considered an incidental catch. In the mid- to late-1970s Japanese longline fisheries developed deep-set longline gear to target large valuable bigeye tuna, which due to

body-heating organs, can inhabit deeper, colder waters well below the warmer, shallower surface waters. Deep-set longlines have fewer floats and more hooks-between-floats on the mainline than do shallow sets, and the use of line shooters for deep sets assists in placing the mainline and hooks deeper in the water column than would gear configuration alone.

A portion of the Japanese fishery has targeted SW with deep sets during daylight hours (Hinton and Maunder 2011) in regions of the eastern Pacific Ocean (EPO) where there were conducive oceanographic conditions and SW distributions. However, this portion of the fisheries remained small in scope and had relatively low catch rates compared to other fisheries for SW. The principal longline fishing technique for swordfish remains shallow-set gear fished at night, and that is the typical fishing method used in US swordfish fisheries. Since shallow-sets fish at night, fishermen also take advantage of the diving patterns of SW. Fishermen deploy hooks in the upper-mixed layer during night hours and also take advantage of SW vision by utilizing fluorescent light sticks attached to gangion/extender lines along the mainline to attract SW and increase encounter rates.

In most fisheries, market value, along with hold capacity, determines catch retention decisions. Fishermen also base retention on other factors, e.g., fuel load, total and available well capacity, the estimated value of catch to date, distance from port, and time at sea (Sun et al. 2016). The skipper's decision whether to retain fish will also depend on their judgment of maximum net return; as a result, the skipper may keep species readily available even if market prices are lower than those of the target species.

Data, Results, and Analyses

General Information and Data Sources

The F/V Pacific Horizon and the F/V Southern Horizon conducted all fishing operations. Each trip carried NOAA trained and approved scientific observers.[5] They were responsible for recording the information needed to accomplish this EFP, including date, time, and location of all fishing events, following procedures outlined in the Hawaii longline observer field manual (NMFS 2017). They also recorded details on the vessel and gear characteristics, including vessel well capacity, the number of hooks and floats used during a set, catch and disposition of catch, and all interactions with protected species. Data also included fish condition at retrieval: alive or dead; and disposition: kept, released alive, or discarded dead. For our analysis, in cases of missing disposition data, we assumed fish released alive were living at retrieval, and we considered those with no disposition information to be dead discards. Though there were occasional missing data in a number of the data fields, we used all records with complete data for specific analyses in our study.

We compiled landings data from sales records (fish tickets) for each trip; however, sales record formats were inconsistent. The vast majority of landings had no condition indicated, and in those cases, we assumed that buyers purchased all fish for the same price. Records showed variations in price across date landed. On most records, the price paid for landings, particularly those of SW varied by condition and by categories of fish size. This variation held for some landings of tuna and sharks. We computed price-per-pound by species for each landing receipt as the weighted-average price.

Protected species

These EFP operations had little to no impact on sea birds, turtles, or marlins. We either encountered none or, if observed (sea birds recorded as present), there was no interaction or catch. Please see Appendix I, pages 3-7, for details of avoidance measures. For example: to discourage or distract seabirds from diving on the baited hooks, we towed tori lines with ribbons

[5] Observer expenses were paid under contract to Frank Orth Associates by Hanan & Associates and by the NMFS. Hanan & Associates paid $50,000 from their NOAA Bycatch Reduction Engineering Program grant. The remainder of the observer costs were paid by NMFS.

of surveyor's tape attached, and we used line shooters to send the baited hooks away from the boat and cause the lines to sink faster during sets. We also followed other seabird mitigation techniques practiced in the Hawaiian longline fishery, such as floating boxes of offal and blue-dyed mackerel bait (see Appendix I).

The only marine mammals with which our fishing interacted were two California sea lions in two separate incidents. We hooked the first on the back of the neck. During gear retrieval, the hook dislodged, and the sea lion swam rapidly away from the vessel. We caught the second California sea lion in the lower jaw. Deckhands attempted to remove the hook using a dehooker, however when that failed, they cut the line, and the sea lion swam away with less than a foot of trailing monofilament line.

It is difficult and probably not appropriate to compare three months of longline fishing bycatch to many years of DGN bycatch. Hanan et al. (1993) report 14 marine mammal and two sea turtle species caught in DGN from 1981 through 1991. Julian and Beeson (1998) estimated 29 different marine mammal, three sea turtle, and one unidentified sea bird species mortalities in DGN for six years (1990-1995). Carretta et al. (2019) report 19 marine mammal taxa and one sea bird taxa bycatch in 29 years of DGN fishing.

Live releases of sharks

Our deckhands followed well-defined handling procedures (also used for other live-caught incidental or bycaught species) that emphasize shortening the time that a live shark, intended to be released, is kept at the surface or on deck. We used de-hookers, but if they couldn't de-hook the shark, they used line cutters to cut the line as close as possible to the hook. Deckhands did not remove most BSH from the water (skippers' estimated 67%); instead, the deckhands de-hooked them in the water next to the ship. They raised some smaller BSH onto the vessel, de-hooked them, and returned them to the sea alive. We assume a high survival for these released sharks (Hutchinson and Bigelow 2019), especially considering the handling procedures that we followed.

Effort

The EFP designated fishing area was within the US 200-mile EEZ offshore of California, outside 50 miles of shore and some restricted regions (Appendix I, Figure 1). Vessels fished in 37 different one-degree latitudes by one-degree longitudes (1x1; 49,373 square nautical miles or 169,344 km^2) areas. Vessel fishing locations were confirmed to be within the United States EEZ (Pers. Comm., R. Sarazen, IATTC 200 mile program, March 31, 2020). Sets were made in an area running relatively parallel to the coast of California and in general along with the interface of the relatively cold southern flowing California Current and the warmer North Pacific gyre from 30°N to 40°N (Fig E-1).

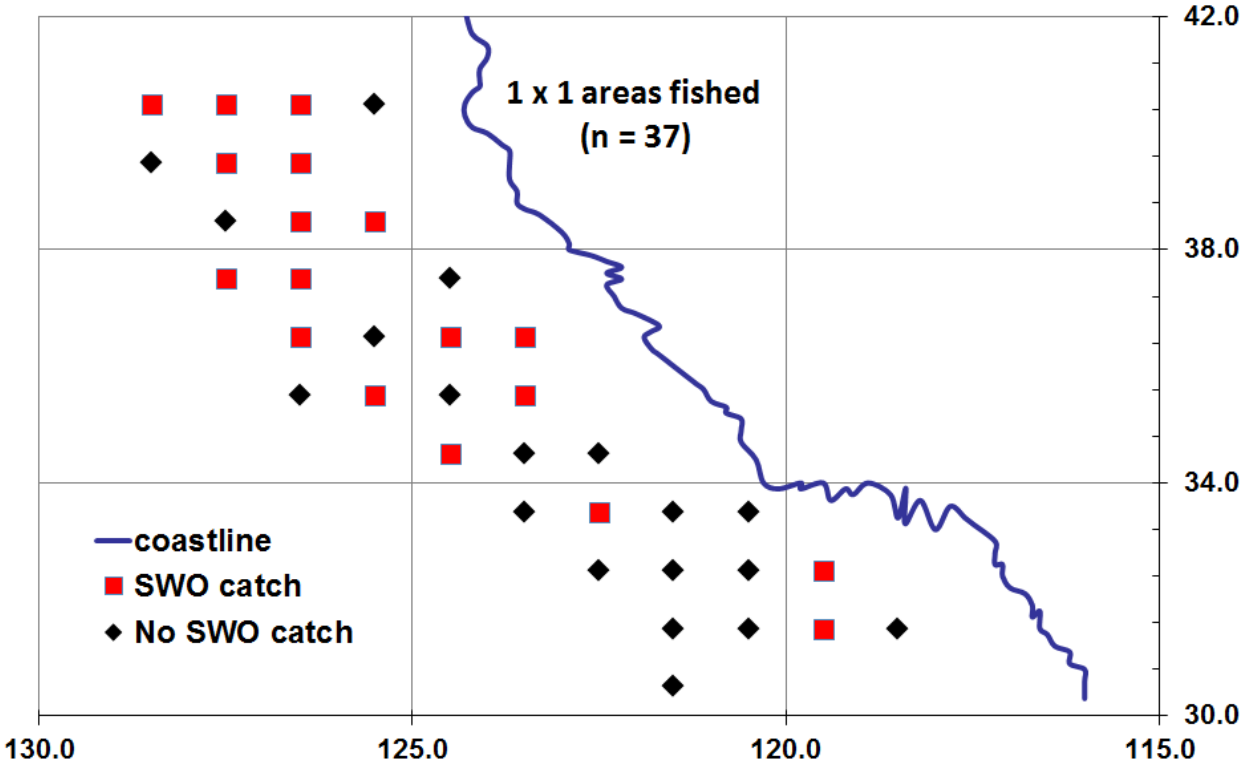

FIGURE E-1. Areas fished by one-degree squares and locations of SW catch.

From September 5, 2019, to December 11, 2019, we completed eight trips during which we made 79 sets (20 deep and 59 shallow) and fished 87,292 hooks. We set 16 of the 20 deep sets during the day, as are sets for tuna. Most of these 16 deep sets were made between 0600-1300 hrs, though most were between 0900-1000 hrs. The remaining four deep sets were made at

or shortly after 1500 hrs. and fished during the night. Of the 59 shallow sets, only two fished during the day as would be a set for tuna. We set these at 0600 and 0800 hrs. (Figure E-2). The average trip length was 17 days (range 11 to 22). There was no significant difference ($p <= 0.7$) between the average trip lengths of the two vessels. Each vessel usually made one set per fishing day. Sets-per-trip ranged from 7 to 14 and were positively correlated ($p < 0.01$) with trip length.

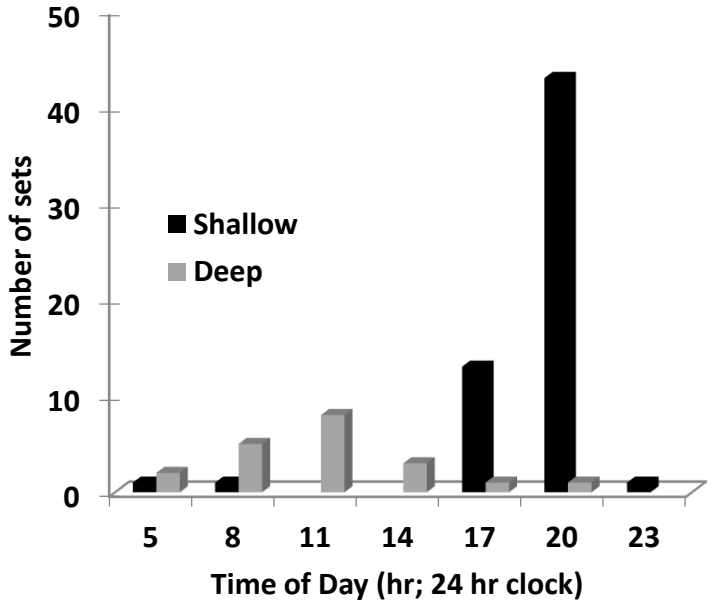

FIGURE E-2. Sets by set type and time of day.

EcoCast

We attempted to use EcoCast to inform decisions on fishing locations. Both vessels had difficulty connecting to the EcoCast website while at sea, and as a result, had no direct real-time information from EcoCast. We also tried emailing the EcoCast charts to the vessels but were not successful mainly because of file size. Skippers made calls to shore via satellite phone to try and obtain EcoCast information, including calls to spouses and Dr. Hanan, but this proved inefficient, and skippers stopped our attempts to use EcoCast.

Catch

We identified 28 species of fish in the catch (Table C-1). This table does not include data from catch records without valid species codes or those with missing or inconsistent retrieval or disposition codes. It also does not contain mahi-mahi (*Coryphaenus* spp.), for which a sale of 55 lbs. appears on a fish sales ticket.

TABLE C-1. The number of fish caught by species, retrieval condition (alive or dead), and disposition (released alive or discarded dead).*

Species	Retrieved Alive	Disposition			Retrieved Dead	Disposition	
		Kept	Release Alive	Discard Dead		Kept	Discard Dead
Albacore	20	18	1	1	25	22	3
Bigeye Thresher	1		1		1	1	
Bigeye Tuna	14	14			6	6	
Blue Shark**	4655	35	4615	5	572	490	82
Bluefin Tuna					1	1	
Brama Promfet					2		2
Bullet Mackerel					1	1	
Common Mola	8		8				
Common Thresher	23	8	9	6	10	10	
Escolar	2	2			2	1	1
King of the Salmon	1			1			
Lancetfish	27		24	3	42	3	39
Longfin Mako	1		1				
Oilfish	21		21		1		1
Opah	68	60	8		77	74	3
Pacific Fanfish					1		1
Pacific Pomfret	2		2				
Pelagic Stingray	6		6				
Rough Pomfret	2		2				
Rough Triggerfish					1		1
Ribbonfish NEI***	1		1		3		3
Ribbonfish, Scalloped	1		1				
Ribbonfish, Tapered	42	6	33	3	85	85	
Shortfin Mako	771	156	615		262	223	39
Sickle Pomfret	1		1				
Skipjack Tuna					2	2	
Swordfish	302	278	24		359	356	3
Thresher NEI***	1		1				
Velvet Dogfish					1	1	
Yellowfin Tuna	1	1			3	3	
Total	5954	564	5374	19	1448	1273	175

* Does not include records with invalid species code.

** Does not include one blue shark without information on retrieval, release or discard. Includes as discarded dead one shark with retrieval code dead and release code alive.

*** NEI: Not elsewhere included. Shown here for counts of fish but not in number of species.

BSH was the most significant incidental catch by number (5,227), and of these, we retrieved 4,655 (89%) alive. Studies show that longline catch and release has very low mortality for BSH (Hutchinson and Bigelow 2019). Musyl et al. (2011) reported: "Meta-analysis of published reports and the current study (*n*=78 reporting PSATs) indicated that the summary effect of post-release mortality for blue sharks was 15% (95% CI, 8.5–25.1%) and suggested that catch-and-release in longline fisheries can be a viable management tool to protect parental biomass in shark populations." This EFP released 4615 (99%) of the BSH retrieved alive, kept 525 (35 retrieved alive, 490 retrieved dead), and discarded 87. In this EFP, some sharks, particularly the highly abundant BSH, were retained and sold as we were trying to establish and maintain that market. In Table C-2, we show the catch and discards of economically valuable species in our fishery based on retention rates and the number of fish retained by shallow- or deep-set. Our bycatch (Table C-3) was 255 fish, of which 96 were released alive, 29 retained for personal use, and 130 were discarded dead.

TABLE C-2. Catch of economically valuable species, and catch-per-set (CPS) by deep- and shallow-set longlines.

Species	Retained (n / %)		Discard	no. Deep	no. Shallow	CPS* Deep	CPS* Shallow
Albacore	40	89	5	7	38	0.4	0.6
Bigeye Tuna	20	100	0	2	18	0.1	0.3
Bluefin Tuna	1	100	0	--	--	--	--
Swordfish	634	96	27	53	608	3.1	9.8
Yellowfin Tuna	4	100	0	--	--	--	--
Opah	134	92	12	46	100	2.7	1.6
Blue Shark	525	10	4,702	901	4,326	53.0	69.8
Mako Sharks	379	37	655	63	971	3.7	15.7
Thresher Sharks(pooled species)	19	53	17	7	29	0.4	0.5

Table C-3. Catch and discards of bycatch by species, set type, and disposition.

Species	Catch	Discarded		Kept
		Dead	Alive	
DEEP SETS				
Brama Pomfret	2	2	0	0
Bullet Mackerel	1	0	0	1
Common Mola	4	0	4	0
Escolar	3	0	0	3
Lancetfish	11	10	1	0
Oilfish	12	0	12	0
Pacific Fanfish	1	1	0	0
Pacific Pomfret	4	0	0	4
Ribbonfish NEI*	3	2	1	0
Rough Pomfret	2	0	2	0
Scalloped Ribbonfish	1	0	1	0
Tapertail Ribbonfish	68	45	23	0
Total Deep	**112**	**60**	**44**	**8**
SHALLOW SETS				
Common Mola	4	0	4	0
Escolar	1	1	0	0
King-of-the-Salmon	1	1	0	0
Lancetfish	58	22	23	13
Oilfish	10	1	9	0
Pelagic Stingray	6	0	6	0
Ribbonfish NEI	1	1	0	0
Rough Triggerfish	1	1	0	0
Sickle Pomfret	1	0	0	1
Tapertail Ribbonfish	59	43	10	6
Velvet Dogfish	1	0	0	1
Total Shallow	**143**	**70**	**52**	**21**

***** NEI – not elsewhere included

Biological data

Scientific observers collected biological data from catch samples following procedures outlined in the Hawaii longline observer field manual (NMFS, 2017). The number of samples taken was sufficient to present size distributions of catch for BSH, SMA, LAG (opah), and SW.

We compared statistics for catch distribution by fishing depth on deep and shallow sets (Figure BD-1). Control of fishing depth is accomplished principally by putting more (deep), or

less (shallow) mainline between floats. The number of hooks between floats (HBF) describes the configuration of the longline because they attach at set intervals along the line. The higher the HBF, the greater the length of mainline between floats, and the deeper the longline fishes in the water column. We made shallow sets with HBF between 3 and 7, and deep sets with HBF between 13 and 25. We calculated the approximate depth of hooks on the line using a mathematical model (Suzuki et al. 1977). We assumed that all hooks on shallow sets were equally likely to hook a fish. Based on the model, the number four hook on a set with HBF = 7 fishes at a depth deeper than that of all other hooks fished on shallow sets. We used this depth to estimate which hooks on deep sets were shallower than the relative depth of the number four hook on the HBF = 7 set. We did not try to calculate the actual depth of individual hooks; instead, we used the model to estimate relative fishing depths of hooks. The real fishing depth of longline hooks deviates from the model due to current shear and internal waves and as well gear design, e.g., mainline material. Only sets with HBF <= 7 and HBF = 15 had sufficient numbers of sets and hooks to estimate catch rates and comparative statistics by HBF.

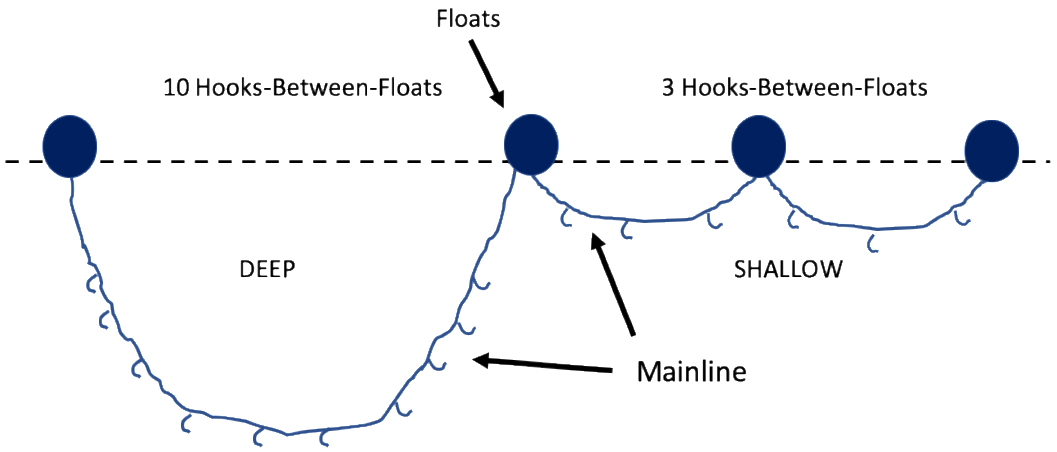

FIGURE BD-1. Illustration of deep (10 HBF) and shallow (3 HBF) configuration longline gear. Note extender/ganion lines not included to simplify the illustration.

SW

We caught 661 swordfish in 63 (80%) of 79 sets and 18 (49%) of 37 one-degree latitude by one-degree longitude (1x1) square areas fished (Table SW-1). In the 18 1x1 areas where we caught SW, we deployed 61,133 hooks (70 % of total hooks fished). We set sixteen deep sets (28,952 hooks, 33% of total hooks fished) as daytime typical of tuna sets. Since SW shoal during

nighttime hours, we did not expect high catch rates on these deep sets. On these sets, we caught only 53 swordfish (8% of the total catch of SW), along with nine tuna, and many sharks and opah (LAG, *Lampris guttatus*) (TABLE SW-2) all of which, we sold. The catch-per-set for deep daytime sets was about 3.1 SW, about one-third the catch rate (9.8 fish) of shallow night sets.

TABLE SW-1. Swordfish catch (numbers) and hooks fished in 1x1 areas with swordfish catch > 0.

North Latitude	West Longitude	Catch	Hooks
31	119	3	725
32	119	1	1520
33	122	2	725
34	124	2	1678
35	123	3	765
35	125	5	1826
36	123	2	595
36	124	4	1432
36	126	6	1776
37	126	16	1460
37	127	7	725
38	125	60	5917
38	126	49	4047
39	126	76	5512
39	127	113	9791
40	126	136	8581
40	127	164	11788
40	128	12	2270

TABLE SW-2. Catch by species from twelve tuna sets.

Species	Number
Albacore	7
Bigeye Thresher Shark	1
Bigeye Tuna	2
Blue Shark	761
Brama Pomfret	2
Common Mola	4
Common Thresher Shark	6
Escolar	1
Lancetfish	11
Longfin Mako Shark	1
Oilfish	11
Opah	79
Pacific Hake	1
Ribbonfish NEI*	3
Rough Pomfret	1
Scalloped Ribbonfish	1
Shortfin Mako Shark	54
Swordfish	53
Tapertail Ribbonfish	65
Unidentified Shark	2

***** NEI: Not elsewhere included

We used eye-fork length (EFL) measurements (n = 583) from swordfish to estimate the weight frequency distribution of the swordfish catch. We obtained dressed weight (kg) from length measurements using the relationship:

Round weight (kg) = $aEFL^b$ where a = 7.96012e-6, b = 3.1307, EFL = eye-fork-length (cm) (from Table 3, Uchiyama et al. 1999)

Table SW-3 and Figure SW-1 provide the number of fish sampled by observers by 20 cm length bins and estimated dressed weight for the midpoint length of each bin.

TABLE SW-3. Estimated round weight (RW) and eye-fork-length (EFL) of swordfish caught in the EFP by 20 cm length bin.

EFL (cm)	RW (kg)	No. of fish
80	9	1
100	18	4
110	24	9
120	32	23
130	41	25
140	51	58
150	63	71
160	77	86
170	93	98
180	111	74
190	131	55
200	154	34
210	178	28
220	206	14
230	236	2
240	269	1

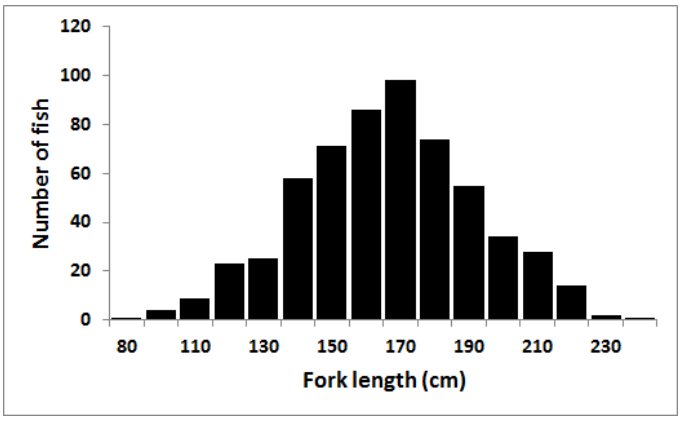

FIGURE SW-1. Size-frequency distribution of SW (both sexes) caught in the EFP. On-board observers took all measurements.

BSH

The area of our catches is a region frequented by subadult BSH (Nakano and Stevens 2008). We found that of the length measurements taken by observers, fork-length (FL, cm), and

approximate length (AL, ft.), only FL was sufficiently precise to allow an analysis of size distributions by sex. We compared measures of FL and AL of 311 BSH males and 167 females. There was a significant difference ($p < 0.01$, t-Test and z-Test) between their distributions. Mean FL of males was 143 cm, and females, 132 cm (Figure BSH-1). We obtained AL from 1,447 BSH (males n = 960, females n = 487). There was no significant difference ($p < 0.44$, t-Test and z-Test) in the distributions of AL of males (n = 960) and females (n = 487). We pooled male and female measurements of AL (ft.) and converted them to centimeters. We present them below (Figure BSH-2).

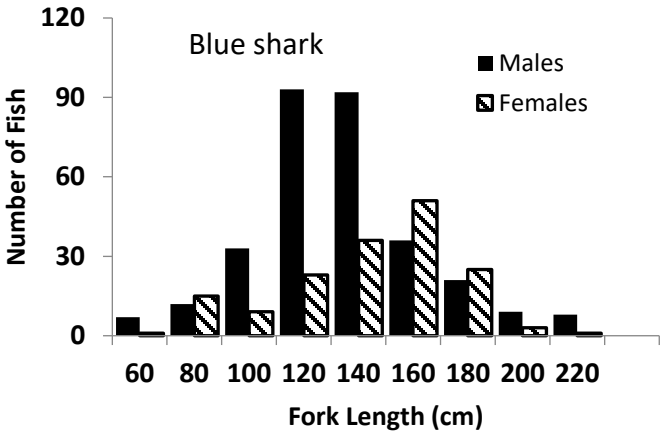

FIGURE BSH-1. Distributions of fork-length (cm) of male and female BSH caught by longline operating under the EFP. On-board observers took all measurements.

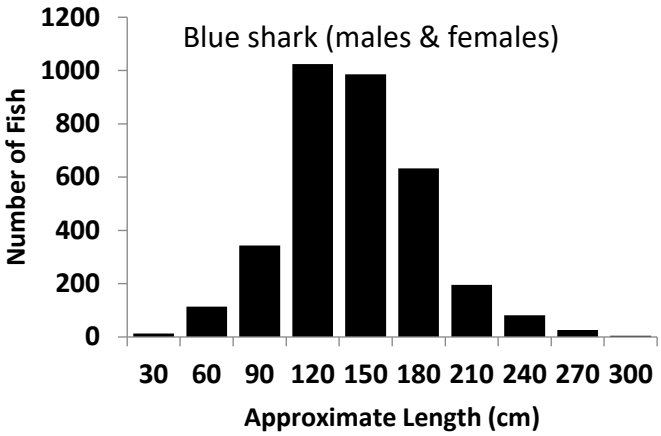

FIGURE BSH-2. Distribution of pooled male and female approximate lengths of BSH taken by EFP longline. Approximate length estimated to the nearest ft. by on-board observers. The original measure, ft., was converted using 1 ft. = 30.48 cm.

There were 5,105 records of BSH catch from shallow (4,232) and deep (873) sets for which the number of floats, numbers of HBF, and the hook number within HBF are known. Primarily, BSH inhabit the upper levels of the water column throughout the day and are most active at night. We caught most BSH (83%) on shallow sets at night. We show the distribution of BSH by hook number for deep sets in Figure BSH-3, and we note that even during daylight hours, we caught BSH primarily on the more shallow hooks.

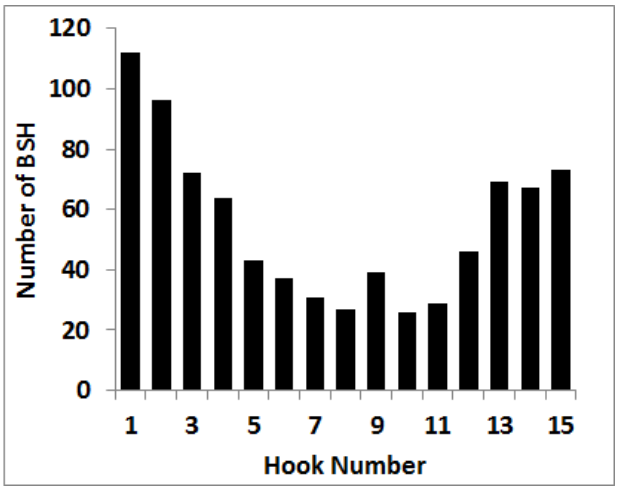

FIGURE BSH-3. Distribution of BSH catch by the hook on sets with HBF = 15.

BSH & SW

Catch rates of both BSH and SW were highest in shallow sets, with a 0.14 ratio of SW to BSH. The number of shallow hooks, complete sets, and total hooks is shown in Table BSH-1, along with catch and catch rates of BSH and SW by HBF.

TABLE BSH-1. Comparison of BSH and SW by hooks between floats.

HBF	Shallow Hooks	Sets	Total Hooks	BSH	BSH per 100 Hooks	SW	SW per 100 Hooks	SW per BSH
3 – 7	All hooks	59	50,136	4,326	8.6	608	1.2	0.14
13	1-3, 11-13	1	1,875	32	--	8	--	
15	1-2, 14-15	14	25,009	833	3.3	44	0.2	0.05
16	1-2, 15-16	3	5,712	4	--	1	--	--
20	1-2, 19-20	1	2,060	6	--	0	--	--
25	1-2, 24-25	1	2,500	2	--	0	--	--

-- Insufficient sample size

-- Insufficient sample size

Nakano and Stevens (2008) provide a detailed review of the biology and ecology of BSH. Of all pelagic sharks, BSH is the best-studied, with most published information relating to the Atlantic and North Pacific populations. BSH are epipelagic and found in all oceans with numbers increasing with latitude, and they prefer waters with temperatures greater than 12°C. Using

acoustic telemetry, Carey et al. (1990) found that BSH move between surface water and deep water on feeding excursions during daylight hours. These movements from the upper mixed layer to several hundred meters depth occur every few hours. At night the sharks remain in the upper mixed layer, moving between the near-surface waters and the thermocline. Since SW make diurnal movements, shoaling during hours of darkness, SW and BSH distributions overlap in the shallower epipelagic waters during the night. During daylight hours, SW typically dive to depths of several hundred meters, below the depths of deep longlines, to reach the water with temperatures of 3-6°C (Takahashi et al. 2003), where they feed until shoaling as darkness falls. As a result, SW and BSH habitat overlaps during night hours, when both are in near-surface waters, but not during the day, when BSH are shallow, and SW are deep.

Our findings that the EFP fishermen caught BSH in the shallow waters is consistent with previous studies of BSH catches in shallow-set longline fisheries. With deeper fishing longlines, the hooks nearest the floats and thus the shallower hooks had the highest catch of BSH (e.g., Figs. 8 & 9 in Kanaiwa et al. 2008).

Nakano and Stevens (2008) noted that BSH is very resilient to fishing pressure due to their "widespread distribution, high initial abundance, and moderate productivity" and that they are a major bycatch of tuna longline fisheries, which are daytime fisheries. They further noted that there is no apparent indication of overfishing impact from fisheries on BSH populations.

The most recent stock assessment of BSH (ISC 2019) found that the BSH in the north Pacific (including the US-EEZ) is not overfished, nor is overfishing occurring. That condition is expected to continue into the foreseeable future. The recent US and international longline fishing effort is 38 percent below that needed to reach maximum sustained yield (MSY), and spawning biomass is 69 percent higher than it needs to be to produce MSY harvests. Thus there is no conservation concern with developing a market for BSH catch from the US-EEZ off California.

SMA

We compared measures obtained by observers of Fork-Length (FL, cm) and Approximate-Length (AL) of SMA males and females. We obtained Fork-length from 202 males and 128 females. There was a significant difference ($p < 0.01$, t-Test and z-Test) between their size-frequency distributions. The mean FL of males was 147 cm, and the mode was 145 cm; and

for females, the mean was 128 cm, and the mode was 137 cm (Figure SMA-1). We obtained approximate-length from 124 SMA (males n = 88, females n = 36). There was no significant difference (p <= 0.3, t-Test and z-Test) between the size-frequency distributions of AL (ft.) of males and females. We pooled male and female measurements of AL (ft.) and converted them to centimeters. We present them below (Figure SMA-2). Mean AL of SMA was 109 cm, and mode, 91 cm. We found, as with BSH, that only FL was sufficiently precise to allow an analysis of size distributions by sex.

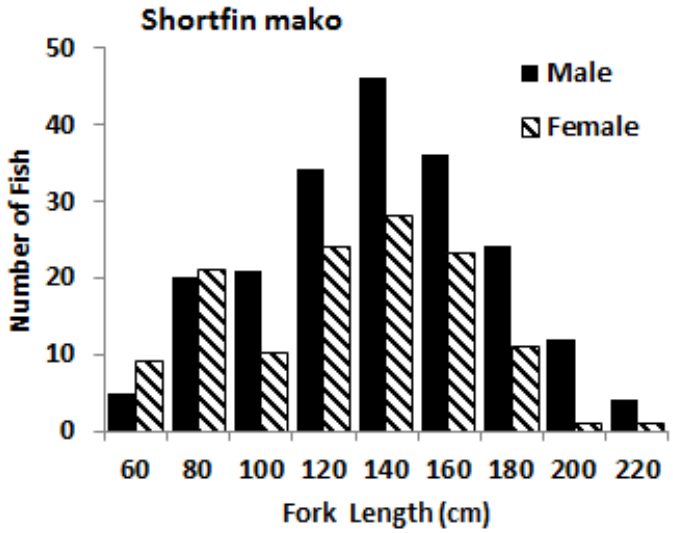

FIGURE SMA-1. Distributions of fork-length (cm) of male and female SMA caught by longline operating under the EFP. On-board observers took all measurements.

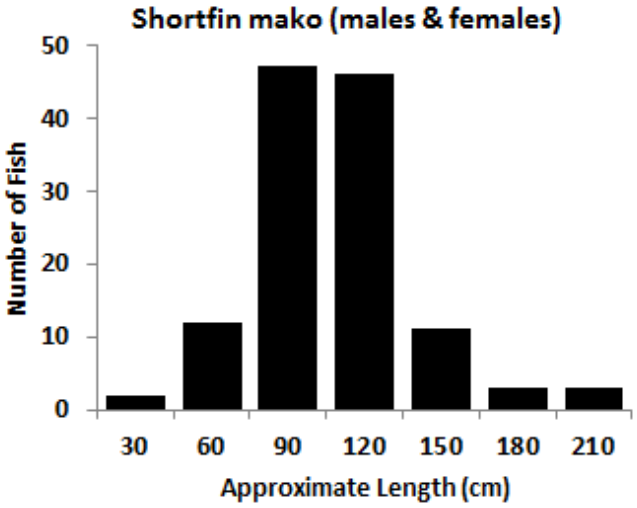

FIGURE SMA-2. Distribution of pooled male and female approximate length of SMA taken by longline operating under the EFP. Approximate length estimated to the nearest ft. by on-board observers. The original measure, ft., was converted using 1 ft. = 30.48 cm.

There were 992 records of SMA catch from shallow- (930) and deep- (62) sets for which we knew the number of floats, the number of hooks between floats (HBF), and individual hook number. HBF on shallow sets ranged between 3 and 7, and on deep, between 13 and 25. We calculated the approximate depth of a hook using a model (see BSH section above).

We show catches of SMA and SW for shallow hooks. Only sets with HBF <= 7 and HBF = 15 had sufficient numbers of sets and hooks to estimate catch rates and comparative statistics (see *Biological data* above). We present the catch and catch rates of SMA and SW by HBF in Table SMA-1. Catch rates of both SMA and SW were highest in shallow sets, which had a ratio of SW to SMA of 0.7. The ratio of SW to SMA is higher (2.4) on the deep (HBF = 15) sets, but the total catch of SMA (18) and SW (44) on deep hooks was insignificant compared to catch (SMA 930 and SW 608) on shallow hooks.

Table SMA-1. Comparison of SMA and SW by hooks between floats.

HBF	Shallow Hooks	Sets	Total Hooks	SMA	SMA per 100 Hooks	SW	SW per 100 Hooks	SW per SMA
3 – 7	All hooks	59	50,136	930	1.9	608	1.2	0.7
13	1-3, 11-13	1	1,875	2	--	8	--	
15	1-2, 14-15	14	25,009	18	0.1	44	0.2	2.4
16	1-2, 15-16	3	5,712	2	--	1	--	--
20	1-2, 19-20	1	2,060	1	--	0	--	--
25	1-2, 24-25	1	2,500	0	--	0	--	--

-- Insufficient sample size: number of sets & hooks

Stevens (2008) provides a detailed review of the biology and ecology of SMA. SMA are pelagic in all oceans. Fishermen value them for both meat and fins, and recreational fisheries target them in some locales. However, the main catches of SMA are by high-seas longline

fisheries for tunas and billfishes. These sharks have been found from the surface to a depth of 600 m, though they prefer waters with temperatures higher than about 55°F (13°C) (J. D. Stevens unpublished data, Stevens 2008). Juveniles spend the majority of their time in the upper mixed layer (Holts and Bedford 1993). We caught the majority of SMA (930 of 953) in shallow sets.

SMA show sexually dimorphic growth, with females reaching larger sizes than males. Francis and Duffy (2005) estimated that the size at maturity for male SMA at about 185 cm fork-length (FL), and for females, about 280 cm. The average FL's in our samples were: males, 147 cm (range, 56 to 236), and females, 128 cm (range, 62 to 222). This result indicates that the majority of the SMA we captured were juveniles.

Since SW undertake diurnal movements, shoaling during hours of darkness, SW and SMA distributions overlap in the shallower mixed layer waters that we fished during the night.

Stevens (2008) noted that there was no indication of a significant impact of fisheries on SMA. The most recent stock assessment of SMA (ISC 2019) found that SMA in the north Pacific (including the US-EEZ) is not overfished, nor is overfishing occurring. Thus there is no conservation concern with SMA catch from the US-EEZ off California.

LAP

We show fork-length measurements by observers from 138 opah (LAP) in the length-frequency distribution graph below. The sizes ranged from about 75 cm to 130 cm and averaged about 103 cm.

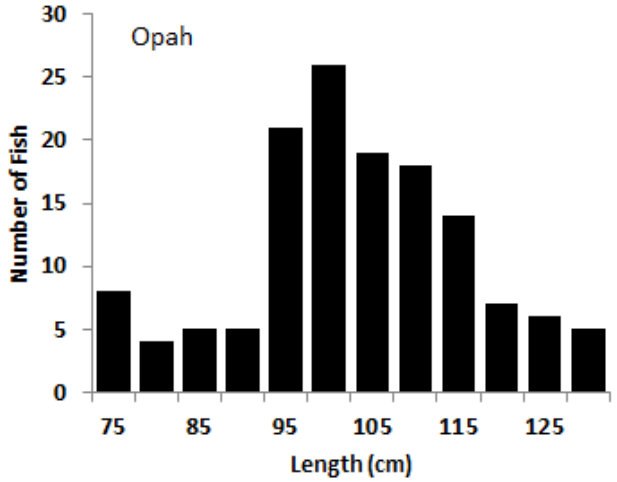

FIGURE LAP-1. Distribution of fork-length of opah caught in the EFP. On-board observers took all measurements.

Economics

The total dockside value of EFP landings was about $340,000 produced from eight fishing trips with the average gross return from a fishing trip of approximately $42,500, with about $36,000 from SW landings. The cost per trip based on expenses presented by EFP holders averaged about $30,000. Costs per trip included: insurance, fuel/oil, gear (hooks, line), light sticks, bait, groceries, maintenance supplies, ice, Telauris, Infostat, Digitalglobe, crew (5) wages, and captain/skipper wages.

Landings of SW provided 85 percent of the value of landings, followed distantly by LAG (5%), and SMA (4%). Other species each provided two percent or less of the value of total landings.

Table EC-1. Total landings and value by species sorted by decreasing dollar value.

Species	Landings (lbs.)	Value (USD)	Percent of Total Value
Swordfish	91,611	$288,385	85
Opah	15,217	$18,614	5
Mako shark	17,670	$14,275	4
Thresher shark	7,352	$5,758	2
Blue shark	21,638	$5,009	1
Bigeye tuna	709	$3,373	1
Yellowfin tuna	489	$2,299	< 1
Bluefin tuna	258	$1,419	< 1
Escolar	260	$520	< 1
Albacore tuna	206	$412	< 1
Mahi-mahi*	55	$96	< 1

* Appears only on fish-ticket

SW was nearly always landed by weight-category, with fish in the 100 to 300-pound range dominating by weight, USD per pound, and total value. We tabulated landings of SW by size-range, pounds landed, total dollar value, and unit price in the following table, EC-2.

Table EC-2. Landings of swordfish

Size range (lbs.)	Landings (lbs.)	Value (USD)	USD/lbs.
25-49	88	$158.00	$1.80
50-69	513	$1,200.00	$2.34
70-99	2629	$6,575.89	$2.50
100-300	47953	$154,643.77	$3.22
300+	20691	$56,709.75	$2.74

Discussion and Recommendations

To focus on swordfish availability, improve the catch of swordfish, our EFP fishermen would have preferred to start the fishing season as far north as Oregon, include the Pacific Leatherback Conservation Area (PLCA), but fish outside the Leatherback Critical Habitat. Hanan et al. (1993) reported that the DGN fishery annually moved northward in the spring and then progressed southward during the fishing season as SW moved southward, finishing the fishing season, usually in January off Southern California. We planned this EFP to last for two fishing seasons. It was cut short by court order on December 20, 2019, which vacated the EFPs based on the possible take of a leatherback sea turtle. Clearly, a second fishing season would have improved our ability to assess this potential fishery.

An objective of this EFP was to test if longline fisheries for SW could operate with lower bycatch than DGN. We caught six species of shark and ray, including the catch of the incidental species, blue, mako, and thresher sharks; and the bycatch species, velvet dogfish shark, and pelagic stingray. Hanan et al. (1993) reported that the DGN fishery caught at least 19 species of shark and rays taken incidentally between 1981 and 1991, including the giant manta (*Manta birostris*) and the megamouth- (*Megachasma pelagios*) and great white- (*Carcharodon carcharias*) sharks. They also report the DGN fishery by-caught marine mammals and two sea turtle species, while catching and selling 21 species of fish. Incidental catch and bycatch can usually be released alive from longline because they are free to swim about with oxygenated

water passing over their gills (Hutchinson and Bigelow 2019), as opposed to being wrapped in netting and usually dead, when caught in DGN.

We caught 7,402 fish (5,954 alive and 1,448 dead) and only discarded 194 of the dead fish (Table C-1). We released 5,374 (90%) of the 5,954 individuals retrieved alive when brought to the side of the vessel, and we kept 88% of the 1,448 individuals that were retrieved dead. Our highest living incidental catch was blue shark, of which 88% were alive, and we released 99% of those. In total, we kept 10% of the total catch of BSH for the market. Marlin catch was a concern for this EFP, but we did not catch any. We caught and released two California sea lions alive. We conclude that the EFP incidental- and by-catch was much lower than DGN, likely we could have done more robust statistical analysis if allowed to fish a second fishing season.

Of the three fish species with the highest numbers in our catch, assessments (ISC and IATTC) of stocks for swordfish, blue shark, and shortfin mako shark indicate none are overfished or being overfished. Swordfish and shortfin mako are of high value to the fishery and the market, while blue shark is a developing fishery. With only three months of fishing, this EFP shows longline to be a profitable fishery with little by-catch and swordfish catches of the highest quality.

For future consideration we recommend:

1. Because of the high quality of longlined SW, work with markets to improve local demand and reduce shipping costs before and during the fishing season.
2. Take advantage of the live-released BSH by tagging a high percentage to better understand survivorship, as well as, movement and basic biology of the species.
3. To reduce incidental catch further explore the depth of shallow sets and the catch of BSH.
4. To increase SW catch, allow fishing in the PLCA and off Oregon early in the fishing season.
5. Locate regions where SW and BSH distributions do not overlap using habitat and biological data (EcoCast).
6. Find a way to get EcoCast data to the vessels. Perhaps augment funding to increase email file size delivered to the vessels.

Acknowledgments

We appreciate the generous funding provided to this project by the NOAA Bycatch Reduction Engineering Program. We also value the significant amount of staff time NMFS spent developing and writing the Biological Opinion and the Exempted Fishing Permits. The Pacific Fisheries Management Council is thanked for reviewing our proposal and for selecting it as one of the EFPs chosen to explore potential fishing methods for the west-coast swordfish resource. We thank the dedicated observers provided by Frank Orth Associates for their contributions to this EFP.

Literature Cited

Carretta, J.V., J.E. Moore, K.A. Forney. 2019. Estimates of Marine Mammal, Sea Turtle, and Seabird Bycatch from the California Large-Mesh Drift Gillnet Fishery: 1990-2017 U.S. Department of Commerce, NOAA Tech. Memorandum NMFS-SWFSC-619. 76 pgs.

Carey, F. G., J. V. Scharold, and A. J. Kalmijn. 1990. "Movements of blue sharks (Prionace glauca) in depth and course." Marine Biology 106(3): 329-342.

Coan, A. L., Jr., M. Vojkovich, and Doug Prescott. 1998. The California harpoon fishery for swordfish, *Xiphias gladius*. NOAA Tech. Rep. NMFS 142: 37-49.

Francis, M. P., and C. Duffy. 2005. Length at maturity in three pelagic sharks (*Lamna nasus*, *Isurus oxyrinchus*, and *Prionace glauca*) from New Zealand. Fish. Bulletin 103: 489-500.

Fritsches, K. A., R. W. Brill, and E. J. Warrant. 2005. "Warm eyes provide superior vision in swordfishes." Current Biology 15(1): 55-58.

Hanan, D. A., D. B. Holts, and A. L. Coan. 1993. The California drift gillnet fishery for sharks and swordfish, 1981-82 through 1990-91. Calif. Dept. Fish and Game, *Fish Bull. 175*. 95 pages.

Helvey, M., C. Pomeroy, N. C. Pradhan, D. Squires, and S. Stohs. 2017. Can the United States have its fish and eat it too? Marine Policy. Volume 75, January 2017, 62-67.

Hinton, M. G., and M. N. Maunder. 2011. Status of swordfish in the eastern Pacific Ocean in 2010 and outlook for the future. Stock Assessment Report. Inter-American Tropical Tuna Commission. W. H. Bayliff. La Jolla, California, Inter-American Tropical Tuna Commission. 12: 133-177.

Holts, D. B., and D. W. Bedford.1993. "Horizontal and vertical movements of the shortfin mako shark, *Isurus oxyrinchus*, in the Southern California Bight." Australian Journal of Marine and Freshwater Research 44: 901-909.

Julian, F., and M. Beeson. 1998. Estimates of marine mammal, turtle, and seabird mortality for two California gillnet fisheries: 1990-1995. Fish. Bulletin. 96(2) 271-284.

Hutchinson, M., and K. Bigelow.2019. Quantifying Post Release Mortality Rates of Sharks Incidentally Captured in Pacific Tuna Longline Fisheries and Identifying Handling Practices to Improve Survivorship. Scientific committee fifteenth regular session. Pohnpei, Federated States of Micronesia. 12-20 August 2019WCPFC-SC15-2019/EB-WP-04 (Rev.01). https://www.wcpfc.int/node/43162

IATTC. 2019. Report on the tuna fishery, stocks, and ecosystem in the eastern pacific ocean in 2018. Fishery status rep Inter-American Tropical Tuna Commission, 162 p. Accessed on April 11, 2020: http://iattc.org/FisheryStatusReportsENG.htm

ISC. 2019. Report of the nineteenth meeting of the International Scientific Committee for tuna and tuna-like species in the North Pacific Ocean. July 11-15, 2019 Taipei City Taiwan. ISC-19 Plenary Report. 59 p. http://isc.fra.go.jp/pdf/ISC19/ISC19_PLENARY_Report_FINAL.pdf

Kanaiwa, M., K. Bigelow, and K. Yokawa. 2008. A comparison of gear configuration and capture by hook, depth, and habitat for Japanese training vessel and Hawaii- based tuna longline fisheries. ISC Billfish Working Group. Honolulu, Hawaii, USA, International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean. ISC/08/BILLWG-1: 22.

Mukherjee, Z. 2015. An economic approach to understanding the international transfer of bycatch from unilateral bycatch reduction policies, Mar. Policy 51 (2015) 190–195.

Musyl, M. K., R. W. Brill, D. S. Curran, N. M. Fragoso, L. M. McNaughton, A. Nielsen, B. S. Kikkawa, and C. D. Moyes. 2011. Post-release survival, vertical and horizontal movements, and thermal habitats of five species of pelagic sharks in the central Pacific Ocean. Fishery Bulletin- National Oceanic and Atmospheric Administration. Fish. Bull. 109(4):341–368 (2011).

Nakano, H., and J. D. Stevens. 2008. Biology and ecology of the blue shark, *Prionace glauca*. Sharks of the Open Ocean: Biology, Fisheries and Conservation. M. D. Camhi, E. K. Pikitch, and E. A. Babcock, Blackwell Publishing Ltd.**:** 140-151.

NMFS. 2017. Hawaii longline observer program field manual. Pacific Islands Regional Office Observer Program. NOAA Inouye Resource Center, Honolulu, HI. Manual ver. LM.17.02. 190 p.

Rausser, G., S. Hamilton, M. Kovach, and R. Stifter. 2008. Unintended consequences: The spillover effects of common property regulations. Marine Policy (2008), doi:10.1016/j.marpol.2008.03.020

Sepulveda, C. A., A. Knight, N. Nasby-Lucas, and M. L. Domeier (2010). "Fine-scale movements of the swordfish *Xiphias gladius* in the Southern California Bight." Fisheries Oceanography 19(4): 279-289.

Stevens, J. D. 2008. The biology and ecology of the shortfin mako shark, *Isurus oxyrinchus.* Sharks of the Open Ocean: Biology, Fisheries and Conservation. M. D. Camhi, E. K. Pikitch, and E. A. Babcock, Blackwell Publishing Ltd.: 87-94.

Sun, J., M. G. Hinton, and D. G. Webster. 2016. "Modeling the Spatial Dynamics of International Tuna Fleets." PLoS ONE 11(8).

Suzuki, Z., Y. Warashina and M. Kishida. 1977. "The comparison of catches by regular and deep tuna longline gears in the western and central equatorial Pacific." Bulletin of the Far Seas Fisheries Research Laboratory 15: 51-89.

Takahashi, M., H. Okamura, K. Yokawa, and M. Okazaki. 2003. "Swimming behaviour and migration of a swordfish recorded by an archival tag." Marine and Freshwater Research 54(4): 527 - 534.

Uchiyama, J. H., E. E. DeMartini, and H. A. Williams. 1999. Length-weight interrelationships for swordfish, *Xiphias gladius* L., caught in the central north Pacific. NOAA-TM-NMFS-SWFSC-284**:** 82 p.

Appendix I. EFP issued to Captain Hayworth. Captain Gibbs' EFP is identical except for the signature page.

See next 10 pages:

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

HIGHLY MIGRATORY SPECIES (HMS) FISHERY
Deep-set Longline and Shallow-set Longline

EXEMPTED FISHING PERMIT (EFP)
AUTHORITY: Title 50, Code of Federal Regulations Sections 600.745 and 660.718

F/V Pacific Horizon, Registration # 627203
Authorized operators: David Haworth, John Vogel, Nick Haworth

The Regional Administrator of the West Coast Region of the National Marine Fisheries Service (NMFS), acting on behalf of the Secretary of Commerce, hereby permits the fishing vessel named above to fish for Pacific swordfish using deep and shallow-set longline gear under the Magnuson-Stevens Fishery Conservation and Management Act, 16 United States Code §§ 1801 et seq. (Magnuson-Stevens Act), and regulations at Subpart K of 50 CFR Part 660 and 50 CFR 600.745. The fishing must be conducted in accordance with the attached terms and conditions applicable to the EFP holder and the fishing vessel fishing under this EFP.

Activities outside the scope of this EFP that are in violation of applicable regulations may be subject to sanctions. This EFP provides exemption only from the regulation prohibiting the use of longline gear to fish for HMS in the U.S. Exclusive Economic Zone (EEZ) off the Pacific coast (fishing with longline gear is currently prohibited in the West Coast EEZ under 50 CFR 660.712(a)(1)). This EFP allows the listed commercial fishing vessel to fish longline gear to harvest swordfish and other marketable HMS species.

This EFP must be signed by the NMFS West Coast Regional Administrator and the EFP vessel owner and captain, and is valid upon the date of the last signature. **This EFP expires 24 hours after notification by the NMFS West Coast Regional Administrator of termination of the EFP or 24 months from the valid date, whichever is earlier.** It also may be terminated or modified earlier by regulatory action pursuant to 50 CFR Part 660, or by revocation, suspension, or modification pursuant to 15 CFR Part 904 or by the terms and conditions of this EFP. In order to facilitate identification of your activities as exempted fishing, you must carry a copy of this EFP on board all vessels while conducting fishing activities.

4/29/2019
Barry A. Thom
Regional Administrator, West Coast Region
National Marine Fisheries Service
Date Signed

6/1/19
Signature
EFP Holder (Authorized Representative of the EFP)
Date Signed

DAVID Haworth
Print EFP Holder Name

By signing this document, the EFP holder agrees that the EFP holder, the vessel owner(s), all vessel operators, and crew members of the vessel understand and will comply with the terms and conditions of this EFP.

6/1/19
Signature
EFP Holder (Authorized Representative of HMS Vessel Owner)
Date Signed

John Vogel
Print EFP Holder Name

By signing this document, the EFP holder agrees that the EFP holder, the vessel owner(s), all vessel operators, and crew members of the vessel understand and will comply with the terms and conditions of this EFP.

150413WCR2015SF00141:CSF

Nicholas Haworth 6/1/19

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OREGON 97232-1274

West Coast Highly Migratory Species Fishery
Deep-set Longline (DSLL) and Shallow-set Longline (SSLL)
Exempted Fishing Permit (EFP)
2019 – 2021

TERMS AND CONDITIONS

A. SCOPE

1. These terms and conditions apply to all fishing activities referenced in the attached EFP. **In addition to all the terms and conditions in this document, the EFP holder[1] and vessel captain are jointly responsible for instructing all fishing permit holders, vessel owners, vessel operators, crew members, and processors of these terms and conditions applicable to the EFP.**

2. The EFP exempts the permitted vessels, for the limited purposes described in this permit, from the prohibition on fishing for Highly Migratory Species (HMS) with longline in the United States West Coast exclusive economic zone (EEZ), which would otherwise be prohibited by 50 C.F.R. 660.712(a)(1).

3. The EFP holder and the vessel captain will be jointly and severally liable for compliance with the terms and conditions of the EFP by each vessel and for all persons aboard the vessel while participating in the EFP project.

4. All other provisions of 50 C.F.R. Part 660, Subpart K, and other applicable laws of the States of California and Oregon that relate to fishing for, landing, and processing of Pacific swordfish and other marketable HMS apply to fishing activities conducted under this EFP.

5. Failure to comply with these terms and conditions will be grounds for revocation, suspension, invalidation, or modification of the EFP with respect to all parties, persons, vessels, and processors conducting activities under the attached EFP.

[1] The vessel owner or manager, or a representative of the owner or manager, who has signed the EFP assumes responsibility on matters related to compliance with the terms and conditions of the EFP and fishing under the EFP, and is deemed the "EFP holder."

B. EFFECTIVE DATES

1. These terms and conditions must be signed by the National Marine Fisheries Service (NMFS) West Coast (WC) Regional Administrator, the EFP holder, and/or the authorized representative of the HMS permit owner and are effective upon the date of the last signature.

   The EFP will be effective for only 24 months from the date of issuance, and may be terminated or modified at an earlier date by NMFS.

2. The EFP may be terminated or modified earlier by regulatory action pursuant to 50 C.F.R. Part 660, Subpart K, by revocation, suspension, modification pursuant to 15 C.F.R. Part 904, any successor regulations, or by the terms and conditions of this permit.

C. PERMIT CONDITIONS.

1. The exemption provided by the EFP is valid only for the vessels and operators listed on the EFP (noted below). A listed operator must be on board the listed vessel during all EFP fishing trips.

   The EFP authorizes the two vessel) and operators listed below:

Vessel Name	Registration #	EFP Holder's Name	Second Operator	Third Operator
Southern Horizon	1052597	John Gibbs		
Pacific Horizon	627203	David Haworth	John Vogel	Nick Haworth

2. All EFP fishing trips by the permitted vessel must be conducted in accordance with the permit and these terms and conditions and are limited to federal waters only. All EFP fishing trips are limited to the specific EFP fishing described on the permit and herein and cannot co-occur on trips that may include fishing under alternative authorizations.

3. This EFP is not transferable to another holder, entity, vessel, or vessel owner.

4. A copy of the EFP must be carried on board the vessels while conducting fishing activities under the EFP and whenever fish caught while fishing under the EFP are on board the vessel.

5. Upon expiration, revocation, or suspension, the original EFP with original EFP holder signatures must immediately be returned to:

   National Marine Fisheries Service
   West Coast Region (WCR)
   Sustainable Fisheries Division
   501 West Ocean Blvd. #4200
   Long Beach, CA 92841

Vessel owners, managers, and operators are reminded that additional Oregon and California state permit and licensing requirements may also apply for landings to state ports.

D. OBSERVER REQUIREMENTS

1. The EFP holder and vessel operator are responsible for ensuring placement of observers who have a completed NMFS WCR Observer program safety training within the past 3 years, valid CPR training, and have been an observer in good standing in either the West Coast Region Observer Program (WCROP) or the Pacific Islands Region Observer Program (PIROP) within the last three years. Observers are required for all fishing trips conducted under the EFP.

2. The EFP holder and vessel operator must allow observers to collect all data elements on the forms, as specified by NMFS WCROP.

3. Requirements for observers found at 50 C.F.R. 660.719 apply to fishing under this EFP.

E. FISHING RESTRICTIONS and REQUIREMENTS:[2]

In accordance with 50 C.F.R. 600.10, "Fishing, or to fish" means any activity, other than scientific research conducted by a scientific research vessel that involves:

(1) the catching, taking, or harvesting of fish;
(2) the attempted catching, taking, or harvesting of fish;
(3) any other activity that can reasonably be expected to result in the catching, taking, or harvesting of fish; or
(4) any operations at sea in support of, or in preparation for, any activity described in paragraphs (1), (2), or (3) of this definition.

1. Time/Area: In the first 12 months of fishing from the EFP effective date (stated on the permit), EFP fishing is prohibited in waters north of the Oregon/California border (42° N latitude).

2. Time/Area: EFP fishing is prohibited at all times:
   a. in waters north of the Washington/Oregon border (46° 15' N latitude);
   b. within 50 nautical miles of the mainland shore and islands;
   c. within the Leatherback Critical Habitat (LCH) designated at 50 CFR 226.207; and
   d. within the southern California bight (SCB). The coordinates for this boundary line are as follows:
      - 33° 57' 21" N, 120° 31' 44" W – Intersection with 50 nautical mile mainland buffer
      - 33° 15' 00" N, 119° 40' 00" W – State waters boundary off western tip of San Nicholas Island
      - 31° 06' 08" N, 118° 45' 00" W – Intersection with southern EEZ boundary

[2] All time/area closures, effort limits, and fish, sea turtles, seabirds, and marine mammal protections are noted below by requirement categories as follows: Time/Area, Effort Limit, Fish, Sea Turtle, Seabird, and Marine Mammal.

Figure 1. Coastwide view of the no-fishing zone (in purple) that encompasses shoreside of the 50 nautical mile line, the Leatherback Critical Habitat and the SCB.

3. Effort Limit: The limit on the cumulative number of hooks deployed during the duration of the two-year EFP is 225,000 hooks for Deep-set Longline (DSLL) and 108,000 hooks for Shallow-set Longline (SSLL). If the limit is met in either fishing

method (i.e., DSLL or SSLL), EFP fishing must cease immediately and EFP fishing for that method will be closed for the remainder of the two-year EFP.

4. Time/Area: Vessel monitoring systems must be installed and operating for all EFP fishing activity, as required under 50 CFR 300.337.

5. Fish: Over the entire effective period of the EFP, EFP fishing is subject to a cumulative limit for striped marlins of 57 fish caught. If the limit is met, EFP fishing must cease immediately and EFP fishing will be closed for the remainder of the two-year EFP.

6. Sea Turtle: All current gear and bait requirements under 50 C.F.R. 665.813(f) and (g) (e.g., for SSLL and DSLL: use only 18/0 or larger circle hooks; if the hook point is offset, it must be offset by no more than 10°; and use of mackerel-type fish bait), and all sea turtle take mitigation measures (set forth in the Hawaii longline fishery) as described at 50 C.F.R. 665.812, apply to all EFP fishing activity.

7. Sea Turtle: Vessels must carry on board, and the crew must use, a NMFS-approved de-hooking device.

8. Sea Turtle and Seabird: Vessel must carry and the crew must use, as appropriate, a wire or bolt cutter that is capable of cutting through a hook that may be embedded externally (i.e., not ingested) in an animal.

9. Sea Turtle, Seabird, and Marine Mammal: Vessels must carry line clippers or cutters and the crew must use the clipper or cutters to cut branch lines as close to the hook as possible from entangled sea turtles, seabirds, and marine mammals.

10. Sea Turtle, Seabird, and Marine Mammal: Vessels must carry a dip net, and the crew must use, the net to hoist a sea turtle onto the deck to facilitate hook/gear removal. Sea turtles, seabirds, and marine mammals must be placed gently onto the deck -- not be dropped onto the deck. This requirement should consider practicality and best practices for safe vessel and fishing operations.

11. Sea Turtle, Seabird, and Marine Mammal: As soon as practicable upon capture, the crew must disengage any hooked or entangled sea turtles, seabirds, and/or marine mammals with the least harm possible to the animals. In the event all of the fishing gear cannot be removed, use line clippers or cutters to cut the line as close to the hook as possible to reduce the amount of trailing line. De-hookers and line clippers or cutters should be carried onboard and affixed to a minimum 6 foot length pole so that gear can be removed as safely as possible.

12. Sea Turtle: Fishermen must comply with the sea turtle protection measures set forth in 50 C.F.R. 660.712(b) and 50 C.F.R 660.812, including specified handling and resuscitation techniques, such as possession and use of line clippers, wire or bolt cutters, and dip nets to disengage hooked or entangled sea turtles. Additionally, comatose or lethargic sea turtles must be retained on board for a reasonable time to allow recovery, and handled, resuscitated and released, according to established procedures detailed in 50 C.F.R. 223.206, as practicable and in consideration of best practices for safe vessel and fishing operations. Incidentally caught sea turtles must be released over the stern of the vessel, released only when fishing gear is not in use, when

engine gears are in neutral, and in an area where they are unlikely to be recaptured or injured by the vessel. If a dead sea turtle is brought on board a vessel, or cannot be resuscitated, the animal must be disposed of at sea unless retained by a fisheries observer for sea turtle research, as practicable and in consideration of best practices for safe vessel and fishing operations.

13. Seabird: Vessels fishing with the SSLL gear configuration are required to begin setting at night exclusively. Setting at "night" means that gear deployment must begin at least 1 hour after local sunset, and completed no later than 1 hour before local sunrise, using the minimum vessel lights necessary to conform to navigation rules and best safety practices.

14. Seabird: Vessels must comply with the seabird avoidance and protection measures set forth at 50 C.F.R. 660.712(c) regardless of area fished, such as specified handling of hooked animals, proper discharge of offal, utilization of proper branch line weights, and use of blue dyed bait.

15. Seabird: Vessels must use a streamer line in all day-time DSLL fishing sets (Figure 2) for seabird avoidance and comply with the procedures set forth at 50 C.F.R. 660.21 (Pacific Coast groundfish fishery), including the detailed instructions on handling of hooked short-tailed albatross.

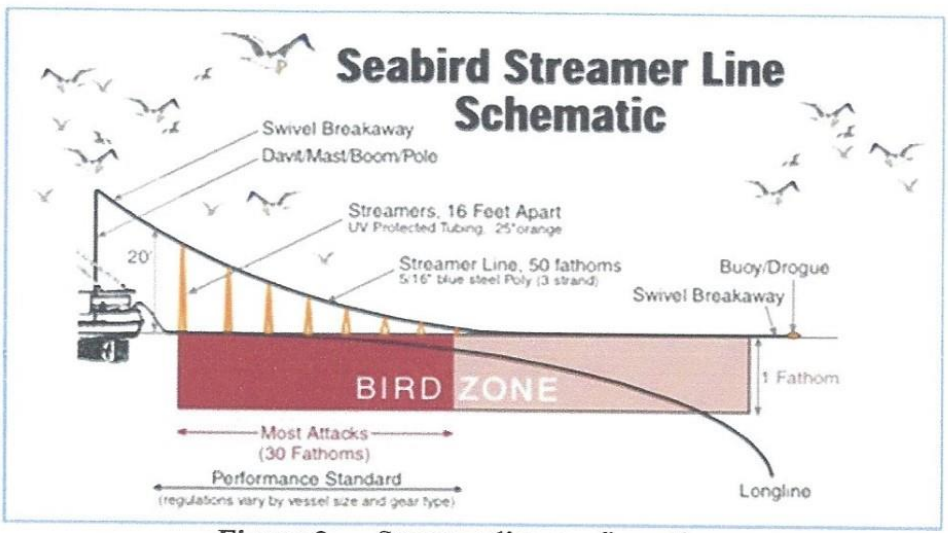

Figure 2. Streamer line configuration.

16. Marine Mammal: Any incidentally caught alive Guadalupe fur seal must be released. Release must occur only when fishing gear is not in use, when engine gears are in neutral, and in an area where they are unlikely to be recaptured or injured by the vessel. Additionally, and only if feasible in consideration of best practices for safe vessel and fishing operations, lethargic Guadalupe fur seals must be brought aboard to allow the animal to recover. Following recovery, incidentally caught Guadalupe fur seals must be released over the stern of the vessel, released only when fishing gear is not in use, when engine gears are in neutral, and in an area where they are unlikely to be recaptured or injured by the vessel to minimize injury and the likelihood of further gear entanglement

or entrapment to increase post-release survivorship, as practicable and in consideration of best practices for safe vessel and fishing operations.

17. Sea Turtle and Marine Mammal: All dead sea turtles or Guadalupe fur seals may not be consumed, sold, offloaded, transshipped, or kept below deck, but must be returned to the ocean after identification, unless the fisheries observer requests the animals be kept for future study.

18. Fish: While at sea, no fish may be transferred to or from the vessel operating under this permit.

19. Time/Area: It is recommended that fishermen be aware of the boundaries of the Pacific leatherback conservation area and avoid setting gear from August 15 through November 15 of each year in the area, which is bounded by straight lines connecting the following coordinates in the order listed (also see Figure 1, above):

    (i) Pt. Sur at 36°18.5′ N. lat., to

    (ii) 34°27′ N. lat. 123°35′ W. long., to

    (iii) 34°27′ N. lat. 129° W. long., to

    (iv) 45° N. lat. 129° W. long., thence to

    (v) The point where 45° N. lat. intersects the Oregon coast.

F. PROTECTED SPECIES INTERACTIONS

1. WCR authorized observers will monitor for any interactions with species protected under the Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) while fishing under the EFP. However, the EFP permit holder must immediately report any interactions with species listed under the ESA and MMPA and its release condition to the NMFS WCR point of contact for ESA-listed species interactions, Justin Viezbicke, listed in Section K below. Upon receipt of this information, NMFS will determine whether and when fishing should cease and resume for the purpose of ensuring compliance with federal statutes (e.g., MMPA and ESA).

2. If the number of interactions with leatherback or loggerhead sea turtles meets or exceeds either of the limits stated in Table 1 below, EFP fishing must cease immediately.

Table 1. Species Limit of Hooked or Entangled Sea Turtles

Species Limits for Hooked or Entangled Sea Turtles for the Duration of the EFP	
Leatherback sea turtles	Loggerhead sea turtles
Limit = 3*	Limit = 2**

* The limit on leatherback sea turtles refers to interactions, not mortality. If an observer records a mortality of a leatherback sea turtle caused by the fishing under this EFP, fishing would cease immediately.
** The limit on loggerhead sea turtles refers to encounters and/or a mortality.

3. If an observer records a mortality of a leatherback sea turtle caused by fishing under this EFP, fishing will cease immediately.

G. DYNAMIC OCEAN MODELING TOOL USE

1. It is recommended that EFP fishermen consult the dynamic ocean modeling tool, EcoCast, prior to making fishing sets.* If the expected presence of leatherbacks is indicated, EFP fishing vessels are strongly encouraged to assess the risks and consider not setting in the area.

**The EFP holders and the vessel operator will be provided guidance on the use of EcoCast and its requirements during a required NMFS WCR training workshop to review these EFP terms and conditions in detail. Details on EcoCast can be found at https://coastwatch.pfeg.noaa.gov/ecocast/.*

H. REPORTING REQUIREMENTS

Under 50 C.F.R. 600.725(l), it is unlawful to fail to report catches as required while fishing pursuant to an EFP. Failure to maintain the required documents may result in a vessel's and/or EFP holder's inability to obtain a future EFP.

1. Departure Notice

24 hours advance notice of departure must be made to the California Department of Fish and Wildlife (CDFW) LED Marine Notifications at LEDMarineNotificaions@wildlife.ca.gov. The advance notice must include: vessel name, expected fishing dates, general area to be fished, departure port, and expected port location.

In the second 12-month period (when EFP fishing is allowed off Oregon), notification must be made to the Oregon Department of Fish and Wildlife (ODFW) one week before beginning to fish off Oregon by either speaking to or leaving a message for the ODFW primary contact listed below in Section K.

48 hours advance notice of departure must be made to the NMFS WCR Observer Program provider in accordance with guidelines provided by the NMFS WCR Observer Program contact. Seek Section K.

2. Annual Preliminary and Final Reports

The EFP holder (or their designee) must present a preliminary report on the results of the EFP and the data collected (including catch data) to NMFS WCR by May 1, 2020 and 2021, in advance of the Briefing Book deadline for the June 2020 and 2021 meetings of the Pacific Fishery Management Council (Council).

A final written report on the results of the EFP and the data collected must be presented by the EFP holder to NMFS WCR, the Council, and the Council's HMS Management

Team at the September 2021 Council meeting in the year following fishing under the two-year EFP.

The final report must include:

a. a summary of the work completed, including observer coverage rate and distribution of observer coverage across all participant fishing vessels;
b. an analysis of the data collected; and
c. conclusions and/or recommendations.

3. Public Release of Information.
The fishing activities carried out under the EFP are for the purpose of collecting information. The vessel owner, operator, and EFP holder agree to the public release of any and all information submitted to NMFS, ODFW, or CDFW pertaining to activities conducted under the EFP.

I. SANCTIONS

Failure of the vessel owner, operator, EFP holder, or any person to comply with these terms and conditions of for the HMS DSLL and SSLL EFP, a notice issued under 50 C.F.R. Part 660, Subpart K, any other applicable provision of 50 C.F.R. Parts 600 and 660 Subpart K, the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801 et seq.) (Magnuson-Stevens Act), or any other regulations promulgated thereunder, may be grounds for revocation, suspension, or modification of this EFP as well as civil or criminal penalties under the Magnuson-Stevens Act with respect to all persons and vessels conducting activities under the EFP (50 C.F.R. 600.745(b)(9)).

J. WAIVER

The EFP holder on his/her own behalf, and on behalf of all persons conducting activities authorized by the permit under his/her direction, waives any and all claims against the United States or the State, and its agents and employees, for any liability whatsoever for personal injury or death related to fishing under the EFP.

K. PRIMARY CONTACT INFORMATION

Prior to initiating any EFP activity, permit holders must provide the NMFS WCR contacts listed below with the satellite phone contact information for the vessels fishing under the EFP, such that a need to cease or resume fishing can immediately be communicated.

NMFS West Coast Region Observer Program

Name: Charles Villafana
Email: Charles.Villafana@noaa.gov
Phone: 562-980-4033

NMFS West Coast Region

Name: Chris Fanning
Email: Chris.Fanning@noaa.gov
Phone: 562-980-4198

For ESA-listed species or marine mammal interactions:
Name: Justin Viezbicke
Email: Justin.Viezbicke @noaa.gov
Phone: 562-506-4315

California Department of Fish and Wildlife

Name: CDFW LED Marine Notifications
Email: LEDMarineNotificaions@wildlife.ca.gov

Oregon Department of Fish and Wildlife

Name: Maggie Sommer Marine Fisheries Section Leader
Phone: (541) 867-0300 x22

NOAA Office for Law Enforcement:

Name: Greg Busch, Assistant Director, West Coast Enforcement Division
Email: Greg.Busch@noaa.gov
Phone: 206-526-6133

Name: Ho Truong, Assistant Special Agent In-Charge
Email: Ho.Truong@noaa.gov
Phone: 562-980-4050

CC: 150413WCR2015SF00141:CSF