

**Annual Report under Section 101(a)(5)(A) of the MMPA for Fisheries and Ecosystem Research
Activities Conducted by Southwest Fisheries Science Center from
January 1, 2022 – December 31, 2022**

On January 15, 2021, 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), 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 in the CCE and AMLR. These authorizations are valid through January 14, 2026.

In accordance with these authorizations, the SWFSC is required to provide annual reports. The following report will cover the period from January 1, 2022 - December 31, 2022 in the CCE. Research projects in AMLR were 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 echosounders 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. Final Outcome of Serious Injury Determinations
- VI. Evaluation of Effectiveness of SWFSC Mitigation Strategies
- VII. Updates on Mitigation Strategy Development
- VIII. Training Provided to SWFSC Staff and Cooperative Agencies

In each section, a summary for the CCE will be described in relation to the reporting period.

I. Overview of SWFSC's Required Mitigation Measures

Prescribed mitigation measures are outlined in the MMPA LOAs for the Center to follow during surveys to minimize the likelihood or severity of incidental gear interactions with marine mammals and other protected species. Specific measures are described for each covered gear type, and consist of dedicated marine mammal/protected species watches, a move-on rule if protected species are seen during watch within the exclusionary zone, and other standard operating procedures.

Below are gear specific descriptions of these conservation measures in trawl, hook and line, and purse seine surveys:

- **15-minute pre-set watch**

During SWFSC trawl, purse seine, and hook and line surveys, a dedicated observer must initiate a 15 minute pre-set watch (visual observation) prior to deploying gear. The surrounding waters are scanned with the naked eye and range-sighting instruments with the assistance of available

vessel lighting. If two sequential stations are more than 15 minutes apart (assuming cruise speed of approximately 10 knots), then the watch will be conducted during the final 15 minutes of transit. If transit time is less than 15 minutes, then a marine mammal watch is conducted for the duration of the transit. A pre-set watch is conducted during pre-set activities once the vessel has arrived on station.

- **Move-on rule**

For surveys using a trawl net, if a marine mammal (excluding baleen whales) or other aquatic protected species is seen during the pre-set watch and 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. If baleen whales are in the vicinity of the station, professional judgment is used.

For surveys using a purse seine net, when one or more killer whales, small cetaceans or five or more pinnipeds are observed within 500 meters (m) of the planned sampling location, the vessel must remain on-site or move to another sampling location. If remaining onsite, the set is delayed until the animals depart the vicinity or no longer appear to be at risk, at which point an additional 15 minute watch is conducted. If after moving on the animals remain at risk of interaction, then the vessel must move again or skip the station. Marine mammals sighted beyond the 500 m exclusion zone are monitored to determine position and movement in relation to the vessel. Professional judgment is used to determine the best course of action to minimize risk of an interaction.

- **Active gear monitoring**

Once gear 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 while gear is in the water, the most appropriate action to avoid an interaction is determined through the use of professional judgment. When professional judgment is used, it will be recorded, and is only to be used in circumstances when the gear is already deployed. For clarity, 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.

If a marine mammal is sighted in the purse seine net, the net is opened immediately to free the animal.

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

SWFSC's marine mammal excluder device was developed to allow marine mammals to escape from the Nordic 264 trawl 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. Operational status is checked prior to deploying the net.

- **Other standard trawl survey protocols**

The SWFSC also employs several standard survey protocols to minimize impacts on protected species: 1) research operations are conducted as soon as practicable upon arrival at the sampling station; 2) the gear is emptied as quickly as possible upon retrieval in order to determine whether to or not protected species are present, and; 3) care is 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

Two trawl-based surveys were conducted in the CCE during the reporting period: Rockfish Recruitment and Ecosystem Assessment (RREA) Survey (RL22-02) and the CCE Survey (RL22-04). RL22-02 was conducted aboard the R/V Reuben Lasker and supplemented on the R/V Shimada during the Applied California Current Ecosystem Studies (ACCESS) Cruise. Trawl operations for RL22-04 were conducted on the R/V Reuben Lasker. Acoustic systems used during 2022 trawl-based surveys include: Simrad EK60 and EK80 narrow beam echosounders, Simrad ME70 multibeam echosounder, Simrad MS70 multibeam sonar and Simrad SX90 narrow beam sonar. The Nearshore CPS Survey, a purse seine-based survey was conducted aboard two fishing vessels (F/V): F/V Long Beach Carnage for the southern aspect of the survey, and F/V Lisa Marie for the northern portion of the survey. The EK60 was the sole acoustic system used during the Nearshore CPS Survey. California Cooperative Oceanic Fisheries Operations (CaCOFI) surveys (RL22-05), which incorporate the EK60/80 acoustic systems are included in Table 1 below.

Table 1. Line-kilometers (kms) surveyed during the reporting period for which the SX90, EK60/EK80, or ME70 systems were the predominant acoustic sources in the CCRA compared to the totals calculated in the SWFSC’s MMPA LOA application (Appendix B of SWFSC’s National Environmental Policy Act (NEPA) Supplemental Programmatic Environmental Assessment (SPEA). Included in the ‘EK60/EK80 - Summed line-kms of reporting period/source (0-200 m)’ column are a fraction of Sairdrone line-kms, which operated with an EK80 WBT mini echosounder. The acoustic output for this source operates with less power at 38 kHz (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 Sairdrone 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 Sairdrone line-kms, which was added to the total line kms reported for the ship, and subsequently analyzed.

California Current Ecosystem						
Echosounder	SPEA Estimated summed dominant line kms/source (0-200 m)	Summed line-kms of reporting period / source (0-200 m)	Pro-rated predominant acoustic line-kms of reporting period/source (0-200 m)	SPEA Estimated summed dominant line-kms/source (>200 m)	Summed line-kms of reporting period / source (>200 m)	Pro-rated predominant acoustic line-kms of reporting period/source (>200 m)
SX90	33,880	2,792	698	33,880	11,049	2,762
EK60/EK80	79,912	9,995	5,997	99,640	22,218	16,664
ME70	19,728	952	143	0	0	0 ¹

¹The ME70 has negligible effects >200 m and is therefore pro-rated to 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 pro-rated acoustic 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	SPEA Estimated Annual Takes
		0-200 m	>200 m	EK60/EK80	ME70	SX90		
<i>CCE Cetaceans</i>								
Harbor porpoise	0.17057	X		13	0	8	22	675
Dall’s porpoise	0.23154	X		18	1	11	29	916
Pacific white-sided dolphin	0.1042	X		8	0	5	13	412
Risso’s dolphin	0.05283	X		4	0	2	7	209
Bottlenose dolphin	0.01565	X		1	0	1	2	62

Striped dolphin	0.22321	X		17	1	10	28	883
Short-beaked common dolphin	3.64808	X		286	9	166	462	14430
Long-beaked common dolphin	0.36033	X		28	1	16	46	1425
Northern right-whale dolphin	0.15534	X		12	0	7	20	614
Killer whale	0.00318	X		0	0	0	0	13
Short-finned pilot whale	0.00068		X	2	0	0	2	30
Baird's beaked whale	0.00523		X	12	0	2	14	72
Mesoplodon beaked whales	0.00612		X	14	0	3	17	84
Cuvier's beaked whale	0.01167		X	26	0	5	32	160
Pygmy sperm whale	0.01548		X	35	0	7	42	213
Dwarf sperm whale	0.01548		X	35	0	7	42	213
Sperm whale	0.00699		X	16	0	3	19	96
Humpback whale	0.00747	X		1	0	0	1	23
Blue whale	0.00449	X		0	0	0	1	18
Fin whale	0.03144	X		2	0	1	4	124
Sei whale	0.00185	X		0	0	0	0	10
Common Minke whale	0.0048	X		0	0	0	1	19
Gray whale	0.13483	X		11	0	6	17	533
<i>CCE Pinnipeds</i>								
California sea lion	1.28803	X		101	3	59	163	5095
Steller sea lion, eastern subspecies	0.31306	X		25	1	14	40	914
Guadalupe fur seal	0.07915	X		6	0	4	10	313
Northern fur seal	3.18399	X		250	8	145	403	12195
Harbor seal	0.28167	X		22	1	13	36	1114
Northern elephant seal	0.358		X	808	0	162	969	4916

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

Table 3. SWFSC gear metadata for the reporting period by trawl net, purse seine, hook and line in the CCRA.

Research Area	Gear Type	Total # tows/sets	Fishing Depth Range (m)	Average Tow Duration of active fishing (minutes)
<i>California Current Ecosystem</i>	Modified cobb trawl net	72	3-50	5-15
	Nordic 264 trawl net	88	0-15	45
	Purse seine	86	0-15	N/A
	Hook and line	30	N/A	180-240 (soak time)

In the CCE, the modified Cobb net was used during RL22-02. The Nordic 264 net was used for RL22-04.

A purse seine net was used by cooperative agencies Washington Department of Fish and Wildlife (WDFW) and California Wetfish Producers Association (CWPA) for northern and southern aspects of the Nearshore CPS Survey.

Hook and line gear was used in the Genetics Physiology and Aquaculture (GPA) Rockfish Barotrauma Project. During fishing efforts, an attempt is made to mimic the recreational fishing fleet, and therefore gear restrictions other than established sport fishing regulations, are not imposed. Hook type was predominately J hooks and varied from 5/0 to 10/0 in size. Fishing line mostly consisted of spectra fishing line with a monofilament leader.

Longline and deep-set buoy 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 SWFSC Level A interaction events in the CCE.

Table 4. SWFSC’s take table from the MMPA LOA for the CCE displays the takes issued to the Center by gear type in that ecosystem over the five year authorization period (January 2021 - January 2026).

Species	Authorized Take				
	M/SI + Level A ¹			Level B ²	
	Trawl	Purse Seine	Hook & Line		
Gray whale (<i>Eschrichtius robustus</i>)	-	-	-	533	
Humpback whale (<i>Megaptera novaeangliae</i>)	-	-	-	23	
Minke whale (<i>Balaenoptera acutorostrata</i>)	-	-	-	19	
Sei whale (<i>Balaenoptera borealis</i>)	-	-	-	10	
Fin whale (<i>Balaenoptera physalus</i>)	-	-	-	124	
Blue whale (<i>Balaenoptera musculus</i>)	-	-	-	18	
Sperm whale (<i>Physeter macrocephalus</i>)	-	-	-	96	
Pygmy or dwarf sperm whale (<i>Kogia</i> spp.)	-	-	2	213	
Cuvier’s beaked whale (<i>Ziphius cavirostris</i>)	-	-	-	160	
Baird’s beaked whale (<i>Berardius bairdii</i>)	-	-	-	72	
Hubbs’, Blainville’s, ginkgo-toothed, Perrin’s, lesser, or Stejneger’s beaked whales (<i>Mesoplodon</i> spp.)	-	-	-	84	
Bottlenose dolphin (<i>Tursiops truncatus</i>)	CA/OR/WA stock	8	-	1	62
	CA coastal stock	3	-	-	
Striped dolphin (<i>Stenella coeruleoalba</i>)	11	1	2	883	
Long-beaked common dolphin (<i>Delphinis capensis</i>)	11	1	2	1,425	
Short-beaked common dolphin (<i>Delphinis delphis</i>)	11	1	2	14,430	
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	40	1	-	412	
Northern right whale dolphin (<i>Lissodelphis borealis</i>)	10	1	-	614	
Risso’s dolphin (<i>Grampus griseus</i>)	11	1	2	209	
Killer whale (<i>Orcinus orca</i>)	-	-	-	13	
Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)	-	-	2	30	
Harbor porpoise (<i>Phocoena phocoena</i>)	5	1	-	675	

Dall's porpoise (<i>Phocoenoides dalli</i>)		5	1	-	916
Guadalupe fur seal (<i>Arctocephalus philippii townsendi</i>)		-	-	-	313
Northern fur seal (<i>Callorhinus ursinus</i>)	California stock	5	-	-	12,595
	Pribilof Islands/ Eastern Pacific stock				
California sea lion (<i>Zalophus californianus</i>)		20	5	5	5,095
Steller sea lion (<i>Eumetopias jubatus</i>)		9	-	1	914
Harbor seal (<i>Phoca vitulina</i>)		9	5	-	1,114
Northern elephant seal (<i>Mirounga angustirostris</i>)		5	-	-	4,916
Unidentified cetacean (Family Delphinidae or Family Phocoenidae)		1	-	-	-
Unidentified pinniped		1	1	1	-

¹ 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 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 (Nordic 264 and modified Cobb 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 (2021-2026)	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	0	11
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	40	0	37
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	1	17
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

Table 6. SWFSC’s Level A takes in purse seine gear for the reporting period and the remaining takes left for purse seine surveys during the authorization period.

Authorized Purse Seine Species	# of Level A (M/SI) authorized incidental takes (2021-2026)	SWFSC Trawl Takes for the reporting period	Remaining Takes
Striped dolphin (<i>Stenella coeruleoalba</i>)	1	0	1
Long-beaked common dolphin (<i>Delphinus capensis</i>)	1	0	1
Short-beaked common dolphin (<i>Delphinus delphis</i>)	1	0	1
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	1	0	1
Northern right whale dolphin (<i>Lissodelphis borealis</i>)	1	0	1
Risso’s dolphin (<i>Grampus griseus</i>)	1	0	1
Harbor porpoise (<i>Phocoena phocoena</i>)	1	0	1
Dall’s porpoise (<i>Phocoenoides dalli</i>)	1	0	1
California sea lion (<i>Zalophus californianus</i>)	5	0	5
Harbor seal (<i>Phoca vitulina</i>)	5	0	5
Unidentified pinniped	1	0	1

Table 7. SWFSC’s Level A takes in hook and line gear for the reporting period and the remaining takes during the authorization period.

Authorized Purse Seine Species	# of Level A (M/SI) authorized incidental takes (2021-2026)	SWFSC Trawl Takes for the reporting period	Remaining Takes
Pygmy or dwarf sperm whale (<i>Kogia</i> spp.)	2	0	2
Bottlenose dolphin (<i>Tursiops truncatus</i>) (CA/WA/OR Stock)	1	0	1
Striped dolphin (<i>Stenella coeruleoalba</i>)	2	0	2
Long-beaked common dolphin (<i>Delphinus</i>)	2	0	2

<i>capensis</i>)			
Short-beaked common dolphin (<i>Delphinus delphis</i>)	2	0	2
Risso's dolphin (<i>Grampus griseus</i>)	2	0	2
Short-finned pilot whale (<i>Globicephala macrorhynchus</i>)	2	0	2
California sea lion (<i>Zalophus californianus</i>)	5	0	5
Steller sea lion (<i>Eumetopias jubatus</i>)	1	0	1
Unidentified Pinniped	1	0	1

Level A Marine Mammal Interactions

During the reporting period, SWFSC had 1 interaction with a California sea lion (*Zalophus californianus*). The interaction 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. 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.

Incidental take of one California sea lion (*Zalophus californianus*) occurred on September 18, 2022 off the coast of Southern California (33.839097, -120.4136) during RL 22-04 (haul 56) between the time period of 0:42, the start of active fishing and 01:27, the completion of active fishing. Three dolphins were seen during the pre-set watch approximately 24 hours prior to the incidental take event. Marine mammals were not seen during the 15 minute pre-set watch. The visual observation period continued during gear deployment, active fishing (tow speed: 3.7 knots; trawl directionality: down swell) and gear retrieval in which no marine mammals were seen until the animal was visualized once it was brought on board with the trawl net. One deceased female California sea lion (RL220918.001, curvilinear length: 143 cm) was discovered entangled in the 8 inch (in) mesh panel. Photographs were taken, and reported to the Protected Species Incidental Take (PSIT) database. No obvious injuries or emaciation were noted. The animal was not lactating. Visibility was reported as good with clear skies. Wind speed was 10 knots and sea conditions were recorded as calm/moderate. Sea surface temperature was 16.8°C. Species composition of the catch was composed mostly of Northern anchovy. Four pingers, confirmed to be operating properly by the scientific crew and the survey technician prior to net deployment, were attached to the headrope and footrope of the trawl net (3-70 kHz and 1-10 kHz). The animal was stored frozen and subsequently transferred to the Marine Mammal and Turtle Division at SWFSC for necropsy and further analysis.

During the reporting period, SWFSC had no Level A marine mammal interactions with purse seine nets.

During the reporting period, SWFSC had no Level A marine mammal interactions with hook and line gear.

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

V. Final Outcome of Serious Injury Determinations

No serious injury determinations were made during the reporting period. However, there was one instance of final outcome determination, fatal incidental take, as described in Section 4. A total of 1 sea lion was taken incidentally in RL22-04 trawl activities. Photographs were taken immediately after the incidental take events and are available on PSIT.

VI. Evaluation of Effectiveness of SWFSC Mitigation Strategies

Mitigation measures are continually evaluated by SWFSC to further reduce potential impacts to marine mammals. 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 these nets, the following mitigation protocols must be observed: protected species watches (15 minute pre-set, gear deployment, active fishing and gear retrieval), move-on rule, use of 2-4 acoustic pingers, use of professional judgment, and standard survey protocols (all described in detail in Section 1).

Over the reporting period, watch logs showed that during nighttime surveys, animals were often able to be heard or seen in close proximity to the ship, resulting in implementation of the move-on rule in order to reduce risk of an interaction. Through anecdotal descriptions, we have determined these sightings typically occur in good conditions, i.e., minimal cloud cover, moonlight, low Beaufort Sea state, etc. and most often, 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 a significant distance from the ship and therefore, even in good conditions, it is nearly impossible to see if marine mammals are in the vicinity of the net. This is evidenced by the fact that the incidentally captured sea lion, as well as no additional marine mammals, were seen during the pre-set, gear deployment, and active fishing. However, there were a number of hauls during both trawl surveys where marine mammals were seen during visual observations, a majority of which were during the pre-set watch and during haul back. There were a few instances where dolphins were observed during active fishing, primarily during the first few minutes. The ship retrieved the net and either enacted the move on rule or canceled the station as a result of the sightings.

During the RL22-02 survey professional judgment was practiced in one instance when a sea lion was heard in close proximity to the ship during active fishing, but not seen. The trawl was immediately aborted and the net hauled back. During the RL22-04 survey, professional judgment was used on one occasion, when approximately 6 dolphins were seen swimming next to the ship during active fishing. Due to the proximity to the vessel and number of dolphins, the net was hauled in and the move-on rule

enacted. Two scientists were performing the watch and the ship moved on a total of 3 times before successfully completing the haul. There were no incidental takes which occurred during either event.

Table 7. 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 canceled due to MM
<i>Modified Cobb Net</i>					
Rockfish Recruitment and Ecosystem Assessment - RL22-02	72	7	9.7%	2	2.8%
<i>Nordic 264 Net</i>					
Summer CCE - RL22-04	88	8	9.1%	2	2.2%

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 or early in gear deployment or active trawling, 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 the associated percentage in the column to the right labeled ‘% of total tows canceled due to MM.’

Purse Seine Marine Mammal Mitigation Measures

The SWFSC conducts collaborative research with WDFW and CWPA and contracted F/V Lisa Marie and F/V Long Beach Carnage to complete Nearshore CPS Survey research objectives. The vessels use a purse seine net and require implementation of mitigation measures. During the use of these nets, the following mitigation protocols must be observed: protected species watches (15 minute pre-set, gear deployment, active fishing and gear retrieval), move on rule (specific to purse seine operations), use of professional judgment and standard survey protocols, including opening of the net if cetaceans are observed within. Mitigation measure descriptions can be found in Section 1.

Over the reporting period, watch logs showed several occasions when pinnipeds (harbor seals and sea lions) were seen swimming outside of the net, however, it was not obvious if direct interaction with the net and/or depredation occurred below the surface.

Hook and Line Marine Mammal Mitigation Measures

Two hook and line surveys are covered under the MMPA LOA, in which visual monitoring must occur prior to deployment of gear, active fishing and gear retrieval. Surveys typically conducted are the GPA Project and Life History and Reproductive Ecology Investigations of Rockfish. The latter did not occur this season. Mitigation measure descriptions for hook and line gear can be found in Section 1.

Over the reporting period, the watch log for the GPA survey indicated that occasionally sea lions would swim in the vicinity of the vessel, but did not investigate or interact with the gear.

To ensure compliance with these regulations, SWFSC implements the use of boilerplate language in all project instructions for surveys that use trawl nets. Project instructions, which detailed required environmental compliance and other standard trawl protocols, were provided to the crew of R/V Reuben Lasker for all trawl surveys discussed in this report.

VII. Mitigation Strategy Updates

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 and limiting survey impacts to protected species. With additional years of data collection, we aim to develop a more informed view of the efficacy of our mitigation strategies.

A continuous effort is underway to analyze environmental factors that may play a role in Level A incidental takes. Current and historical data collected from trawl surveys between 2008-2021, including watch logs, GoPro footage (between the years of 2013-2016) and a number of environmental factors have been recorded in an active dataset. Environmental factors included are moon phase, visibility, sky conditions, sea surface temperature, salinity, wind speed, etc. Pending the results of the analysis, the goal is to create a risk analysis for scientists to use at sea.

During both trawl surveys, the Simrad SX90 echosounder was opportunistically used to aid in detection of marine mammals in the vicinity of the ship. In the event a marine mammal is detected with the sonar, scientists and/or crew will scan the surface of the water in an attempt to visualize the animal within the 1 n mi exclusionary zone. In one instance during RL22-04, an unidentified marine mammal was detected with the sonar, but could not be seen by the scientist and crew on watch. The decision was made to continue trawling. No marine mammals were incidentally captured during the haul. There has been renewed interest and discussions to investigate the feasibility of incorporating available acoustic technology to further reduce the risk of incidental take. The echosounders used during SWFSC trawl surveys (EK60/80, SX90, ME70 and MS70) may have potential to assist in mitigation efforts, however extensive data will need to be collected to accurately localize the animals, and potentially develop a notification system in select species of marine mammals are within the 1 n mi exclusionary zone during the pre-set watch and active fishing. The implementation of the project is contingent upon available funding and personnel.

VIII. Training Provided to SWFSC Staff and Cooperative Agencies

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 judgment to avoid marine mammal interactions to gain an understanding of successful versus unsuccessful decisions.

Quarterly meetings are held between Environmental Compliance Coordinators on the West coast (SWFSC, NWFSC, AFSC and PIFSC) to discuss various topics, including protocols, training and authorization renewals.

Annual training was provided April 13, 2022 for SWFSC's Fisheries Ecology Division trawl-based surveys and on April 22, 2022 for the Fisheries Resources Division trawl-based survey. Training for Nearshore CPS Survey participants which include cooperative agencies (WDFW and CWPA) was provided on June 8, 2022. Training for hook and line projects was provided to Chief Scientists and key biologists within those projects on March 3, 2022. All trainings 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, implementation of the authorization conditions (mitigation measures, reporting requirements, data collection, etc), discussion of the use of professional judgment 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). In addition to the annual training, refresher environmental compliance training sessions were offered to participants of the Summer CCE Survey. Refresher training occurred on June 9, 2022. Protected Species Handling Training was provided to the R/V Reuben Lasker crew on May 10, 2022. All training sessions were provided virtually.

Appendix A

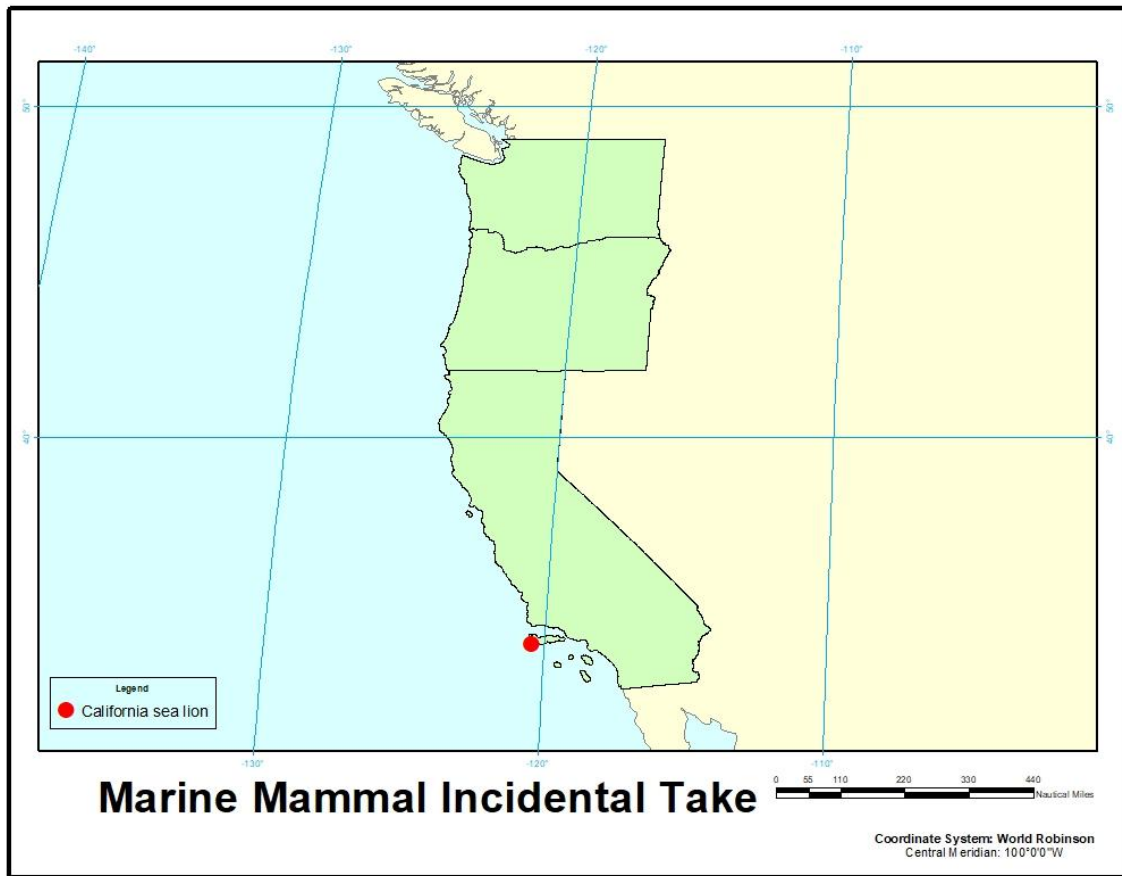


Figure 1. Map of SWFSC’s Level A incidental take of marine mammal species protected under the MMPA over the reporting period.