

**Annual Report under Section 101(a)(5)(A) of the MMPA for Fisheries and Ecosystem Research
Activities Conducted by Southwest Fisheries Science Center during
January 1, 2019 – December 31, 2019**

On October 30, 2015, the Southwest Fisheries Science Center (SWFSC) received Letters of Authorization (LOA) under section 101 (a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C.1371(a)(5)) to take marine mammals incidental to fishery and ecosystem research activities in the California Current Ecosystem (CCE), the Eastern Tropical Pacific (ETP), and the Antarctic Marine Living Resources Ecosystem (AMLR). Take of marine mammals incidental to SWFSC fishery and ecosystem research activities are subject to the provisions of the MMPA and the regulations governing this take as described in 50 CFR Part 219, Subpart A (CCE), 50 CFR Part 219, Subpart B (ETP), and 50 CFR Part 219, Subpart C (AMLR). These authorizations are valid through October 29, 2020.

In accordance with these authorizations, the SWFSC is required to provide annual reports. The following report will cover the period from January 1, 2019 - December 31, 2019 in the CCE. The Center did not conduct research in the ETP, and thus it will not be included in this report. Additionally, research conducted in AMLR was conducted under a directed research permit, and therefore will not be included in this report.

The report will be organized into the following sections:

- I. Overview of SWFSC's Required Mitigation Measures
- II. Line-Kilometers Surveyed During Which EK60/80, ME70 and SX90 Were Predominant and Pro-Rated Estimates of Actual Level B Acoustic Take
- III. SWFSC Gear Metadata for All Fisheries and Ecosystem Surveys in the CCE During the Reporting Period
- IV. Accounts of All Incidents of Marine Mammal Interactions in the CCE
- V. Evaluation of Effectiveness of SWFSC Mitigation Strategies
- VI. Final Outcome of Serious Injury Determinations
- VII. Updates of Development
- VIII. Training Provided to SWFSC Staff

In each section, a summary for the California Current Research Area will be described in relation to the reporting period.

I. Overview of SWFSC's Required Mitigation Measures

With the issuance of the SWFSC's MMPA LOA's, a set of prescribed mitigation measures were outlined for the Center to follow on all surveys in order to attempt to minimize the likelihood or severity of incidental gear interactions with marine mammals and other protected species. These measures vary slightly depending on the gear type and survey, but are mainly comprised of dedicated marine mammal/protected species watches, an associated exclusion zone, and move-on rule if protected species are seen during watch, and standard operating procedures by gear type.

Below are gear specific descriptions of these conservation measures in trawl-based surveys:

- **30-minute pre-set watch**

During all SWFSC trawl surveys, a dedicated observer must initiate a 30 minute pre-set watch (visual observation) prior to deploying trawl gear. The surrounding waters are scanned with the naked eye and range finding sighting instruments during the day and at night are conducted using the naked eye and available vessel lighting. If two sequential trawl stations are more than 30 minutes apart (assuming cruise speed of approximately 10 knots), then the watch will be conducted during the final 30 minutes of transit. If transit time is less than 30 minutes, then a marine mammal watch is conducted for the duration of the transit.

- **Move-on rule**

If a marine mammal (excluding baleen whales) or other protected species is seen during the pre-set watch within 1 nautical mile (n mi) of the set location (i.e. exclusion zone), the move on rule must be implemented: before starting the haul, the ship must move on to ensure that the observed marine mammal is 1 n mi away from the set location. If, after moving on, the marine mammal remains in the exclusion zone (within the 1 n mi radius of the set location) the ship must move again or skip the station. In 2018, the LOA issued for the California Current Research Area was modified to exempt baleen whales from the 1 nm exclusionary zone of the move on rule. If baleen whales are in the vicinity of the station, professional judgement is used.

- **Active gear monitoring**

Once trawl net deployment begins, an active gear watch (visual monitoring during gear deployment, fishing, and retrieval) must be conducted by a dedicated observer. If a marine mammal is seen during the active gear watch, the most appropriate action to avoid an interaction will be determined through the use of professional judgement. When professional judgment is employed, it will be recorded, and only to be used in circumstances when the gear is already deployed. Further defined, if a marine mammal is seen during the pre-set watch, the move-on rule must be implemented, but if it is seen during deployment of the net, active fishing or haul back, then professional judgment is used to determine the best course of action to avoid an interaction.

- **Marine mammal excluder device (MMED)**

On the Nordic 264 trawl, a marine mammal excluder device is used at all times. This device was developed to allow marine mammals to escape from the net without losing target catch. The modified cobb trawl is not equipped with a MMED.

- **Acoustic deterrent devices**

On all SWFSC trawl nets, 2-4 acoustic deterrent devices, or pingers, are placed along the head rope and footrope to deter marine mammals from entering the net. On the Rockfish Recruitment and Ecosystem Assessment Survey (RL-19-02), two DDD-03 pingers were attached to the trawl net. On the California Current Ecosystem Survey (RL-19-07), and Gear Selectivity Survey (RL-19-04) two to four pingers were placed along the footrope and/or head rope for all trawls. Pingers are tested for functionality upon each deployment and haulback of the net.

- **Other standard trawl survey protocols**

The SWFSC also employs several standard survey protocols to attempt to minimize impacts to protected species: 1) the gear will be emptied as quickly as possible upon retrieval in order to determine whether or not protected species are present, and 2) care will be taken when emptying the trawl to avoid damage to protected species that may be caught, but not visible during retrieval of the net.

II. Line-Kilometers Surveyed During Which EK60/EK80, ME70, and SX90 Were Predominant and Pro-Rated Estimates of Actual Level B Acoustic Take

Three trawl-based surveys were conducted in the California Current Ecosystem during the reporting period: RL-19-02, RL-19-04, and RL-19-07. The tables below are the combined acoustic data from both surveys for the reporting period. Additionally, echosounder data is reported for California Cooperative Fisheries Investigations (CalCOFI) (RL-19-03) and Sailandrone (autonomous surface vehicle) surveys. Sailandrone was first introduced and operated in shallow waters in 2018 to compliment the coastal pelagic species portion of the California Current Ecosystem Survey. Three Sailandrones were operated during the 2019 field season to support RL-19-07 research efforts.

Table 1. Total line-kilometers (kms) surveyed during the reporting period for which the SX90, EK60/EK80, or ME70 echosounder was the predominant acoustic source in the CCE compared to the totals calculated in the SWFSC’s MMPA LOA application (Appendix C of SWFSC’s National Environmental Policy Act (NEPA) Programmatic Environmental Assessment (PEA). Included in the ‘EK60/EK80 - Summed line-kms of reporting period/source (0-200 m)’ column are a fraction of Sailandrone line-kms, which operated with an EK80 WBT mini echosounder. The acoustic output for this source operates with less power at 38kHz (500W), less frequent intervals (~2 seconds) and a wider bandwidth (18 degrees) than that of the echosounder on the ship. To calculate the difference in acoustic output between the WBT Mini echosounder vs. the ship’s EK60/80 echosounder, the following equation was used: (Total Sailandrone kms) *(Change in beamwidth 7/18) * (Change in power 500/2000) for operation at 38 kHz. The resulting number obtained was approximately 10% of the total Sailandrone line-kms, which was added to the total line kms reported for the ship, and subsequently analyzed. The totals below include both ship and drone acoustic sources for the estimation of Level B take.

California Current Ecosystem				
Echosounder	EA Estimated summed dominant line kms/source (0-200 m)	Summed line-kms of reporting period / source (0-200 m)	EA Estimated summed dominant line-kms/source (>200 m)	Summed line-kms of reporting period / source (>200 m)
SX90	33,880	2696	33,880	6198
EK60/EK80	79,912	14117	99,640	39478
ME70	19,728	1618	0	0

Table 2. SWFSC’s annual Level B harassment by acoustic sources by sound type for each marine mammal species in the CCE. For each species and predominant source, the cross-sectional area for the relevant depth strata (Table 6.5 of SWFSC’s PEA Appendix C) was multiplied by the actual line-km for each respective strata (Table 1), and the volumetric density (shown here) to assess Level B harassment for the reporting period.

Common name	Volumetric Density (#/km ³)	Typical vertical habitat		SWFSC Reporting Period Acoustic Takes (# of animals)			Reporting Period Total Takes	EA Estimated Annual Takes
		0-200 m	>200 m	EK60/EK80	ME70	SX90		
<i>CCE Cetaceans</i>								
Harbor porpoise	0.188725	X		35	6	33	74	682
Dall’s porpoise	0.37765	X		70	11	66	147	1365
Pacific white-sided dolphin	0.10465	X		19	3	18	41	378
Risso’s dolphin	0.0523	X		10	2	9	20	189
Bottlenose dolphin	0.0089	X		2	0	2	3	32
Striped dolphin	0.08335	X		15	2	15	33	301
Short-beaked common dolphin	1.54675	X		285	46	272	603	5591
Long-beaked common dolphin	0.0962	X		18	3	17	38	348
Northern right-whale dolphin	0.04875	X		9	1	9	19	176
Killer whale	0.00355	X		1	0	1	1	13
Short-finned pilot whale	0.00062		X	3	0	1	4	12
Baird’s beaked whale	0.00176		X	9	0	2	11	34
Mesoplodon beaked whales	0.00206		X	11	0	2	13	39
Cuvier’s beaked whale	0.00764		X	41	0	8	49	146
Pygmy sperm whale	0.00218		X	12	0	2	14	42
Dwarf sperm whale	0.00218		X	12	0	2	14	42
Sperm whale	0.0034		X	18	0	3	22	65
Humpback whale	0.00415	X		1	0	1	2	15
Blue whale	0.0068	X		1	0	1	3	25
Fin whale	0.0092	X		2	0	2	4	33
Sei whale	0.00045	X		0	0	0	0	2
Common Minke whale	0.0036	X		1	0	1	1	13
Gray whale	0.09565	X		18	3	17	37	346
<i>CCE Pinnipeds</i>								
California sea lion	1.19	X		220	35	209	464	4302
Steller sea lion, eastern subspecies	0.29165	X		54	9	51	114	1054
Guadalupe fur seal	0.03705	X		7	1	7	14	134

Northern fur seal	1.68275	X		311	50	296	656	6083
Harbor seal	0.252	X		47	7	44	98	911
Northern elephant seal	0.248		X	1326	0	251	1577	4744

III. SWFSC Gear Metadata for All Fisheries and Ecosystem Surveys in the CCE During the Reporting Period

Table 3. SWFSC trawl survey metadata for the reporting period by trawl net and research area.

Research Area	Trawl Net	Total # tows	Fishing Depth Range (m)	Average Tow Duration of active fishing (minutes)
<i>California Current Ecosystem</i>	Modified cobb	103	3-50	15
	Nordic 264	188	0-15	45

In the CCE, the modified cobb net was used during the Juvenile Rockfish Recruitment Survey (RL-19-02) and the Nordic 264 net was used for the California Current Ecosystem Survey (RL-19-07), and Gear Selectivity Survey (RL-19-03).

Longline gear was not used during the reporting period.

IV. Accounts of All Incidents of Marine Mammal Interactions in the CCE

The following section will detail the SWFSC Level A marine mammal interaction events in the CCE.

Table 4. SWFSC's take table from the MMPA LOA for the CCE (Table 1 in the authorization) displays the takes issued to the Center by gear type in that ecosystem over the five year authorization period (October 2015 - October 2020).

Species	Authorized Take		
	M/SI + Level A ¹		Level B ²
	Trawl	Longline	
Gray whale (<i>Eschrichtius robustus</i>)	-	-	346
Humpback whale (<i>Megaptera novaeangliae</i>)	-	-	14
Minke whale (<i>Balaenoptera acutorostrata</i>)	-	-	13
Sei whale (<i>Balaenoptera borealis</i>)	-	-	1
Fin whale (<i>Balaenoptera physalus</i>)	-	-	33
Blue whale (<i>Balaenoptera musculus</i>)	-	-	24
Sperm whale (<i>Physeter macrocephalus</i>)	-	-	65
Pygmy or dwarf sperm whale (<i>Kogia</i> spp.)	-	1	42

Cuvier's beaked whale (<i>Ziphius cavirostris</i>)		-	-	146
Baird's beaked whale (<i>Berardius bairdii</i>)		-	-	34
Hubbs', Blainville's, ginkgo-toothed, Perrin's, lesser, or Stejneger's beaked whales (<i>Mesoplodon</i> spp.)		-	-	40
Bottlenose dolphin (<i>Tursiops truncatus</i>)	CA/OR/WA stock	8	1	32
	CA coastal stock	3		
Striped dolphin (<i>Stenella coeruleoalba</i>)		11	1	301
Long-beaked common dolphin (<i>Delphinis capensis</i>)		11	1	348
Short-beaked common dolphin (<i>Delphinis delphis</i>)		11	1	5,592
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)		35	-	378
Northern right whale dolphin (<i>Lissodelphis borealis</i>)		10	-	176
Risso's dolphin (<i>Grampus griseus</i>)		11	1	188
Killer whale (<i>Orcinus orca</i>)		-	-	13
Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)		-	1	12
Harbor porpoise (<i>Phocoena phocoena</i>)		5	-	682
Dall's porpoise (<i>Phocoenoides dalli</i>)		5	-	1,365
Guadalupe fur seal (<i>Arctocephalus philippii townsendi</i>)		-	-	134
Northern fur seal (<i>Callorhinus ursinus</i>)	California stock	5	-	236
	Pribilof Islands/ Eastern Pacific stock			11,555
California sea lion (<i>Zalophus californianus</i>)		20	5	4,302
Steller sea lion (<i>Eumetopias jubatus</i>)		9	1	1,055
Harbor seal (<i>Phoca vitulina</i>)		9	-	910
Northern elephant seal (<i>Mirounga angustirostris</i>)		5	-	4,743
Unidentified cetacean (Family Delphinidae or Family Phocoenidae)		1	-	-
Unidentified pinniped		1	1	-

¹ These takes may be by mortality or any lesser intensity, including serious injury and Level A harassment, and are apportioned by gear type. The number represents the total authorization over five years. ² These takes may be by Level B harassment only. The number represents the annual take authorization for five years.

Table 5. SWFSC's Level A takes in trawl gear (modified Cobb and Nordic 264 nets) for the reporting period and the remaining takes left for trawl surveys during the authorization period.

Authorized Trawl Species	# of Level A (M/SI) authorized incidental takes (2015-2020)	SWFSC Trawl Takes for the reporting period	Remaining Takes
Bottlenose dolphin (<i>Tursiops truncatus</i>) CA/OR/WA offshore	8	0	8
Bottlenose dolphin (<i>Tursiops truncatus</i>) CA coastal	3	0	3

Striped dolphin (<i>Stenella coeruleoalba</i>)	11	0	11
Short-beaked common dolphin (<i>Delphinus delphis</i>)	11	0	11
Long-beaked common dolphin (<i>Delphinus capensis</i>)	11	1	10
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	35	5	18
Northern right whale dolphin (<i>Lissodelphis borealis</i>)	10	0	10
Risso's dolphin (<i>Grampus griseus</i>)	11	0	11
Harbor porpoise (<i>Phocoena phocoena</i>)	5	0	5
Dall's porpoise (<i>Phocoenoides dalli</i>)	5	0	5
Northern fur seal (<i>Callorhinus ursinus</i>) – California Stock & Pribilof Islands/ Eastern Pacific stock	5	0	5
California sea lion (<i>Zalophus californianus</i>)	20	0	19
Steller sea lion (<i>Eumetopias jubatus</i>)	9	0	9
Harbor seal (<i>Phoca vitulina</i>)	9	0	9
Northern elephant seal (<i>Mirounga angustirostris</i>)	5	0	5
Unidentified pinniped	1	0	1
Unidentified cetacean (Family Delphinidae or Family Phocoenidae)	1	0	1

Level A Marine Mammal Interactions

During the reporting period, SWFSC had 4 separate interaction events with marine mammals that resulted in incidental takes of 5 Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) and 1 long-beaked common dolphin (*Delphinus capensis*). All interactions occurred on the NOAA Reuben Lasker fisheries research vessel (FSV) during nighttime trawl operations. All required mitigation measures were followed. Pingers were tested for functionality, dedicated observer(s) performed the pre-set, gear deployment, active fishing, and gear retrieval watch. Watch logs and anecdotal narratives indicate that no protected species were seen during the pre-set, gear deployment, and active fishing watches. A single sea lion was seen during a gear retrieval watch in which an incidental take of a long-beaked common dolphin had occurred. Therefore, the move-on rule was not implemented and no professional judgement decisions were made. The scientists followed SWFSC's Detailed Sampling Protocol for Marine Mammal and Sea Turtle Incidental Takes During SWFSC Research Cruises (PSIT-002.02) to determine species ID and sex. Photographs and morphometric measurements were taken prior to freezing the carcass. All incidental takes occurred during the RL-19-07 survey.

Incidental take of two Pacific white-sided dolphins occurred on June 22, 2019 off the coast of Northern Washington (47.980833°N, -125.076944° W) during RL-19-07 (haul 18) between the time period of 22:48, the start of the active fishing and 23:33, the completion of the active fishing. Marine mammals were not seen in the previous 24 hours, or during the full 30 minute pre-set protected species watch. The watch was conducted by two scientists, positioned on the starboard and port side. No protected species were seen during the 30 minute protected species watch. The protected species watch continued during gear deployment, active fishing (depth: 12 m; tow speed: 3.8 knots) and gear retrieval, in which no marine mammals were seen. Visibility was reported as good with overcast skies. Wind speed was 16 knots and wave height was 2-3 feet. Two deceased male dolphins (RL190622.001: curvilinear length 194 cm, max girth 125 cm, sexually mature; and RL190622.002: curvilinear length 181 cm, max girth 109 cm, sexual maturity status pending) were discovered upon haul back of the net. RL190622.001 was entangled in the 5 inch white mesh part of the net, and facing forward. The dorsal fin and pectoral flippers were entangled, and the net was cut to retrieve the animal. Superficial lacerations were present on the dorsal fin that appeared to be caused by the net. RL190622.002 was entangled right above the MMED grate. It was also facing forward with the dorsal fin, and pectoral fins entangled, and retrieved through the MMED. Superficial lacerations were present on the dorsal fin that appeared to be a result of the net. The animals were found approximately 12 feet apart. Photographs were taken, and reported to the Protected Species Incidental Take (PSIT) database. Four pingers were functioning at: frequency - 70kHz; sound pressure level - 140 decibels re:1uPa; emission - every 4 sec; duration - 300 m/s, and found to be functional during the sampling event. The animals were stored frozen and subsequently transferred to the Marine Mammal and Turtle Division at SWFSC for necropsy and analysis.

Incidental take of second pair of Pacific white-sided dolphins occurred on August 8, 2019 off the coast of Central California (37.4778, -123.1668) during RL-19-07 (haul 97) between the time period of 02:39, the start of active fishing, and 03:24, the completion of active fishing. No marine mammals were seen in the prior 24 hours. Prior to arriving at the station, a 30 minute protected species watch was conducted, and no protected species were seen. Similarly, the protected species watch was continued during gear deployment, active fishing (depth: 12 m; tow speed: 3.6 knots), and during gear retrieval for a total watch time of 118 minutes, with no protected species seen. Visibility was reported as clear with few clouds. Wind speed was 15 knots, and sea wave height was 2-3 feet. Two deceased female dolphins (RL190808.01 straight length 191 cm, max girth 114 cm; and RL190808.002 straight length 201 cm, max girth 193 cm) were discovered upon haulback of the net. RL190808.01 presented with rake marks seen across both sides of the body, and a cut posterior to the right eye. The right pectoral fin appeared to have a small notch missing. Net impressions were visible near the fluke and was discovered first with the entire body entangled in the net. RL190808.002 presented with a few lacerations on the body, but mainly with what appeared to be net impressions. Dolphin RL190808.002 was found behind the RL190808.01. Both dolphins were found entangled forward of the MMED in the 8 inch white, nylon mesh. Both animals required being cut from the net for retrieval. Photographs were taken, and reported to the PSIT database. Four pingers were functional during active fishing and operating at: frequency - 70kHz; sound pressure level - 140 decibels re:1uPa; emission every 4 sec; duration 300 m/s, and found to be functional during the sampling event. The animals were stored frozen and subsequently transferred to the Marine Mammal and Turtle Division at SWFSC for necropsy and analysis.

Incidental take of a fifth Pacific white-sided dolphin occurred during haul 99, which was initiated on August 8, 2019 and ended on August 9, 2019. This take occurred during the following night of trawling, and it was logistically considered a separate day. The take occurred off the coast of Central California (36.9268, -122.7078) during RL-19-07 between the time period of 23:28, the start of the active fishing on August 8, 2019 and 00:13, the end of active fishing on August 9, 2019. Visibility was reported as clear with few

clouds. Wind speed was 16 knots and sea wave height was 2-3 feet. An incidental take event occurred approximately 22 hours prior during the previous night's active fishing. Additionally, during haul 98, and approximately 3 hours prior to active fishing, multiple sea lions were seen at the start of the 30 minute watch, when the the net was being streamed to clean out residual catch, however, they were located outside of the 1 nm exclusionary zone. The sea lions were spotted once again near the target station, and the move on rule was enacted. Sea lions were not seen again until after the haul back was nearly complete, and were attempting to depredate from the codend. Prior to the active fishing, a 30 minute protected species watch was conducted, in which no protected species were seen. The protected species watch was continued during gear deployment, active fishing (depth: 12 m; tow speed: 3.5 knots), and during gear retrieval for a total watch time of 141 minutes. No protected species were seen. One deceased female (RL190808.03, straight length: 187 cm, max girth: 119 cm, sexually mature) was discovered upon haulback of the net. The dolphin presented with net impressions over a majority of the body, and lacerations on the dorsal fin, flukes and right pectoral fin. The dolphin was discovered entangled forward of the MMED in the 8 inch white, nylon mesh. Photographs were taken, and reported to the PSIT database. Four pingers were functional during active fishing and operating at: frequency - 70kHz; sound pressure level 140 decibels re:1uPa; emission every 4 sec; duration 300 m/s. The animals were stored frozen and subsequently transferred to the Marine Mammal and Turtle Division at SWFSC for necropsy and analysis.

Incidental take of a long-beaked common dolphin occurred on August 26, 2018 off the coast of Southern California (34.360278, -119.796111) during RL-19-07 trawling operations (haul 129) between the time period of 23:53, the start of active fishing on August 26, 2019 and 00:38, the end of the active fishing on August 27, 2019. No marine mammals were seen in the previous 24 hours. Sky condition was reported as partly cloudy. Wind speed was 13 knots and sea wave height was 1 foot. Prior to the arrival at the station, a 30 minute protected species watch was conducted, in which no protected species were seen. The protected species watch continued during gear deployment, active fishing (depth: 12 m; tow speed: 3.7 knots), and during gear retrieval. A single sea lion was seen during haulback once the doors were already up. One deceased female (RL190826.01, straight length: 189 cm, max girth: 107.5 cm, sexually mature) was discovered upon haulback of the net, and found entangled forward of the MMED in 8 inch white, nylon mesh. The animal was found facing forward and presented with lacerations around the dorsal and pectoral fins that appeared to be a result of net entanglement. A laceration was also present near the right lateral head that could have been a result of the entanglement. Necropsy findings indicated that this animal was likely pregnant based on the corpus luteum and possible embryonic material collected. Photographs were taken and reported to the PSIT database. Three pingers were functional during active fishing and operating at: frequency - 70kHz; sound pressure level - 140 decibels re:1uPa; emission every 4 sec - duration 300 m/s, and located on the footrope (length: 52 m) of the net. The animal was stored frozen and subsequently transferred to the Marine Mammal and Turtle Division at SWFSC for necropsy and analysis.

All accounts of incidental take were reported to the Protected Species Incidental Take (PSIT) database within 48 hours. Notifications were then administered to appropriate parties. See Appendix A for Map 1 depicting location of SWFSC marine mammal incidental takes from the reporting period.

V. Evaluation of Effectiveness of SWFSC Mitigation Strategies

An evaluation of the mitigation measures employed by the SWFSC to reduce potential impacts to marine mammals are outlined below for trawl gear. For detailed mitigation measure descriptions, please see Section 1 of this report.

Trawl Marine Mammal Mitigation Measures

The SWFSC uses two types of trawl nets that require the implementation of mitigation measures, the Nordic 264 surface trawl, and the modified Cobb midwater trawl. During use of either of these nets, the following mitigation protocols must be observed: protected species watches (30 minute pre-set, gear deployment, active fishing and gear retrieval), move-on rule, use of 2-4 acoustic pingers, use of a MMED on Nordic 264 net only, use of professional judgement, and standard survey protocols (all described in detail in Section 1).

To ensure compliance with these regulations, SWFSC implements the use of boilerplate language in all project instructions for trawl surveys that use the Nordic 264 or modified Cobb nets. The boilerplate language provides detail and instruction on the required mitigation measures and other standard trawl protocols. In addition, the Center has continued collecting observational and environmental data in watch logs during each survey to record sightings of marine mammals or other protected species during required watches, and if they were observed, what actions were implemented to mitigate potential interactions (e.g. move-on rule, or professional judgement decisions.)

Over the reporting period, our watch logs showed that during nighttime surveys, we are often able to see or hear animals in close proximity to the ship, resulting in implementation of the move-on rule in order to avoid interaction. Through anecdotal descriptions, we have determined these sightings typically occur in good conditions, i.e., minimal cloud cover, moonlight, low sea state (beaufort), etc. and most importantly, when the animals are in close proximity and made visible by available ship lighting. However, once the net has been deployed and is actively fishing, it is located far from the ship and therefore, even in the good nighttime conditions, it is nearly impossible to see if there are marine mammals in the vicinity of the net. This is evidenced by the fact that of the 4 interaction events that took marine mammals during this reporting period, no marine mammals were seen during the pre-set, gear deployment, and active fishing, and one report of a sea lion was seen nearing the end of a haulback.

Table 6. Implementation and effect of marine mammal (MM) watches and move-on rule on SWFSC Trawl surveys during the reporting period.

Trawl Survey	Total # tows	Move-on Implemented	% total tows that had to move-on	Trawl aborted due to MM	% of total tows cancelled due to MM	Net interaction events w/ MM
<i>Nordic 264 Net</i>						
California Current Ecosystem Survey RL-19-07	167	11	6.6%	2	1.2%	7
Gear Selectivity Survey RL-19-04	21	1	5%	1	5%	0
<i>Modified Cobb Net</i>						
Rockfish Recruitment and Ecosystem Assessment- RL-19-03	103	10	9.7%	3	2.9%	6

The column labeled 'Move-on Implemented' represents the number of hauls where marine mammals were seen within 1 n mi of the set location during the pre-set watch, resulting in the ship moving on to exclude them from the restricted radius. The column labeled '% of total tows that had to move on' represents the percentage of total tows that the ship moved to exclude marine mammals. The column labeled 'Trawl aborted due to MM' reflects the number of times that a station was skipped due to the prolonged presence of marine mammals within the 1 n mi radius, and associated percentage in the column to the right labeled '% of total tows cancelled due to MM.' The column labeled 'Interaction events w/MM' reflects the number of times when marine mammals were incidentally captured, and/or observed directly interacting with trawl gear (i.e. depredation, investigating the net).

In some instances of marine mammal sightings, the move-on rule was successful in avoiding marine mammal interactions and the net was subsequently set. But, in others, the haul was cancelled due to the continued presence of marine mammals within the restricted 1 n mi radius. Additionally, tow cancellation could have been the result of marine mammal sightings when the net was already set, before the doors were deployed and the mouth of the net was opened, indicating the commencement of active fishing. In such instances, a professional judgement call was made, and the net was immediately hauled back to avoid an interaction (trawl aborted).

In several instances, as noted from the watch logs, there were many occasions where California sea lions and dolphins were seen during the haul back portion of the active gear watch. These animals were typically seen swimming around the hull of the ship, or codend of the net as it is towed back and brought aboard the ship. However, in two separate hauls during RL-19-02, a single sea lion attempted to haul out on the ramp as the net was brought aboard. Additionally, on two separate occasions, observers witnessed California sea lions depredating fish being released from the codend.

In instances when marine mammals were seen, haul back continued as usual, i.e., no alternative action was taken, and none of these instances resulted in a marine mammal take.

During the RL-19-07 survey, professional judgement was practiced in one instance when an estimated 30 dolphins were seen on the starboard side approximately 30 minutes into active fishing swimming toward the bow of the ship. After a few minutes, the group of dolphins disappeared and trawling continued as normal. A professional judgement call was made to continue fishing based on the number of animals present, directionality and behavior. No incidental takes occurred as a result of this decision.

For all trawl surveys, pre-set and active gear watches were conducted 100% of the time for the reporting period. In every instance during all surveys where the move-on rule was implemented, and a trawl followed, there was no interaction with protected species. Two to four pingers were deployed and functioning on every tow for both nets throughout the reporting period.

VI. Final Outcome of Serious Injury Determinations

No serious injury determinations were made during the reporting period. However, there were six instances of final outcome determination, resulting in fatal incidental take, as described in Section 4. A total of 5 Pacific white-sided dolphins and one long-beaked common dolphin were taken incidentally in RL-19-07 trawl activities. Photographs were taken immediately after the incidental take events and are available on PSIT.

VII. Updates of Development

A major part of implementing EC / ITA compliance throughout the Center has been devoted to data collection to aid in the understanding of the practical impacts of our mitigation measures on limiting survey impacts to protected species. With additional years of data collection, we may be able to develop a more informed view of the efficacy of our mitigation strategies.

An effort is underway to incorporate video technology in future surveys to evaluate marine mammal trawl interactions during active fishing. Objectives may include evaluating behavior of animals entering the trawl, interactions with and efficiency of the MMED, and evaluation of areas forward of the MMED, including the 8 inch nylon mesh where animals have historically become entangled. The goal is to use video to better understand fisheries interactions between marine mammals and the Nordic 264 trawl, and incorporate practical measures which may help to reduce incidental take.

VIII. Training Provided to SWFSC Staff

The SWFSC is required to conduct annual training for chief scientists and other personnel responsible for implementing mitigation measures, data collection, and reporting requirements. A portion of the training must be dedicated to discussion on the use of best professional judgement to avoid marine mammal interactions to gain an understanding of successful versus unsuccessful decisions.

Annual training occurred on March 14, 2019 at SWFSC in La Jolla, CA, and included the following topics: overview and background of statutory requirements, SWFSC's incidental take history, development of the Center's mitigation measures, scope of coverage for the Center's authorized takes and implementation of the authorization conditions (mitigation measures, reporting requirements, data collection, etc), discussion of the use of professional judgement in interactions/avoidance practices with protected species, and review of handling and sampling methodologies for marine mammal and sea turtles (in coordination with the SWFSC Marine Mammal and Turtle Division).

After completion of the field season, a SWFSC Fisheries & Ecosystem Environmental Compliance Forum was held on October 29, 2019. This forum focused on the 2019 field season debrief and discussed the implementation of mitigation measures. A survey was designed, and distributed to staff listed on 2019 cruise / project instructions prior to the forum.

The survey results highlighted the following key topics that were covered in forum discussions:

- 1) Overview of current mitigation measures and effect on data collection
- 2) Need / want for improvements of required EC/ITA measures
- 3) Recommendations for additional mitigation efforts

During the 2018 field season, the LOA issued for the California Current Research Area was modified to exempt baleen whales from the 1 nm exclusionary zone of the move on rule. Trawl surveys with special interest areas off the coast of California (Gulf of the Farallone and Monterey Bay) operate where large whales often aggregate to forage. The modification allowed scientists to meet survey objectives without having to skip a multitude of stations due to the whales' aggregation and locations. The use of professional judgement continues to be enforced if a baleen whale appears within close proximity during active fishing, such as an instance where a whale blow was seen approximately 300 feet off the starboard side of the ship 20 minutes into active fishing during RL-19-07.

Additionally, PSIT database training and authorizations were given to selected staff on each leg of the survey for ease of reporting any protected species that are incidentally taken. Future incidental takes of

protected species will continue to be reported by staff as outlined in PSIT 001.02. The Center is currently working with the Office of Science and Technology (OST) to update the PSIT database. Modifications may include the addition of a webpage so that users, including scientists in the field, may easily search and view PSIT authorization quotas. A second update will include the addition of an authorization quota section in each PSIT record page, and for the total incidental take for the entire authorization period.

Appendix A

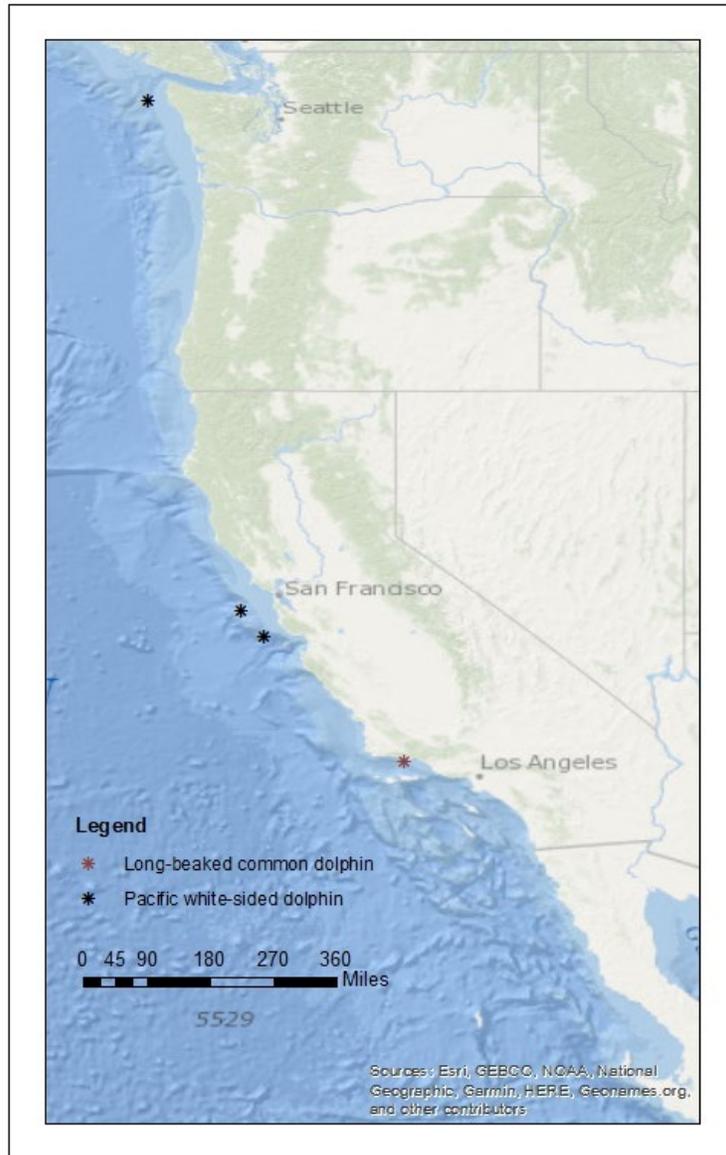


Figure 1. This map displays SWFSC’s take of protected species protected under the MMPA over the reporting period.