

NWFSC Processed Report 2018-03



Observed and Estimated Marine Mammal Bycatch in U.S. West Coast Groundfish Fisheries, 2002–16

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National Oceanic and Atmospheric Administration
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Jason E. Jannot,¹ Kayleigh A. Somers,¹ Vanessa Tuttle,¹
Jon McVeigh,¹ James V. Carretta,² and Van Helker³

¹Fishery Resource Analysis and Monitoring Division
Northwest Fisheries Science Center
2725 Montlake Boulevard East
Seattle, Washington 98112

²Marine Mammal and Sea Turtle Division
Southwest Fisheries Science Center
8901 La Jolla Shores Drive
La Jolla, California 92037

³Marine Mammal Laboratory
Alaska Fisheries Science Center
7600 Sand Point Way Northeast
Seattle, Washington 98115

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Note:

Due to the amount of data they contain, Tables 7, 8, 9, 13, 14, 15, 16, and 17 have been typeset on legal-sized pages. Printing them on regular, letter-sized paper may result in reduced legibility.

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Summary

Marine mammal bycatch estimates are provided for the years 2002 through 2016 from all fishery sectors observed by the Northwest Fishery Science Center Groundfish Observer Program (Table 1). In addition, we provide historical estimates of marine mammal bycatch in the Limited Entry (LE) bottom trawl fishery for the 2002–10 period.

The five-year average bycatch of pinnipeds and 95% confidence interval is given in Figure 1. California sea lions are the most frequently caught pinniped in the fisheries reported here, followed by Steller sea lions and northern elephant seals. Pinniped bycatch is mainly in fisheries using bottom and midwater trawls. During the LE bottom trawl years (2002–10), pinniped mortality was relatively high, driven by the bycatch of California sea lions in the LE trawl fishery (Table 7). In 2010, pinniped mortality began to drop over the 2010–15 period (Figure 1), coinciding with the implementation of the catch share management program of the LE bottom trawl fishery in 2011. Pinniped bycatch made a sharp upswing in 2016 (Figure 1) due to unusually high bycatch of both California and Steller sea lions in the at-sea hake catcher–processor fleet that year (Figure 1).

The five year average bycatch and 95% confidence interval of cetaceans excluding humpback whales is given in the top portion of Figure 2, and hovered around a five-year average of 10 for 2002–16. Dolphins and porpoises are the most frequently caught cetaceans in the fisheries reported here, mainly in fisheries using bottom and midwater trawls.

The five-year average bycatch and 95% confidence interval of humpback whales is given in the bottom portion of Figure 2. Two humpback whales were observed entangled in pot gear over the 2002–16 period. The single humpback whale entangled in the limited entry sablefish pot fishery in 2014 (Table 14) resulted in an estimated five-year average of one (1) entangled whale in 2012–16 (95% confidence interval: 1–3). The single humpback whale entangled in the open access fixed gear fishery in 2016 (Table 16) resulted in an estimated five-year average of three (3) entangled whales in 2012–16 (95% confidence interval: 1–6).

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The authors gratefully acknowledge the hard work and dedication of observers and staff of the Northwest Fisheries Science Center's Fisheries Observation Science Program (NWFSC FOS). We would like to thank Jim Carretta (Southwest Fisheries Science Center) and Van Helker (Alaska Fisheries Science Center) for providing serious injury determinations used in these analyses. We would like to thank Kate Richerson (NWFSC FOS) and Michelle McClure (NWFSC FRAM) for reviewing this document, and Al Brown of NWFSC Communications for technical editing.

Introduction

The California Current marine ecosystem on the United States West Coast (Washington, Oregon, and California) supports a diversity of marine mammals. Managing and conserving marine biodiversity requires accounting for human-induced mortality to marine mammals. The distributions of marine mammals overlap with commercial fisheries operating within the U.S. Exclusive Economic Zone (EEZ), which can cause incidental human-induced serious injury or mortality of these species, a.k.a., bycatch. Under the Marine Mammal Protection Act (MMPA), a “take” is defined as any act that harasses, hunts, captures, or kills, or attempts to harass, hunt, capture, or kill, a marine mammal. While commercial fisheries are granted an exemption on the prohibition of takes under the MMPA, the Act tasks NOAA Fisheries with managing serious injuries and mortalities of marine mammals from bycatch in commercial fishing operations. This report summarizes interactions between the U.S. West Coast groundfish fishery and marine mammals, and presents estimates of fleetwide bycatch for these species based on data from the fishery and federal observer programs for 2002–16.

Marine Mammal Protection Act

The MMPA was passed in 1972 and amended in 1994. The Act states that marine mammal species and population stocks should not be permitted to diminish below their optimum sustainable population level, and that measures must be taken to replenish depleted species or population stocks. Measures include reduction in the taking of marine mammals in U.S. waters by U.S. citizens on the high seas, and through the importation of marine mammals and marine mammal products in the United States. The MMPA contains specific provisions for reducing marine mammal bycatch in U.S. commercial fisheries.

Effects of U.S. commercial fisheries on marine mammal populations are determined annually and reported in the List of Fisheries (LOF), which is published by the National Marine Fisheries Service (NMFS) as required by section 118 of the MMPA (16 USC 1387(c)(1)). Each fishery is placed into one of three categories based on the level of marine mammal serious injury and mortality in the fishery; Category I has the highest injury/mortality level, and Category III has the lowest injury/mortality level. The categorization process often relies on Marine Mammal Stock Assessment Reports (SARs) to provide the allowable biological removal of the stock that ensures a sustainable population is maintained. The categorization level of a fishery determines if compliance is required with particular provisions of the MMPA, including registration, observer coverage, and take reduction plans. Category I and Category II commercial fisheries are required to comply with MMPA provisions, while Category III commercial fisheries are not.

Fishery Descriptions

Table 1 provides a description of permits, gears used, target groups, vessel length range, fishing depth range, and management of fishery sectors and subsectors in U.S. West Coast groundfish fisheries. To describe the management of each sector and subsector, we divided the fisheries into three management components: 1) federally managed catch share fisheries, 2) other federally managed fisheries (non-catch share), and 3) fisheries managed by one or more U.S. West Coast

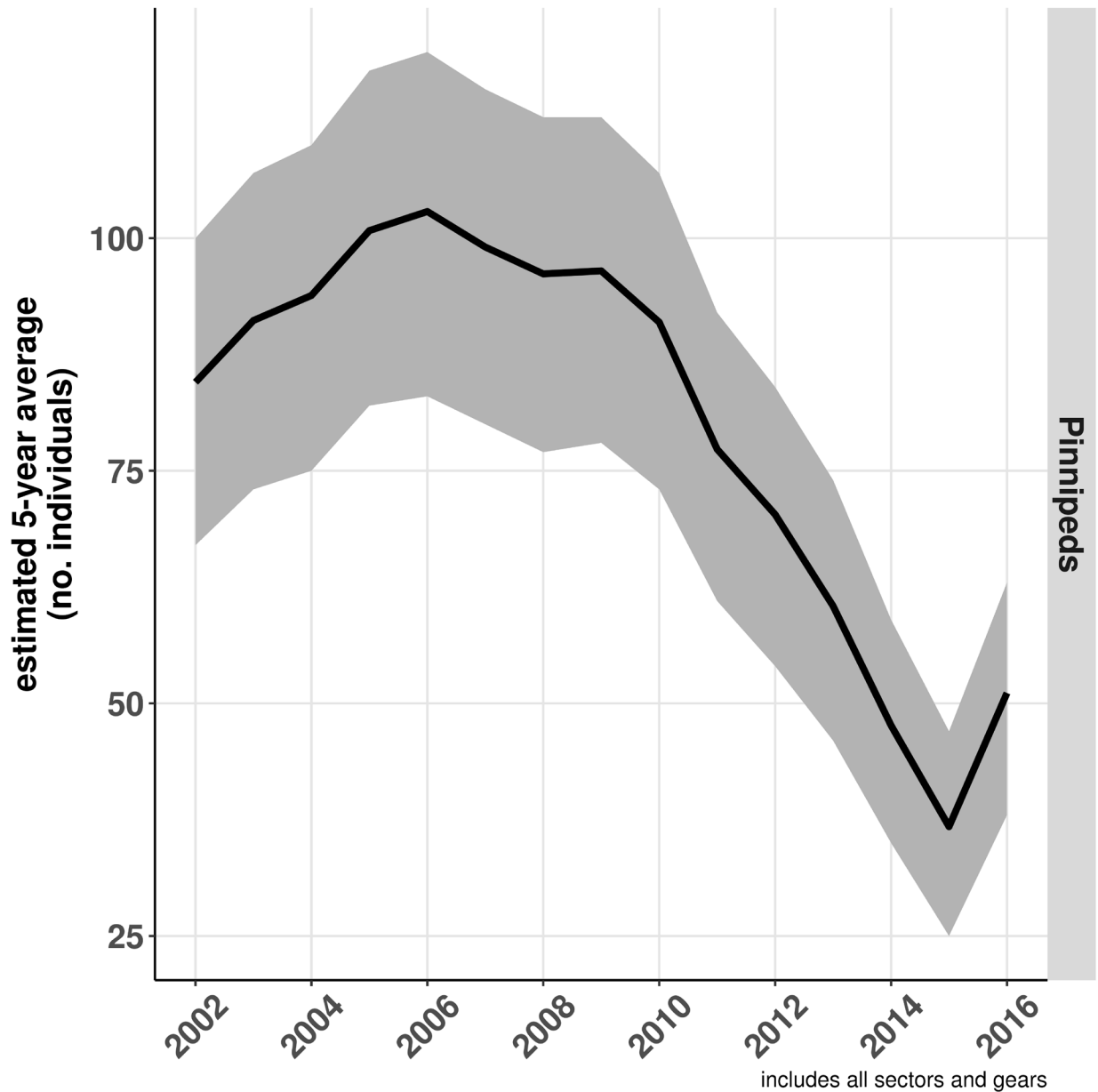


Figure 1. Estimated 5-year mean number (= line; ribbon = 95% confidence interval) of pinniped mortalities from all sectors and gears (Table 1), 2002–16, observed by the NWFSC Groundfish Observer Program.

states. Within federally managed catch share fisheries, we divided management into the years of fishery observation before catch shares (2002–10) and management since the implementation of catch shares (2011–16). For other federally managed and state-managed fisheries, we present the dominant management policies for 2002–16. Regulatory management varied within each time period; here we only present a summary of the significant regulations within each time period.

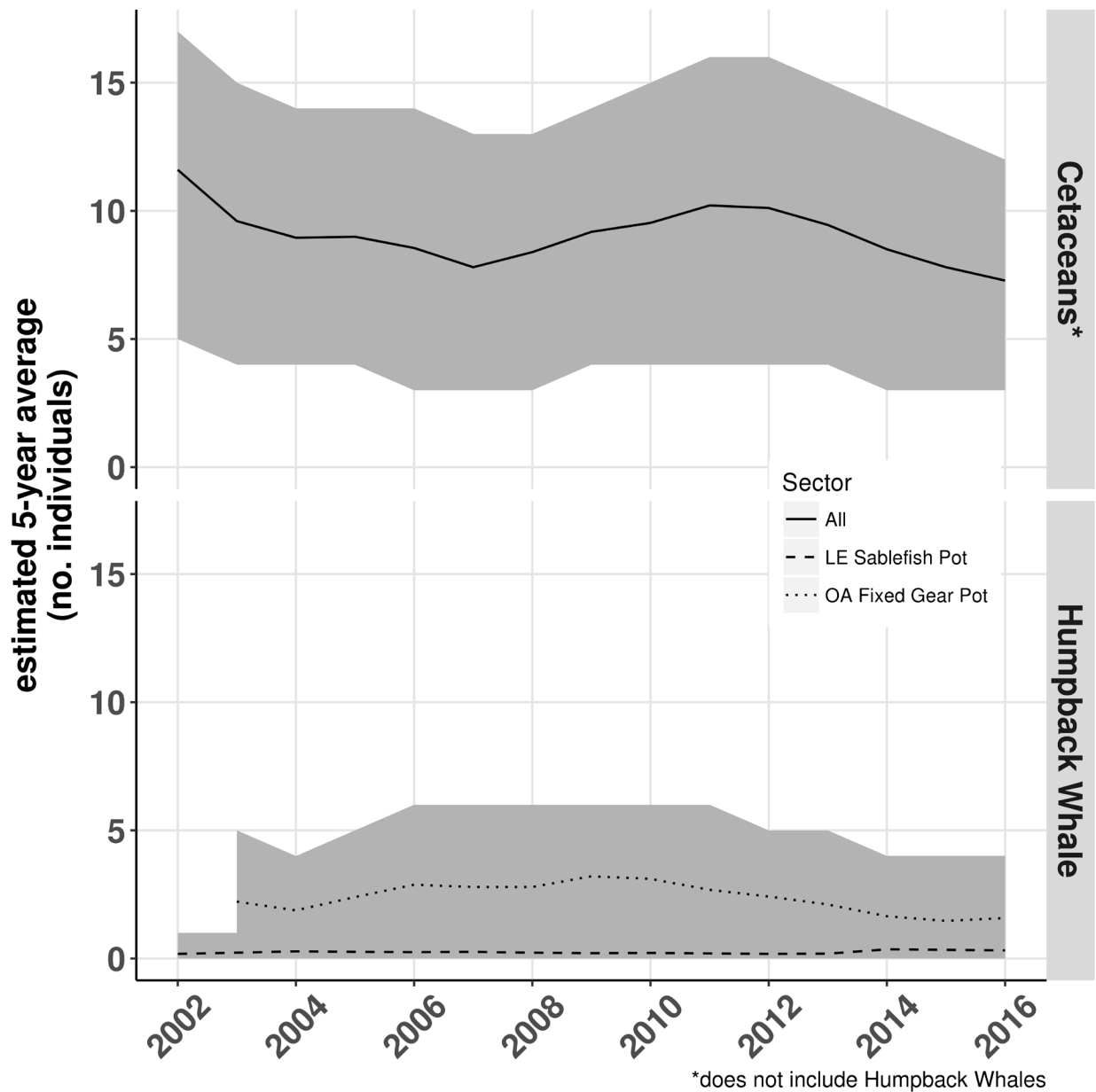


Figure 2. Estimated 5-year mean number (= line; ribbon = 95% confidence interval) of cetacean and humpback whale mortalities, 2002–16, observed by the NWFSC Groundfish Observer Program.
 *Cetaceans exclude humpback whale bycatch, but include all fishery sectors and gears.

Table 1a. A description of permits, gears used, target groups, vessel length range, fishing depth range, and management of fishery sectors and subsectors in federally managed U.S. West Coast groundfish catch share fisheries. For brevity, management descriptors are generalized for the given time period and are not meant to be complete or comprehensive.

Sector	Subsector	Permit(s)	Gear(s)	Target(s)	Vessel Length (m)	Depth (m)	Management period	
							2002–10	2011–present
Limited Entry (LE) Trawl	Limited Entry (LE) Trawl	Federal LE permit ^a with trawl endorsement	Bottom trawl (after 1 Jan 2011); hook-and-line; pot	Ground-fish assemblage	11–29	Wide range	Cumulative two-month trip limits; depth-based closures; 14–23% observer coverage	Individual Fishing Quotas (IFQs); 100% observer coverage
	LE California Halibut	CA halibut permit ^b and LE permit with trawl endorsement ^a	Bottom trawl	California halibut	9–22	<55	Cumulative two-month trip limits; depth-based closures; 3–23% observer coverage	IFQs; 100% observer coverage
At-Sea Hake	Mother-ship Catcher Vessel (MSCV)	LE permit with MSCV endorsement ^a	Midwater trawl	Pacific hake	26–45 ^c	53–460 ^c	Seasonal quotas for target and bycatch species of concern; 100% observer coverage	IFQs; seasonal; 100% observer coverage
	Catcher-processor (CP)	LE permit with CP endorsement ^a	Midwater trawl	Pacific hake	82–115	60–570	Seasonal quotas for target and bycatch species of concern; 100% observer coverage	IFQs; seasonal; 100% observer coverage
	Tribal	(none)	Midwater trawl	Pacific hake	<38	53–460	Tribal; 100% observer coverage	Tribal; 100% observer coverage
Shoreside Hake	n/a	LE permit with trawl endorsement ^a	Midwater trawl	Pacific hake	17–29	Wide range	Seasonal quotas for target and bycatch species of concern; electronic monitoring	IFQs; seasonal; 100% observer coverage

^a All LE permits are issued by federal agency (NOAA).

^b Issued by the state of California.

^c Average value for catcher vessels delivering catch to motherships.

Table 1b. A description of permits, gears used, target groups, vessel length range, fishing depth range, and management of fishery sectors and subsectors in other federally managed U.S. West Coast groundfish fisheries. For brevity, management descriptors are generalized for the given time period and are not meant to be complete or comprehensive.

Sector	Subsector	Permit(s)	Gear(s)	Target(s)	Vessel Length (m)	Depth (m)	Management period
							2002–present
Non-nearshore Fixed Gear	Sablefish endorsed	LE permit with fixed gear endorsement ^a and sablefish quota	Longlines; pots	Sablefish	11–32	>145	Sablefish tier quotas; seven-month season; 9–27% observer coverage
	Sablefish non-endorsed (a.k.a., Zero Tier)	LE permit with fixed gear endorsement ^a without sablefish quota	Longlines; pots	Sablefish; rockfish; flatfish	5–18	>145	Trip limits; 1–12% observer coverage
	Open Access	(none)	Longlines; pots	Sablefish; other groundfish	3–30	>64	Trip limits; 1–6% observer coverage

^a All LE permits are issued by federal agency (NOAA).

Table 1c. A description of permits, gears used, target groups, vessel length range, fishing depth range, and management of fishery sectors and subsectors in state-managed U.S. West Coast groundfish fisheries. For brevity, management descriptors are generalized for the given time period and are not meant to be complete or comprehensive.

Sector	Permit(s)	Gear(s)	Target(s)	Vessel Length (m)	Depth (m)	Management period
						2002–present
Open Access California Halibut	CA halibut permit ^b	Bottom trawl	California halibut	9–22	<55	All fishing occurs within CA waters, most in the California Halibut Trawl Grounds where minimum mesh sizes, seven-month season, and minimum size requirements hold; 1–16% observer coverage
Nearshore Fixed Gear ^a	OR or CA state nearshore permits and endorsements	Hand lines; pot gear; stick and-reel	Rockfish; cabezon; greenling	3–15	<110 (usually <55 in OR waters)	Federal and OR or CA state nearshore regulations; area closures; two-month trip limits; minimum size limits; 2–8% observer coverage
Pink Shrimp	WA, OR, or CA state pink shrimp permits	Shrimp trawl	Pink shrimp	11.5–33	91–256	WA, OR, or CA state pink shrimp regulations; Bycatch Reduction Devices required; trip limits on groundfish landed; 4–14% observer coverage

^a The state of Washington does not conduct a nearshore fishery.

^b Issued by the state of California.

Marine Mammal Data Collection

Serious Injury and Mortality Determinations

Mammal bycatch can occur by a variety of means, and species vary in susceptibility to fishing mortality. Fishing behavior and methods, gear type, time, and weather all contribute to the probability of mammal mortality. In addition, species-specific characteristics, such as feeding locations and times, diet preferences, size, and individual physical condition, also play a role in susceptibility.

Serious injury and mortality designations were determined by marine mammal injury experts at both NOAA's Southwest Fisheries Science Center (La Jolla, CA, USA) and Marine Mammal Laboratory (Seattle, WA, USA; Carretta et al. 2016, 2017). The combination of the interaction category, interaction outcome, and specific details in observer notes recorded at the time of the interaction informed injury and mortality designations. For most interactions, the interaction category, in combination with the interaction outcome, was sufficient to make the determination. In other instances, the observer notes recorded at the time of the interaction indicated that the interaction resulted in, or was likely to result in, the mortality of the animal. Observers typically detail the nature of the injury and changes in the animal's behavior following its release. Noted factors indicating a potential mortality could include evidence of bleeding, broken bones, wounds, trailing gear, vomiting, and abnormal behavior. In the cases of live but potentially injured animals, NMFS and NOAA guidelines and policies were applied to determine whether the injury had the potential to cause mortality, was serious, or was nonserious (NMFS 2012a, 2012b, USOFR 2012, Carretta et al. 2017). Serious injuries and mortalities were used in bycatch estimates, whereas nonserious injuries or other nonlethal interactions were excluded from bycatch estimates.

For the purposes of bycatch estimation, we assume that any observed marine mammals represent a complete census of the mammals in the catch. This assumption is justified because the large size of marine mammals makes them easy to observe and sample, even among large quantities of fish catch. In addition, marine mammal interactions take priority over other observer duties.

Marine Mammal Bycatch Estimation

Observer coverage, defined as the percentage of observed landings to total landings, varies among the U.S. West Coast groundfish fleets based on fisheries management priorities and observer program logistics and priorities. A substantial portion of the fleet is 100% monitored—that is, either an observer or electronic monitoring equipment is used on every fishing trip.

In other fishery sectors, observer coverage is less than 100%. In sectors with less than 100% coverage, we must expand the observed marine mammal interactions to the unobserved portion of the fleet.

Ratio estimators have been widely used in expanding discards for the purposes of estimating fleetwide discards (Stratoudakis et al. 1999, Borges et al. 2005, Walmsley et al. 2007), including to estimate marine mammal bycatch in fisheries reported here (Jannot et al. 2011). Ratio estimators rely heavily on the assumption that bycatch is proportional to some metric or proxy of fishing

effort, such as fishery landings, an assumption not often supported by data (Rochet and Trenkel 2005). In some cases, bycatch might vary nonlinearly or even be unrelated to the ratio estimator denominator. Most mammal species reported here are rarely or sporadically caught. The rarity of mammal bycatch, combined with less than 100% observer monitoring in many of these fisheries, makes it difficult to assess the link between mammal bycatch and fishing effort. Low levels of observer coverage can produce biased estimates when ratio estimators are used to calculate fleetwide bycatch of protected species (Carretta and Moore 2014, Martin et al. 2015).

To overcome the limitations of ratio estimators, we applied a Bayesian modeling approach to estimate total bycatch and associated error for fisheries sectors with less than 100% observer monitoring. These methods have been used with other rare bycatch species, including cetaceans, delphinids, pinnipeds, sea turtles, and sharks (Martin et al. 2015). We modeled bycatch rate as constant, and inferred annual expected mortality given a specified level of effort. Fleetwide bycatch for fisheries with less than 100% observer coverage was estimated using observer coverage rate (observed landings \div total landings).

The general modeling approach was to use a simple Poisson process model, where the total number of bycatch events were assumed to follow a Poisson distribution,

$$n_{take,y} \sim Poisson(\lambda_y = \theta \cdot E_y) \quad (1)$$

where, for each stratum,

- E_y represents the effort in year y ,
- θ is an estimated bycatch rate,
- λ_y represents the mean expected bycatch, and
- $n_{take,y}$ represents the number of observed bycatch events (or take events) in year y .

The estimated bycatch rate θ is assumed constant through time, but the quantity $\theta \cdot E_y$ includes uncertainty (as θ is estimated). Thus, a time series of the mean bycatch can be generated for a given species, with a given metric of effort. We used a Bayesian model (Martin et al. 2015) to generate mean and 95% CIs of the parameter θ , as well as for $\theta \cdot E_y$. The estimated bycatch rate θ is assumed constant through time. All uncertainty in the time series originates from fluctuating levels of effort through time (percent observer coverage only affects the expansion). Future investigations will explore the assumption that θ is constant through time.

Because observer coverage is less than 100% in some fleets, and variable through time, we need to expand the estimated bycatch, $\theta \cdot E_y$, to the fleetwide level. One approach for expansion would be to divide $\theta \cdot E_y$ by the percent observer coverage; however, this ignores uncertainty in the expansion. We accounted for uncertainty in the expansion by treating the observer coverage and estimated bycatch ($\theta \cdot E_y$) as known, and sampling from the distribution of total bycatch in proportion to the binomial density function. This process was repeated for each Markov Chain Monte Carlo (MCMC) draw, to propagate uncertainty in the estimates through the uncertainty in the expansion.

As noted above, the relationship between bycatch and fishery landings as a metric of effort is not always supported in fisheries data (Rochet and Trenkel 2005). To examine the effects of different metrics on our bycatch estimates, we estimated bycatch using the Bayesian approach described above with three different metrics of effort: total sector landings, gear units, and hours gear spent in the water. We compared the results of these different effort metrics to each other and to the estimated bycatch using a ratio estimator, by sector, gear type, and mammal species. Our results (not shown) indicate that in the majority of cases, the annual bycatch estimate does not vary substantially among effort metrics using the Bayesian approach. However, there are significant differences in annual bycatch estimates between the Bayesian approach and the ratio estimator method, as was expected (Carretta and Moore 2014, Martin et al. 2015).

In the tables and figures, we present the results from the Bayesian approach using landings as the effort metric, because this is consistent with both NWFSC observer coverage calculations and NWFSC bycatch estimation for nonbird species.

We did not post-stratify the data, as has been done in previous reports (Jannot et al. 2011). In the past, we used separate stratification schemes for each marine mammal, based on biology as described in Jannot et al. (2011). Post-stratification of the data was inconsistent with the sampling design employed by the WCGOP. Dropping the post-stratification could account for the differences between the Bayesian estimates and the ratio estimator estimates. We tested for this effect by comparing Bayesian estimates generated with the strata described above to those generated without strata (data not shown). The largest difference between annual estimates calculated by the two methods was less than 1%. Thus, we do not feel that removal of the stratification accounts for the large differences between Bayesian and ratio estimates. Here we report the Bayesian estimates generated without post-stratification. We also present the five-year mean of the Bayesian estimate for comparison.

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Tables

Trawl Fisheries

Catch Share Fisheries, 2002–16

Table 2. Catch share (a.k.a., Individual Fishing Quota, IFQ) trawl fisheries marine mammal bycatch and observer coverage statistics by year, sector, and gear type. These vessels carried a scientific observer for 100% of the trips; electronic monitoring (EM) was not used. All IFQ fisheries are 100% observed by a scientific observer or electronically monitored. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: *CS* = catch share, *MR* = midwater rockfish, *BT* = bottom trawl, *MT* = midwater trawl.

Year	Sector	Gear	Observed			Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Trips	Tow hours	Sets	Catch (mt)	Sets	Catch (mt)	Sets	Catch (mt)		
2011	CS	BT, MT	72	1134	40198.1	9195	17253.2	58	96.64	0.99	0.99	California sea lion	10
2012	CS	BT	67	1089	38029.4	8968	17178.8	52	106.43	0.99	0.99	California sea lion	6
2013	CS	BT	68	1193	42066.2	10017	18615.4	24	50.89	1.00	1.00	California sea lion	0
2014	CS	BT	64	1033	34171.2	8333	16094.1	32	75.70	1.00	1.00	California sea lion	8
2015	CS	BT	60	904	28855.2	7480	15666.1	13	52.41	1.00	1.00	California sea lion	4
2016	CS	BT	53	802	25050.6	6623	14968.3	16	42.70	1.00	1.00	California sea lion	3
2011	CS	BT, MT	72	1134	40198.1	9195	17253.2	58	96.64	0.99	0.99	Northern elephant seal	1
2012	CS	BT	67	1089	38029.4	8968	17178.8	52	106.43	0.99	0.99	Northern elephant seal	0
2013	CS	BT	68	1193	42066.2	10017	18615.4	24	50.89	1.00	1.00	Northern elephant seal	1
2014	CS	BT	64	1033	34171.2	8333	16094.1	32	75.70	1.00	1.00	Northern elephant seal	0
2015	CS	BT	60	904	28855.2	7480	15666.1	13	52.41	1.00	1.00	Northern elephant seal	2
2016	CS	BT	53	802	25050.6	6623	14968.3	16	42.70	1.00	1.00	Northern elephant seal	1
2011	CS	BT, MT	72	1134	40198.1	9195	17253.2	58	96.64	0.99	0.99	Pacific white-sided dolphin	0
2012	CS	BT	67	1089	38029.4	8968	17178.8	52	106.43	0.99	0.99	Pacific white-sided dolphin	0
2013	CS	BT	68	1193	42066.2	10017	18615.4	24	50.89	1.00	1.00	Pacific white-sided dolphin	0
2014	CS	BT	64	1033	34171.2	8333	16094.1	32	75.70	1.00	1.00	Pacific white-sided dolphin	1
2015	CS	BT	60	904	28855.2	7480	15666.1	13	52.41	1.00	1.00	Pacific white-sided dolphin	2
2016	CS	BT	53	802	25050.6	6623	14968.3	16	42.70	1.00	1.00	Pacific white-sided dolphin	0

Table 2 (continued). Catch share trawl fisheries marine mammal bycatch and observer coverage statistics by year, sector, and gear type.
Key: CS = catch share, MR = midwater rockfish, BT = bottom trawl, MT = midwater trawl.

Year	Sector	Gear	Observed			Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Trips	Tow hours	Sets	Catch (mt)	Sets	Catch (mt)	Sets	Catch (mt)		
2011	CS	BT, MT	72	1134	40198.1	9195	17253.2	58	96.64	0.99	0.99	Seal unidentified	1
2012	CS	BT	67	1089	38029.4	8968	17178.8	52	106.43	0.99	0.99	Seal unidentified	0
2013	CS	BT	68	1193	42066.2	10017	18615.4	24	50.89	1.00	1.00	Seal unidentified	0
2014	CS	BT	64	1033	34171.2	8333	16094.1	32	75.70	1.00	1.00	Seal unidentified	0
2015	CS	BT	60	904	28855.2	7480	15666.1	13	52.41	1.00	1.00	Seal unidentified	0
2016	CS	BT	53	802	25050.6	6623	14968.3	16	42.70	1.00	1.00	Seal unidentified	0
2011	CS	BT, MT	72	1134	40198.1	9195	17253.2	58	96.64	0.99	0.99	Steller sea lion	20
2012	CS	BT	67	1089	38029.4	8968	17178.8	52	106.43	0.99	0.99	Steller sea lion	8
2013	CS	BT	68	1193	42066.2	10017	18615.4	24	50.89	1.00	1.00	Steller sea lion	6
2014	CS	BT	64	1033	34171.2	8333	16094.1	32	75.70	1.00	1.00	Steller sea lion	5
2015	CS	BT	60	904	28855.2	7480	15666.1	13	52.41	1.00	1.00	Steller sea lion	13
2016	CS	BT	53	802	25050.6	6623	14968.3	16	42.70	1.00	1.00	Steller sea lion	0
2012	MR	MT	5	10	73.0	36	197.6	0	0.00	1.00	1.00	-	0
2013	MR	MT	8	26	138.0	79	404.7	0	0.00	1.00	1.00	-	0
2014	MR	MT	9	34	268.5	133	873.7	0	0.00	1.00	1.00	-	0
2015	MR	MT	7	43	246.5	147	968.5	0	0.00	1.00	1.00	-	0
2016	MR	MT	4	16	100.6	49	375.3	0	0.00	1.00	1.00	-	0

Table 3. Catch share (a.k.a., Individual Fishing Quota, IFQ) trawl fisheries marine mammal bycatch and observer coverage statistics by year, sector, and gear type. These vessels carried electronic monitoring equipment on 100% of the trips and a scientific observer for the proportion of trips given under *Proportion sampled catch*. All IFQ fisheries are 100% observed by a scientific observer or electronically monitored. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: CS = catch share, EM = electronic monitoring, BT = bottom trawl, MT = midwater trawl.

Year	Sector	Gear	Observed			Sampled			Species	Observed number	
			Vessels	Trips	Tow hours	Sets	Catch (mt)	Landed catch (mt)			Proportion sampled catch
2015	CS EM	BT, MT	4	9	317.4	57	134.8	404.5	0.33	Northern elephant seal	1
2016	CS EM	BT, MT	8	30	922.6	186	503.5	1732.0	0.29	Northern elephant seal	0

Table 4. Catch share (a.k.a., Individual Fishing Quota, IFQ) midwater trawl fisheries marine mammal bycatch and observer coverage statistics by year, sector, and gear type. Shoreside hake vessels carried observers on 100% of trips. Since 2015, midwater hake vessels carried either an observer or electronic monitoring (EM) equipment on 100% of the trips and a scientific observer for the proportion of sampled catch given under *Proportion sampled catch*. All IFQ fisheries are 100% observed by a scientific observer or electronically monitored. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: *SH* = shoreside hake, *MH* = midwater hake, *MT* = midwater trawl.

Year	Sector	Gear	Observed			Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Trips	Tow hours	Sets	Catch (mt)	Sets	Catch (mt)	Sets	Catch (mt)		
2011	SH	MT	27	929	3974.6	1717	90777.3	0	0.00	1.00	1.00	California sea lion	0
2012	SH	MT	24	744	5960.8	1601	65396.4	0	0.00	1.00	1.00	California sea lion	0
2013	SH	MT	24	960	4628.1	1734	96867.8	0	0.00	1.00	1.00	California sea lion	0
2014	SH	MT	25	996	4732.7	1725	97925.2	1	57.48	1.00	1.00	California sea lion	1
2015	MH	MT	5	129	1194.0	289	11461.4	0	0.00	1.00	1.00	California sea lion	0
2016	MH	MT	4	100	652.6	207	8970.0	0	0.00	1.00	1.00	California sea lion	0
2011	SH	MT	27	929	3974.6	1717	90777.3	0	0.00	1.00	1.00	Northern elephant seal	1
2012	SH	MT	24	744	5960.8	1601	65396.4	0	0.00	1.00	1.00	Northern elephant seal	0
2013	SH	MT	24	960	4628.1	1734	96867.8	0	0.00	1.00	1.00	Northern elephant seal	0
2014	SH	MT	25	996	4732.7	1725	97925.2	1	57.48	1.00	1.00	Northern elephant seal	0
2015	MH	MT	5	129	1194.0	289	11461.4	0	0.00	1.00	1.00	Northern elephant seal	0
2016	MH	MT	4	100	652.6	207	8970.0	0	0.00	1.00	1.00	Northern elephant seal	0
2011	SH	MT	27	929	3974.6	1717	90777.3	0	0.00	1.00	1.00	Steller sea lion	1
2012	SH	MT	24	744	5960.8	1601	65396.4	0	0.00	1.00	1.00	Steller sea lion	0
2013	SH	MT	24	960	4628.1	1734	96867.8	0	0.00	1.00	1.00	Steller sea lion	0
2014	SH	MT	25	996	4732.7	1725	97925.2	1	57.48	1.00	1.00	Steller sea lion	1
2015	MH	MT	5	129	1194.0	289	11461.4	0	0.00	1.00	1.00	Steller sea lion	0
2016	MH	MT	4	100	652.6	207	8970.0	0	0.00	1.00	1.00	Steller sea lion	0

Table 5. At-sea hake midwater trawl catcher–processor marine mammal bycatch and observer coverage statistics by year. These vessels carried two scientific observers for 100% of the trips. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: *CP* = catcher–processor, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed Number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	CP	MT	5	1061.3	556	36529.7	1	89.52	1.00	1.00	California sea lion	0
2003	CP	MT	6	911.0	766	41408.1	1	25.05	1.00	1.00	California sea lion	2
2004	CP	MT	6	1973.4	1492	74589.0	4	186.53	1.00	1.00	California sea lion	2
2005	CP	MT	6	2238.8	1332	79310.6	2	22.18	1.00	1.00	California sea lion	0
2006	CP	MT	9	2980.7	1488	79917.4	2	28.41	1.00	1.00	California sea lion	1
2007	CP	MT	9	4403.7	1566	74214.5	4	89.06	1.00	1.00	California sea lion	0
2008	CP	MT	8	5557.9	1864	109939.8	18	1086.35	0.99	0.99	California sea lion	1
2009	CP	MT	5	1932.4	863	38495.2	0	0.00	1.00	1.00	California sea lion	0
2010	CP	MT	6	2653.1	1063	54750.8	1	29.24	1.00	1.00	California sea lion	0
2011	CP	MT	9	4761.9	1530	72600.8	4	157.61	1.00	1.00	California sea lion	1
2012	CP	MT	9	3545.6	1100	55534.5	2	133.70	1.00	1.00	California sea lion	0
2013	CP	MT	9	3293.9	1439	78216.5	4	226.66	1.00	1.00	California sea lion	1
2014	CP	MT	9	4731.4	1683	103546.8	1	89.47	1.00	1.00	California sea lion	2
2015	CP	MT	9	5690.9	1503	69076.9	4	129.21	1.00	1.00	California sea lion	0
2016	CP	MT	9	7291.4	2188	109679.5	1	60.42	1.00	1.00	California sea lion	49
2002	CP	MT	5	1061.3	556	36529.7	1	89.52	1.00	1.00	Harbor seal	0
2003	CP	MT	6	911.0	766	41408.1	1	25.05	1.00	1.00	Harbor seal	0
2004	CP	MT	6	1973.4	1492	74589.0	4	186.53	1.00	1.00	Harbor seal	0
2005	CP	MT	6	2238.8	1332	79310.6	2	22.18	1.00	1.00	Harbor seal	1
2006	CP	MT	9	2980.7	1488	79917.4	2	28.41	1.00	1.00	Harbor seal	1
2007	CP	MT	9	4403.7	1566	74214.5	4	89.06	1.00	1.00	Harbor seal	0
2008	CP	MT	8	5557.9	1864	109939.8	18	1086.35	0.99	0.99	Harbor seal	1
2009	CP	MT	5	1932.4	863	38495.2	0	0.00	1.00	1.00	Harbor seal	0
2010	CP	MT	6	2653.1	1063	54750.8	1	29.24	1.00	1.00	Harbor seal	0
2011	CP	MT	9	4761.9	1530	72600.8	4	157.61	1.00	1.00	Harbor seal	0
2012	CP	MT	9	3545.6	1100	55534.5	2	133.70	1.00	1.00	Harbor seal	0
2013	CP	MT	9	3293.9	1439	78216.5	4	226.66	1.00	1.00	Harbor seal	0
2014	CP	MT	9	4731.4	1683	103546.8	1	89.47	1.00	1.00	Harbor seal	0
2015	CP	MT	9	5690.9	1503	69076.9	4	129.21	1.00	1.00	Harbor seal	0
2016	CP	MT	9	7291.4	2188	109679.5	1	60.42	1.00	1.00	Harbor seal	0

Table 5 (continued). At-sea hake midwater trawl catcher–processor marine mammal bycatch and observer coverage statistics by year.
 Key: *CP* = catcher–processor, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed Number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	CP	MT	5	1061.3	556	36529.7	1	89.52	1.00	1.00	Northern elephant seal	0
2003	CP	MT	6	911.0	766	41408.1	1	25.05	1.00	1.00	Northern elephant seal	0
2004	CP	MT	6	1973.4	1492	74589.0	4	186.53	1.00	1.00	Northern elephant seal	3
2005	CP	MT	6	2238.8	1332	79310.6	2	22.18	1.00	1.00	Northern elephant seal	0
2006	CP	MT	9	2980.7	1488	79917.4	2	28.41	1.00	1.00	Northern elephant seal	0
2007	CP	MT	9	4403.7	1566	74214.5	4	89.06	1.00	1.00	Northern elephant seal	1
2008	CP	MT	8	5557.9	1864	109939.8	18	1086.35	0.99	0.99	Northern elephant seal	5
2009	CP	MT	5	1932.4	863	38495.2	0	0.00	1.00	1.00	Northern elephant seal	1
2010	CP	MT	6	2653.1	1063	54750.8	1	29.24	1.00	1.00	Northern elephant seal	2
2011	CP	MT	9	4761.9	1530	72600.8	4	157.61	1.00	1.00	Northern elephant seal	0
2012	CP	MT	9	3545.6	1100	55534.5	2	133.70	1.00	1.00	Northern elephant seal	0
2013	CP	MT	9	3293.9	1439	78216.5	4	226.66	1.00	1.00	Northern elephant seal	0
2014	CP	MT	9	4731.4	1683	103546.8	1	89.47	1.00	1.00	Northern elephant seal	0
2015	CP	MT	9	5690.9	1503	69076.9	4	129.21	1.00	1.00	Northern elephant seal	1
2016	CP	MT	9	7291.4	2188	109679.5	1	60.42	1.00	1.00	Northern elephant seal	1
2002	CP	MT	5	1061.3	556	36529.7	1	89.52	1.00	1.00	Steller sea lion	1
2003	CP	MT	6	911.0	766	41408.1	1	25.05	1.00	1.00	Steller sea lion	1
2004	CP	MT	6	1973.4	1492	74589.0	4	186.53	1.00	1.00	Steller sea lion	0
2005	CP	MT	6	2238.8	1332	79310.6	2	22.18	1.00	1.00	Steller sea lion	2
2006	CP	MT	9	2980.7	1488	79917.4	2	28.41	1.00	1.00	Steller sea lion	2
2007	CP	MT	9	4403.7	1566	74214.5	4	89.06	1.00	1.00	Steller sea lion	3
2008	CP	MT	8	5557.9	1864	109939.8	18	1086.35	0.99	0.99	Steller sea lion	1
2009	CP	MT	5	1932.4	863	38495.2	0	0.00	1.00	1.00	Steller sea lion	0
2010	CP	MT	6	2653.1	1063	54750.8	1	29.24	1.00	1.00	Steller sea lion	8
2011	CP	MT	9	4761.9	1530	72600.8	4	157.61	1.00	1.00	Steller sea lion	1
2012	CP	MT	9	3545.6	1100	55534.5	2	133.70	1.00	1.00	Steller sea lion	1
2013	CP	MT	9	3293.9	1439	78216.5	4	226.66	1.00	1.00	Steller sea lion	2
2014	CP	MT	9	4731.4	1683	103546.8	1	89.47	1.00	1.00	Steller sea lion	3
2015	CP	MT	9	5690.9	1503	69076.9	4	129.21	1.00	1.00	Steller sea lion	0
2016	CP	MT	9	7291.4	2188	109679.5	1	60.42	1.00	1.00	Steller sea lion	21

Table 6. At-sea hake midwater trawl catcher vessels delivering at-sea to motherships, marine mammal bycatch and observer coverage statistics by year. Mothership vessels carried two scientific observers for 100% of the trips. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: *MSCV* = mothership catcher vessels, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	California sea lion	1
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	California sea lion	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	California sea lion	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	California sea lion	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	California sea lion	1
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	California sea lion	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	California sea lion	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	California sea lion	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	California sea lion	1
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	California sea lion	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	California sea lion	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	California sea lion	1
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	California sea lion	2
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	California sea lion	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	California sea lion	3
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Dall's porpoise	1
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Dall's porpoise	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Dall's porpoise	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Dall's porpoise	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Dall's porpoise	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Dall's porpoise	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Dall's porpoise	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Dall's porpoise	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Dall's porpoise	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Dall's porpoise	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Dall's porpoise	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Dall's porpoise	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Dall's porpoise	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Dall's porpoise	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Dall's porpoise	0

Table 6 (continued). At-sea hake midwater trawl catcher vessels delivering at-sea to motherships, marine mammal bycatch and observer coverage statistics by year. Key: *MSCV* = mothership catcher vessels, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Dolphin unidentified	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Dolphin unidentified	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Dolphin unidentified	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Dolphin unidentified	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Dolphin unidentified	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Dolphin unidentified	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Dolphin unidentified	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Dolphin unidentified	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Dolphin unidentified	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Dolphin unidentified	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Dolphin unidentified	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Dolphin unidentified	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Dolphin unidentified	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Dolphin unidentified	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Dolphin unidentified	1
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Harbor seal	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Harbor seal	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Harbor seal	1
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Harbor seal	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Harbor seal	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Harbor seal	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Harbor seal	1
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Harbor seal	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Harbor seal	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Harbor seal	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Harbor seal	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Harbor seal	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Harbor seal	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Harbor seal	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Harbor seal	0

Table 6 (continued). At-sea hake midwater trawl catcher vessels delivering at-sea to motherships, marine mammal bycatch and observer coverage statistics by year. Key: *MSCV* = mothership catcher vessels, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Northern elephant seal	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Northern elephant seal	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Northern elephant seal	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Northern elephant seal	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Northern elephant seal	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Northern elephant seal	1
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Northern elephant seal	2
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Northern elephant seal	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Northern elephant seal	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Northern elephant seal	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Northern elephant seal	1
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Northern elephant seal	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Northern elephant seal	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Northern elephant seal	1
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Northern elephant seal	0
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Northern fur seal	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Northern fur seal	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Northern fur seal	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Northern fur seal	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Northern fur seal	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Northern fur seal	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Northern fur seal	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Northern fur seal	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Northern fur seal	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Northern fur seal	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Northern fur seal	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Northern fur seal	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Northern fur seal	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Northern fur seal	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Northern fur seal	1

Table 6 (continued). At-sea hake midwater trawl catcher vessels delivering at-sea to motherships, marine mammal bycatch and observer coverage statistics by year. Key: *MSCV* = mothership catcher vessels, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Northern right whale dolphin	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Northern right whale dolphin	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Northern right whale dolphin	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Northern right whale dolphin	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Northern right whale dolphin	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Northern right whale dolphin	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Northern right whale dolphin	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Northern right whale dolphin	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Northern right whale dolphin	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Northern right whale dolphin	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Northern right whale dolphin	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Northern right whale dolphin	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Northern right whale dolphin	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Northern right whale dolphin	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Northern right whale dolphin	1
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Otariid unidentified	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Otariid unidentified	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Otariid unidentified	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Otariid unidentified	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Otariid unidentified	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Otariid unidentified	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Otariid unidentified	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Otariid unidentified	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Otariid unidentified	2
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Otariid unidentified	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Otariid unidentified	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Otariid unidentified	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Otariid unidentified	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Otariid unidentified	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Otariid unidentified	0

Table 6 (continued). At-sea hake midwater trawl catcher vessels delivering at-sea to motherships, marine mammal bycatch and observer coverage statistics by year. Key: *MSCV* = mothership catcher vessels, *MT* = midwater trawl.

Year	Sector	Gear	Observed		Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Tow hours	Tows	Catch (mt)	Tows	Catch (mt)	Tows	Catch (mt)		
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Pacific white-sided dolphin	1
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Pacific white-sided dolphin	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Pacific white-sided dolphin	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Pacific white-sided dolphin	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Pacific white-sided dolphin	0
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Pacific white-sided dolphin	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Pacific white-sided dolphin	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Pacific white-sided dolphin	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Pacific white-sided dolphin	0
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Pacific white-sided dolphin	0
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Pacific white-sided dolphin	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Pacific white-sided dolphin	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Pacific white-sided dolphin	0
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Pacific white-sided dolphin	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Pacific white-sided dolphin	0
2002	MSCV	MT	11	1624.6	573	26607.6	1	32.52	1.00	1.00	Steller sea lion	0
2003	MSCV	MT	12	500.9	522	25368.3	14	671.74	0.97	0.97	Steller sea lion	0
2004	MSCV	MT	10	796.8	569	24109.6	2	52.99	1.00	1.00	Steller sea lion	0
2005	MSCV	MT	18	1882.7	1038	49314.8	1	20.00	1.00	1.00	Steller sea lion	0
2006	MSCV	MT	20	2325.7	1243	53873.8	40	1729.10	0.97	0.97	Steller sea lion	1
2007	MSCV	MT	20	3133.6	1135	47582.7	11	402.45	0.99	0.99	Steller sea lion	0
2008	MSCV	MT	19	3866.2	1346	58083.6	3	175.07	1.00	1.00	Steller sea lion	0
2009	MSCV	MT	19	1686.3	597	24249.0	3	47.54	1.00	1.00	Steller sea lion	0
2010	MSCV	MT	22	2804.5	908	35935.4	0	0.00	1.00	1.00	Steller sea lion	1
2011	MSCV	MT	18	2975.7	1246	50329.7	2	1.02	1.00	1.00	Steller sea lion	1
2012	MSCV	MT	16	3161.8	931	37988.7	18	654.52	0.98	0.98	Steller sea lion	0
2013	MSCV	MT	18	3075.7	1249	52746.2	7	141.04	0.99	1.00	Steller sea lion	0
2014	MSCV	MT	19	3547.1	1288	62178.8	18	155.11	0.99	1.00	Steller sea lion	1
2015	MSCV	MT	14	2134.7	625	27805.0	6	47.15	0.99	1.00	Steller sea lion	0
2016	MSCV	MT	17	5502.1	1550	65426.7	7	64.31	1.00	1.00	Steller sea lion	2

Limited-Entry Trawl, 2002–10

Table 7. Limited entry trawl fishery marine mammal bycatch and observer coverage statistics by year. This fishery was converted to the catch share fishery in 2011. From 2002–10, LE trawl vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Key: *LE* = limited entry, *BT* = bottom trawl, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed				Landed catch (mt)	Proportion landed observed	Species	Observed number	Bayes				Bayes 5 yr.			
			Vessels	Trips	Hauls	Tow hours					Catch (mt)	Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE	BT	133	578	3206	13573.9	2681.4	19708.4	0.14	California sea lion	3	18.20	18.16	13.34	23.72	18.20	10	25
2003	LE	BT	125	465	2315	11578.8	2590.4	20109.3	0.13	California sea lion	8	23.67	23.66	18.05	29.29	20.94	12	29
2004	LE	BT	103	616	3483	13900.9	4311.0	18652.2	0.23	California sea lion	1	13.81	13.76	9.40	18.56	18.56	11	26
2005	LE	BT	105	524	3504	12715.4	4249.3	19286.2	0.22	California sea lion	4	17.39	17.33	13.12	22.42	18.27	10	26
2006	LE	BT	87	477	3027	11577.6	3443.4	17794.9	0.19	California sea lion	4	16.83	16.81	12.56	21.39	17.98	10	25
2007	LE	BT	88	374	2550	11457.9	3448.6	20516.3	0.17	California sea lion	2	17.23	17.32	12.15	22.66	17.79	10	25
2008	LE	BT	100	438	3224	15129.5	4918.5	24203.2	0.20	California sea lion	2	19.19	19.17	13.52	25.31	16.89	9	24
2009	LE	BT	101	590	4455	19786.5	6074.6	26063.9	0.23	California sea lion	7	24.84	24.85	18.98	31.09	19.10	11	27
2010	LE	BT	83	348	2640	13152.0	4076.4	22320.4	0.18	California sea lion	1	17.32	17.29	11.85	23.51	19.08	11	27
2002	LE	BT	133	578	3206	13573.9	2681.4	19708.4	0.14	Northern elephant seal	0	1.12	0.99	0.12	2.82	1.12	0	3
2003	LE	BT	125	465	2315	11578.8	2590.4	20109.3	0.13	Northern elephant seal	0	1.16	1.01	0.17	3.13	1.14	0	3
2004	LE	BT	103	616	3483	13900.9	4311.0	18652.2	0.23	Northern elephant seal	0	0.92	0.80	0.12	2.39	1.07	0	3
2005	LE	BT	105	524	3504	12715.4	4249.3	19286.2	0.22	Northern elephant seal	0	0.96	0.83	0.12	2.52	1.04	0	3
2006	LE	BT	87	477	3027	11577.6	3443.4	17794.9	0.19	Northern elephant seal	0	0.92	0.80	0.12	2.40	1.02	0	3
2007	LE	BT	88	374	2550	11457.9	3448.6	20516.3	0.17	Northern elephant seal	1	2.10	1.97	1.15	3.95	1.21	0	3
2008	LE	BT	100	438	3224	15129.5	4918.5	24203.2	0.20	Northern elephant seal	0	1.22	1.07	0.17	3.21	1.23	0	3
2009	LE	BT	101	590	4455	19786.5	6074.6	26063.9	0.23	Northern elephant seal	1	2.27	2.11	1.17	4.34	1.50	0	4
2010	LE	BT	83	348	2640	13152.0	4076.4	22320.4	0.18	Northern elephant seal	0	1.18	1.00	0.16	3.09	1.54	0	4
2002	LE	BT	133	578	3206	13573.9	2681.4	19708.4	0.14	Pacific white-sided dolphin	0	0.69	0.52	0.03	2.16	0.69	0	2
2003	LE	BT	125	465	2315	11578.8	2590.4	20109.3	0.13	Pacific white-sided dolphin	1	1.71	1.53	1.03	3.25	1.20	0	3
2004	LE	BT	103	616	3483	13900.9	4311.0	18652.2	0.23	Pacific white-sided dolphin	0	0.55	0.42	0.03	1.70	0.98	0	3
2005	LE	BT	105	524	3504	12715.4	4249.3	19286.2	0.22	Pacific white-sided dolphin	0	0.58	0.44	0.03	1.76	0.88	0	3
2006	LE	BT	87	477	3027	11577.6	3443.4	17794.9	0.19	Pacific white-sided dolphin	0	0.56	0.45	0.04	1.81	0.82	0	3
2007	LE	BT	88	374	2550	11457.9	3448.6	20516.3	0.17	Pacific white-sided dolphin	0	0.66	0.53	0.03	2.10	0.81	0	2
2008	LE	BT	100	438	3224	15129.5	4918.5	24203.2	0.20	Pacific white-sided dolphin	0	0.74	0.56	0.04	2.27	0.62	0	2
2009	LE	BT	101	590	4455	19786.5	6074.6	26063.9	0.23	Pacific white-sided dolphin	0	0.76	0.59	0.05	2.39	0.66	0	2
2010	LE	BT	83	348	2640	13152.0	4076.4	22320.4	0.18	Pacific white-sided dolphin	0	0.70	0.54	0.05	2.14	0.69	0	2

Table 7 (continued). Limited entry trawl fishery marine mammal bycatch and observer coverage statistics by year. Key: *LE* = limited entry, *BT* = bottom trawl, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed						Landed catch (mt)	Proportion landed observed	Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Hauls	Tow hours	Catch (mt)						Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE	BT	133	578	3206	13573.9	2681.4	19708.4	0.14	Risso's dolphin	0	1.67	1.52	0.37	3.87	1.67	0	4	
2003	LE	BT	125	465	2315	11578.8	2590.4	20109.3	0.13	Risso's dolphin	0	1.72	1.55	0.35	3.99	1.70	0	4	
2004	LE	BT	103	616	3483	13900.9	4311.0	18652.2	0.23	Risso's dolphin	0	1.38	1.26	0.29	3.04	1.59	0	4	
2005	LE	BT	105	524	3504	12715.4	4249.3	19286.2	0.22	Risso's dolphin	0	1.45	1.31	0.34	3.26	1.55	0	4	
2006	LE	BT	87	477	3027	11577.6	3443.4	17794.9	0.19	Risso's dolphin	0	1.38	1.27	0.29	3.14	1.52	0	4	
2007	LE	BT	88	374	2550	11457.9	3448.6	20516.3	0.17	Risso's dolphin	0	1.64	1.48	0.35	3.84	1.51	0	4	
2008	LE	BT	100	438	3224	15129.5	4918.5	24203.2	0.20	Risso's dolphin	3	4.84	4.68	3.40	7.12	2.14	0	5	
2009	LE	BT	101	590	4455	19786.5	6074.6	26063.9	0.23	Risso's dolphin	0	1.90	1.73	0.41	4.29	2.24	0	5	
2010	LE	BT	83	348	2640	13152.0	4076.4	22320.4	0.18	Risso's dolphin	0	1.76	1.61	0.44	4.06	2.31	0	5	
2002	LE	BT	133	578	3206	13573.9	2681.4	19708.4	0.14	Sea lion unidentified	1	1.67	1.54	1.03	3.13	1.67	0	4	
2003	LE	BT	125	465	2315	11578.8	2590.4	20109.3	0.13	Sea lion unidentified	0	0.70	0.58	0.04	2.12	1.19	0	3	
2004	LE	BT	103	616	3483	13900.9	4311.0	18652.2	0.23	Sea lion unidentified	0	0.56	0.46	0.03	1.73	0.98	0	3	
2005	LE	BT	105	524	3504	12715.4	4249.3	19286.2	0.22	Sea lion unidentified	0	0.58	0.45	0.03	1.90	0.88	0	3	
2006	LE	BT	87	477	3027	11577.6	3443.4	17794.9	0.19	Sea lion unidentified	0	0.57	0.46	0.02	1.79	0.82	0	3	
2007	LE	BT	88	374	2550	11457.9	3448.6	20516.3	0.17	Sea lion unidentified	0	0.67	0.53	0.02	2.15	0.62	0	2	
2008	LE	BT	100	438	3224	15129.5	4918.5	24203.2	0.20	Sea lion unidentified	0	0.74	0.58	0.03	2.28	0.62	0	2	
2009	LE	BT	101	590	4455	19786.5	6074.6	26063.9	0.23	Sea lion unidentified	0	0.75	0.60	0.04	2.39	0.66	0	2	
2010	LE	BT	83	348	2640	13152.0	4076.4	22320.4	0.18	Sea lion unidentified	0	0.72	0.56	0.02	2.27	0.69	0	2	
2002	LE	BT	133	578	3206	13573.9	2681.4	19708.4	0.14	Steller sea lion	2	9.91	9.72	6.36	14.08	9.91	4	15	
2003	LE	BT	125	465	2315	11578.8	2590.4	20109.3	0.13	Steller sea lion	0	8.09	7.88	4.56	12.45	9.00	4	14	
2004	LE	BT	103	616	3483	13900.9	4311.0	18652.2	0.23	Steller sea lion	0	6.61	6.41	3.81	10.32	8.20	3	13	
2005	LE	BT	105	524	3504	12715.4	4249.3	19286.2	0.22	Steller sea lion	0	6.95	6.84	3.91	10.64	7.89	3	13	
2006	LE	BT	87	477	3027	11577.6	3443.4	17794.9	0.19	Steller sea lion	0	6.60	6.47	3.79	10.28	7.63	3	12	
2007	LE	BT	88	374	2550	11457.9	3448.6	20516.3	0.17	Steller sea lion	2	9.90	9.65	6.55	14.11	7.63	3	12	
2008	LE	BT	100	438	3224	15129.5	4918.5	24203.2	0.20	Steller sea lion	0	8.90	8.68	5.18	13.72	7.79	3	13	
2009	LE	BT	101	590	4455	19786.5	6074.6	26063.9	0.23	Steller sea lion	5	14.20	14.00	10.31	18.87	9.31	4	15	
2010	LE	BT	83	348	2640	13152.0	4076.4	22320.4	0.18	Steller sea lion	7	15.43	15.31	11.85	20.14	11.01	5	17	

California Halibut, 2002–09

Table 8. Limited entry (LE) California (CA) halibut trawl fishery marine mammal bycatch and observer coverage statistics by year. Since 2011, this fishery's estimates are included in the catch share trawl fisheries (above). From 2002–09, LE trawl vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Values from the 2010 LE CA halibut fishery are combined with the open access (OA) CA halibut fishery (in Table 9) to meet confidentiality requirements. Key: *LE CA H* = limited entry California halibut, *BT* = bottom trawl, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed					Landed catch (mt)	Proportion landed observed	Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Hauls	Tow hours	Catch (mt)					Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE CA H	BT	7	19	52	4824.3	3.6	108.3	0.03	California sea lion	2	37.21	36.65	25.69	50.65	37.21	26	48
2003	LE CA H	BT	12	73	207	17190.8	19.1	105.5	0.18	California sea lion	12	40.89	40.55	32.38	50.91	39.05	27	50
2004	LE CA H	BT	8	46	171	16009.5	31.5	136.4	0.23	California sea lion	2	37.08	36.69	26.94	49.09	38.39	27	49
2005	LE CA H	BT	10	74	235	17830.1	30.5	188.9	0.16	California sea lion	1	53.95	53.38	38.70	71.32	42.28	30	53
2006	LE CA H	BT	9	78	224	11458.4	14.3	119.5	0.12	California sea lion	14	49.17	48.70	38.99	60.96	43.66	31	55
2007	LE CA H	BT	5	40	81	6640.3	5.4	18.6	0.29	California sea lion	4	8.41	8.36	7.15	9.99	37.90	26	48
2008	LE CA H	BT	6	40	118	9132.5	9.6	36.4	0.26	California sea lion	4	12.97	12.83	10.38	16.26	32.31	22	42
2009	LE CA H	BT	3	12	29	1106.7	2.9	47.2	0.06	California sea lion	0	14.91	14.85	9.88	20.38	27.88	18	37
2002	LE CA H	BT	7	19	52	4824.3	3.6	108.3	0.03	Harbor porpoise	0	1.56	1.20	0.09	5.21	1.56	0	4
2003	LE CA H	BT	12	73	207	17190.8	19.1	105.5	0.18	Harbor porpoise	0	1.09	0.86	0.07	3.42	1.33	0	3
2004	LE CA H	BT	8	46	171	16009.5	31.5	136.4	0.23	Harbor porpoise	1	2.30	2.02	1.08	4.96	1.65	0	4
2005	LE CA H	BT	10	74	235	17830.1	30.5	188.9	0.16	Harbor porpoise	0	1.99	1.48	0.13	6.30	1.74	0	4
2006	LE CA H	BT	9	78	224	11458.4	14.3	119.5	0.12	Harbor porpoise	0	1.37	1.03	0.11	4.30	1.66	0	4
2007	LE CA H	BT	5	40	81	6640.3	5.4	18.6	0.29	Harbor porpoise	0	0.17	0.13	0.01	0.57	1.38	0	4
2008	LE CA H	BT	6	40	118	9132.5	9.6	36.4	0.26	Harbor porpoise	0	0.35	0.27	0.02	1.12	1.24	0	3
2009	LE CA H	BT	3	12	29	1106.7	2.9	47.2	0.06	Harbor porpoise	0	0.70	0.54	0.03	2.35	0.92	0	3
2002	LE CA H	BT	7	19	52	4824.3	3.6	108.3	0.03	Harbor seal	0	1.43	1.12	0.08	4.62	1.43	0	4
2003	LE CA H	BT	12	73	207	17190.8	19.1	105.5	0.18	Harbor seal	0	0.99	0.77	0.07	3.14	1.21	0	3
2004	LE CA H	BT	8	46	171	16009.5	31.5	136.4	0.23	Harbor seal	0	1.18	0.93	0.07	3.65	1.20	0	3
2005	LE CA H	BT	10	74	235	17830.1	30.5	188.9	0.16	Harbor seal	0	1.77	1.41	0.13	5.44	1.34	0	3
2006	LE CA H	BT	9	78	224	11458.4	14.3	119.5	0.12	Harbor seal	1	2.22	1.96	1.08	4.89	1.52	0	4
2007	LE CA H	BT	5	40	81	6640.3	5.4	18.6	0.29	Harbor seal	0	0.16	0.13	0.01	0.52	1.26	0	3
2008	LE CA H	BT	6	40	118	9132.5	9.6	36.4	0.26	Harbor seal	0	0.31	0.23	0.01	1.01	1.13	0	3
2009	LE CA H	BT	3	12	29	1106.7	2.9	47.2	0.06	Harbor seal	0	0.62	0.51	0.04	1.82	1.02	0	3

Table 8 (continued). Limited entry California halibut trawl fishery marine mammal bycatch and observer coverage statistics by year. Key: *LE CA H* = limited entry California halibut, *BT* = bottom trawl, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed					Landed catch (mt)	Proportion landed observed	Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Hauls	Tow hours	Catch (mt)					Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE CA H	BT	7	19	52	4824.3	3.6	108.3	0.03	Steller sea lion	0	3.34	2.98	0.69	7.72	3.34	0	7
2003	LE CA H	BT	12	73	207	17190.8	19.1	105.5	0.18	Steller sea lion	1	3.55	3.31	1.58	6.92	3.45	0	7
2004	LE CA H	BT	8	46	171	16009.5	31.5	136.4	0.23	Steller sea lion	0	3.06	2.83	0.75	6.75	3.32	0	7
2005	LE CA H	BT	10	74	235	17830.1	30.5	188.9	0.16	Steller sea lion	0	4.63	4.34	1.10	10.57	3.65	0	7
2006	LE CA H	BT	9	78	224	11458.4	14.3	119.5	0.12	Steller sea lion	0	3.09	2.84	0.72	7.26	3.53	0	7
2007	LE CA H	BT	5	40	81	6640.3	5.4	18.6	0.29	Steller sea lion	1	1.40	1.37	1.08	1.95	3.15	0	6
2008	LE CA H	BT	6	40	118	9132.5	9.6	36.4	0.26	Steller sea lion	1	1.79	1.74	1.17	2.74	2.79	0	6
2009	LE CA H	BT	3	12	29	1106.7	2.9	47.2	0.06	Steller sea lion	0	1.43	1.30	0.26	3.33	2.47	0	5

Table 9. Open access (OA) California halibut trawl fishery marine mammal bycatch and observer coverage statistics by year. OA trawl vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Values from the 2010 LE CA halibut fishery (Table 8) are combined with the OA fishery in this table to meet confidentiality requirements. This fishery was not observed in 2006. Key: *OA CA H* = open access California halibut, *LE* = limited entry, *BT* = bottom trawl, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed					Landed catch (mt)	Proportion landed observed	Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Hauls	Tow hours	Catch (mt)					Mean	Median	LCL	UCL	Mean	LCL	UCL
2003	OA CA H	BT	5	18	110	2018.3	2.0	25.8	0.08	California sea lion	0	3.20	3.10	1.67	5.17	3.2	0	6
2004	OA CA H	BT	4	53	244	5404.5	5.1	70.9	0.07	California sea lion	1	9.70	9.55	5.89	14.52	6.45	2	11
2005	OA CA H	BT	6	59	362	7752.1	7.4	64.5	0.12	California sea lion	2	9.50	9.30	6.48	13.57	7.47	3	12
2006	OA CA H	BT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2007	OA CA H	BT	8	48	227	2694.9	2.7	39.2	0.07	California sea lion	0	4.80	4.65	2.54	7.89	6.81	2	11
2008	OA CA H	BT	7	49	199	2701.2	2.7	51.9	0.05	California sea lion	1	7.54	7.37	4.43	11.53	7.68	3	12
2009	OA CA H	BT	3	9	30	586.4	0.6	82.4	0.01	California sea lion	0	11.84	11.03	4.64	22.23	8.11	3	13
2010	LE/OA CA H	BT	8	43	153	5587.9	8.8	123.6	0.07	California sea lion	1	16.00	15.66	9.79	23.96	9.41	4	15
2011	OA CA H	BT	13	48	204	7187.0	12.4	79.9	0.16	California sea lion	3	11.78	11.63	8.28	16.41	10.39	5	16
2012	OA CA H	BT	7	27	78	1835.1	3.5	55.8	0.06	California sea lion	0	6.95	6.86	3.92	10.90	10.82	5	16
2013	OA CA H	BT	5	29	81	3350.6	4.3	68.9	0.06	California sea lion	1	9.46	9.25	5.59	14.27	11.21	5	17
2014	OA CA H	BT	6	51	145	5484.3	18.1	81.4	0.22	California sea lion	0	8.22	8.01	5.03	12.41	10.48	5	16
2015	OA CA H	BT	8	100	339	11546.4	30.6	92.1	0.33	California sea lion	4	11.99	11.80	8.78	16.04	9.68	4	15
2016	OA CA H	BT	11	114	500	14131.2	27.3	89.6	0.30	California sea lion	4	12.11	11.94	9.03	16.19	9.75	4	15

Table 9 (continued). Open access California halibut trawl fishery marine mammal bycatch and observer coverage statistics by year. Key: *OA CA H* = open access California halibut, *LE* = limited entry, *BT* = bottom trawl, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed						Landed catch (mt)	Proportion landed observed	Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Hauls	Tow hours	Catch (mt)						Mean	Median	LCL	UCL	Mean	LCL	UCL
2003	OA CA H	BT	5	18	110	2018.3	2.0	25.8	0.08	Northern elephant seal	0	0.34	0.27	0.01	1.02	0.34	0	1	
2004	OA CA H	BT	4	53	244	5404.5	5.1	70.9	0.07	Northern elephant seal	0	0.77	0.62	0.05	2.44	0.55	0	2	
2005	OA CA H	BT	6	59	362	7752.1	7.4	64.5	0.12	Northern elephant seal	0	0.62	0.50	0.04	1.87	0.57	0	2	
2006	OA CA H	BT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2007	OA CA H	BT	8	48	227	2694.9	2.7	39.2	0.07	Northern elephant seal	0	0.48	0.38	0.02	1.54	0.56	0	2	
2008	OA CA H	BT	7	49	199	2701.2	2.7	51.9	0.05	Northern elephant seal	0	0.66	0.51	0.02	1.95	0.63	0	2	
2009	OA CA H	BT	3	9	30	586.4	0.6	82.4	0.01	Northern elephant seal	0	1.93	1.40	0.07	6.78	0.86	0	3	
2010	LE/OA CA H	BT	8	43	153	5587.9	8.8	123.6	0.07	Northern elephant seal	0	1.23	0.97	0.10	3.97	0.98	0	3	
2011	OA CA H	BT	13	48	204	7187.0	12.4	79.9	0.16	Northern elephant seal	0	0.69	0.54	0.04	2.16	1	0	3	
2012	OA CA H	BT	7	27	78	1835.1	3.5	55.8	0.06	Northern elephant seal	0	0.63	0.51	0.02	1.93	1.03	0	3	
2013	OA CA H	BT	5	29	81	3350.6	4.3	68.9	0.06	Northern elephant seal	0	0.76	0.60	0.05	2.38	1.05	0	3	
2014	OA CA H	BT	6	51	145	5484.3	18.1	81.4	0.22	Northern elephant seal	0	0.63	0.49	0.04	1.99	0.79	0	2	
2015	OA CA H	BT	8	100	339	11546.4	30.6	92.1	0.33	Northern elephant seal	0	0.60	0.46	0.04	1.98	0.66	0	2	
2016	OA CA H	BT	11	114	500	14131.2	27.3	89.6	0.30	Northern elephant seal	1	1.61	1.48	1.03	2.95	0.85	0	3	
2003	OA CA H	BT	5	18	110	2018.3	2.0	25.8	0.08	Steller sea lion	0	1.30	1.18	0.37	2.71	1.3	0	3	
2004	OA CA H	BT	4	53	244	5404.5	5.1	70.9	0.07	Steller sea lion	0	3.41	3.21	1.12	6.63	2.35	0	5	
2005	OA CA H	BT	6	59	362	7752.1	7.4	64.5	0.12	Steller sea lion	0	2.94	2.80	1.15	5.68	2.55	0	5	
2006	OA CA H	BT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2007	OA CA H	BT	8	48	227	2694.9	2.7	39.2	0.07	Steller sea lion	0	1.90	1.73	0.64	3.93	2.45	0	5	
2008	OA CA H	BT	7	49	199	2701.2	2.7	51.9	0.05	Steller sea lion	0	2.64	2.44	0.83	5.46	2.72	0	6	
2009	OA CA H	BT	3	9	30	586.4	0.6	82.4	0.01	Steller sea lion	0	5.33	4.88	0.82	12.23	3.1	0	6	
2010	LE/OA CA H	BT	8	43	153	5587.9	8.8	123.6	0.07	Steller sea lion	0	5.80	5.50	2.08	11.30	3.67	0	7	
2011	OA CA H	BT	13	48	204	7187.0	12.4	79.9	0.16	Steller sea lion	0	3.40	3.19	1.27	6.59	3.81	1	7	
2012	OA CA H	BT	7	27	78	1835.1	3.5	55.8	0.06	Steller sea lion	0	2.69	2.49	0.95	5.59	3.97	1	7	
2013	OA CA H	BT	5	29	81	3350.6	4.3	68.9	0.06	Steller sea lion	0	3.39	3.16	1.12	6.87	4.12	1	8	
2014	OA CA H	BT	6	51	145	5484.3	18.1	81.4	0.22	Steller sea lion	0	3.17	2.98	1.20	5.94	3.69	1	7	
2015	OA CA H	BT	8	100	339	11546.4	30.6	92.1	0.33	Steller sea lion	3	6.07	5.91	4.19	8.89	3.74	1	7	
2016	OA CA H	BT	11	114	500	14131.2	27.3	89.6	0.30	Steller sea lion	3	6.11	5.91	4.14	8.93	4.28	1	8	

Pink Shrimp, 2004–16

Table 10. State-managed pink shrimp trawl fisheries marine mammal bycatch and observer coverage statistics by state and year. Pink shrimp vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Observations in the Washington pink shrimp fishery did not start until 2010. Key: PS = pink shrimp, ST = shrimp trawl, * = confidential, - = not observed.

State	Year	Sector	Gear	Observed					Landed catch (mt)	Proportion landed observed	Species
				Vessels	Trips	Hauls	Tow hours	Catch (mt)			
WA	2010	PS	ST	7	18	341	6551.3	399.5	4295.6	0.09	-
WA	2011	PS	ST	11	35	578	12142.4	697.2	4312.1	0.16	-
WA	2012	PS	ST	10	31	522	9752.0	626.0	4239.4	0.15	-
WA	2013	PS	ST	13	29	386	5731.4	626.8	6157.9	0.10	-
WA	2014	PS	ST	17	44	401	6536.7	980.9	13876.2	0.07	-
WA	2015	PS	ST	24	100	1458	31290.6	2151.1	18814.3	0.11	-
WA	2016	PS	ST	17	59	974	21828.6	1107.9	6395.9	0.17	-
OR	2004	PS	ST	18	43	765	24688.1	427.2	5537.0	0.08	-
OR	2005	PS	ST	22	36	533	12441.0	402.9	7159.4	0.06	-
OR	2006	PS	ST	-	-	-	-	-	-	-	-
OR	2007	PS	ST	28	61	929	19047.5	650.0	9128.6	0.07	-
OR	2008	PS	ST	30	49	785	17144.6	672.5	11575.9	0.06	-
OR	2009	PS	ST	34	52	672	10586.3	751.2	10048.7	0.07	-
OR	2010	PS	ST	39	94	1233	19055.0	1706.8	14290.4	0.12	-
OR	2011	PS	ST	41	132	1892	36261.3	2986.0	21915.1	0.14	-
OR	2012	PS	ST	52	154	2122	28754.8	3014.2	22291.6	0.14	-
OR	2013	PS	ST	46	107	1403	20143.0	2313.2	21604.3	0.11	-
OR	2014	PS	ST	38	106	1463	25802.9	2291.3	23573.3	0.10	-
OR	2015	PS	ST	42	131	1990	31465.9	2282.1	21273.6	0.09	-
OR	2016	PS	ST	54	157	2467	46138.7	2309.4	16115.6	0.14	-
CA	2004	PS	ST	*	*	*	*	*	*	*	*
CA	2005	PS	ST	*	*	*	*	*	*	*	*
CA	2006	PS	ST	-	-	-	-	-	-	-	-
CA	2007	PS	ST	*	*	*	*	*	*	*	*
CA	2008	PS	ST	*	*	*	*	*	*	*	*
CA	2009	PS	ST	*	*	*	*	*	*	*	*
CA	2010	PS	ST	8	14	134	1193.9	265.5	1770.9	0.15	-
CA	2011	PS	ST	8	19	203	1720.4	420.6	3331.9	0.15	-
CA	2012	PS	ST	7	15	175	1178.0	347.6	2790.6	0.12	-
CA	2013	PS	ST	10	17	188	1358.0	359.8	3915.3	0.09	-
CA	2014	PS	ST	11	26	337	3666.4	597.5	3845.0	0.16	-
CA	2015	PS	ST	9	23	335	4977.0	334.7	3452.9	0.10	-
CA	2016	PS	ST	11	28	406	8103.9	313.4	1337.2	0.23	-

Fixed Gear Fisheries

Catch Share Fisheries, 2011–16

Table 11. Catch share (a.k.a., Individual Fishing Quota, IFQ) fixed gear fisheries, marine mammal bycatch and observer coverage statistics by year, sector, and gear type. These vessels carried a scientific observer for 100% of the trips, electronic monitoring (EM) was not used. All IFQ fisheries are 100% observed by a scientific observer or electronically monitored. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: CS = catch share, H&L = hook and line, FG = fixed gear.

Year	Sector	Gear	Observed			Sampled		Unsampled		Proportion		Species	Observed number
			Vessels	Trips	FG units	Sets	Catch (mt)	Sets	Catch (mt)	Sets	Catch (mt)		
2011	CS	H&L	11	94	2265264	630	335.6	1	0.00	1.00	1.00	Northern elephant seal	2
2012	CS	H&L	8	32	1472865	506	241.3	0	0.00	1.00	1.00	Northern elephant seal	0
2013	CS	H&L	8	29	587238	215	79.5	0	0.00	1.00	1.00	Northern elephant seal	0
2014	CS	H&L	8	31	601654	227	88.7	32	9.84	0.88	0.90	Northern elephant seal	0
2015	CS	H&L	5	16	592919	185	137.8	0	0.00	1.00	1.00	Northern elephant seal	0
2016	CS	H&L	5	30	1110926	351	192.8	0	0.00	1.00	1.00	Northern elephant seal	0
2011	CS	Pot	17	233	41307	1536	813.8	18	3.41	0.99	1.00	–	0
2012	CS	Pot	19	278	52248	1709	740.7	0	0.00	1.00	1.00	–	0
2013	CS	Pot	10	100	30097	1086	470.8	0	0.00	1.00	1.00	–	0
2014	CS	Pot	14	118	31876	1288	681.2	0	0.00	1.00	1.00	–	0
2015	CS	Pot	8	62	18808	584	405.3	0	0.00	1.00	1.00	–	0
2016	CS	Pot	8	61	15785	584	387.0	0	0.00	1.00	1.00	–	0

Table 12. Catch share (a.k.a. Individual Fishing Quota, IFQ) fixed gear fisheries, marine mammal bycatch and observer coverage statistics by year, sector, and gear type. These vessels carried electronic monitoring equipment on 100% of the trips and a scientific observer for the proportion of trips given under *Proportion sampled catch*. All IFQ fisheries are 100% observed by a scientific observer or electronically monitored. There is no uncertainty in these values because the observed value represents a complete census of the fishing fleet. Key: CS EM = catch share electronic monitoring, FG = fixed gear.

Year	Sector	Gear	Observed			Sampled				Observed number	
			Vessels	Trips	FG units	Sets	Catch (mt)	Landed catch (mt)	Proportion sampled catch		Species
2015	CS EM	Pot	7	18	4272	184	102.4	339.4	0.30	–	0
2016	CS EM	Pot	6	19	6275	249	152.0	470.5	0.32	–	0

Limited Entry Sablefish, 2002–16

Table 13. Limited entry sablefish marine mammal bycatch and observer coverage statistics by year for vessels fishing hook and line gear. These vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Key: *LE S* = limited entry sablefish, *H&L* = hook and line, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed			Landed Proportion				Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Sets	Hooks (no.)	Catch (mt)	catch (mt)	landed observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE S	H&L	25	68	391	779624.0	190.8	788.5	0.24	California sea lion	0	1.43	1.39	0.63	2.46	1.43	0	4
2003	LE S	H&L	15	48	351	733602.0	222.8	1034.9	0.22	California sea lion	1	2.94	2.88	1.89	4.37	2.19	0	5
2004	LE S	H&L	17	45	326	492009.0	180.0	1309.4	0.14	California sea lion	1	3.70	3.63	2.18	5.71	2.69	0	6
2005	LE S	H&L	26	101	678	1456102.0	481.5	1293.1	0.37	California sea lion	5	6.92	6.87	5.90	8.25	3.75	1	7
2006	LE S	H&L	19	68	470	939951.0	295.9	1377.3	0.21	California sea lion	0	2.57	2.52	1.20	4.48	3.51	0	7
2007	LE S	H&L	22	75	517	1034046.0	298.5	1080.7	0.28	California sea lion	0	1.88	1.83	0.88	3.21	3.60	0	7
2008	LE S	H&L	18	77	540	1244141.0	338.1	1094.7	0.31	California sea lion	0	1.80	1.75	0.86	3.12	3.37	0	7
2009	LE S	H&L	8	45	287	648980.0	97.8	1447.6	0.07	California sea lion	0	3.31	3.14	1.40	6.19	3.30	0	7
2010	LE S	H&L	21	143	762	1761173.0	345.8	1304.2	0.27	California sea lion	1	3.28	3.20	2.08	4.91	2.57	0	5
2011	LE S	H&L	23	98	673	1405444.0	240.7	1153.5	0.21	California sea lion	0	2.18	2.14	1.00	3.78	2.49	0	5
2012	LE S	H&L	17	88	532	1580075.0	239.3	1075.0	0.22	California sea lion	0	2.00	1.95	0.92	3.50	2.51	0	5
2013	LE S	H&L	18	58	353	1047526.0	166.4	751.1	0.22	California sea lion	0	1.40	1.36	0.61	2.49	2.43	0	5
2014	LE S	H&L	17	85	495	1200615.0	203.2	745.2	0.27	California sea lion	1	2.30	2.25	1.57	3.24	2.23	0	5
2015	LE S	H&L	26	97	632	1536820.0	392.0	938.5	0.42	California sea lion	0	1.29	1.26	0.61	2.21	1.83	0	4
2016	LE S	H&L	21	94	671	1743233.0	338.1	1025.3	0.33	California sea lion	0	1.63	1.61	0.74	2.77	1.73	0	4
2002	LE S	H&L	25	68	391	779624.0	190.8	788.5	0.24	Northern elephant seal	0	0.96	0.92	0.35	1.89	0.96	0	3
2003	LE S	H&L	15	48	351	733602.0	222.8	1034.9	0.22	Northern elephant seal	0	1.30	1.23	0.45	2.55	1.13	0	3
2004	LE S	H&L	17	45	326	492009.0	180.0	1309.4	0.14	Northern elephant seal	0	1.80	1.73	0.59	3.53	1.36	0	3
2005	LE S	H&L	26	101	678	1456102.0	481.5	1293.1	0.37	Northern elephant seal	0	1.28	1.21	0.46	2.57	1.34	0	3
2006	LE S	H&L	19	68	470	939951.0	295.9	1377.3	0.21	Northern elephant seal	1	2.72	2.59	1.64	4.31	1.62	0	4
2007	LE S	H&L	22	75	517	1034046.0	298.5	1080.7	0.28	Northern elephant seal	0	1.24	1.15	0.45	2.43	1.67	0	4
2008	LE S	H&L	18	77	540	1244141.0	338.1	1094.7	0.31	Northern elephant seal	0	1.19	1.13	0.42	2.34	1.65	0	4
2009	LE S	H&L	8	45	287	648980.0	97.8	1447.6	0.07	Northern elephant seal	0	2.22	2.05	0.70	4.51	1.73	0	4
2010	LE S	H&L	21	143	762	1761173.0	345.8	1304.2	0.27	Northern elephant seal	1	2.52	2.43	1.54	4.01	1.98	0	5
2011	LE S	H&L	23	98	673	1405444.0	240.7	1153.5	0.21	Northern elephant seal	0	1.47	1.39	0.50	2.86	1.73	0	4
2012	LE S	H&L	17	88	532	1580075.0	239.3	1075.0	0.22	Northern elephant seal	1	2.33	2.25	1.46	3.61	1.95	0	4
2013	LE S	H&L	18	58	353	1047526.0	166.4	751.1	0.22	Northern elephant seal	0	0.95	0.89	0.30	1.93	1.90	0	4
2014	LE S	H&L	17	85	495	1200615.0	203.2	745.2	0.27	Northern elephant seal	0	0.87	0.81	0.29	1.74	1.63	0	4
2015	LE S	H&L	26	97	632	1536820.0	392.0	938.5	0.42	Northern elephant seal	3	3.86	3.81	3.33	4.71	1.89	0	4
2016	LE S	H&L	21	94	671	1743233.0	338.1	1025.3	0.33	Northern elephant seal	0	1.08	1.02	0.40	2.05	1.82	0	4

Table 13 (continued). Limited entry sablefish marine mammal bycatch and observer coverage statistics by year for vessels fishing hook and line gear. Key: *LE S* = limited entry sablefish, *H&L* = hook and line, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed				Landed Proportion				Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Sets	Hooks (no.)	Catch (mt)	catch (mt)	landed	observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE S	H&L	25	68	391	779624.0	190.8	788.5	0.24	Pinniped unidentified	0	0.22	0.17	0.01	0.72	0.22	0	1	
2003	LE S	H&L	15	48	351	733602.0	222.8	1034.9	0.22	Pinniped unidentified	0	0.30	0.21	0.01	1.00	0.26	0	1	
2004	LE S	H&L	17	45	326	492009.0	180.0	1309.4	0.14	Pinniped unidentified	0	0.44	0.32	0.01	1.41	0.32	0	1	
2005	LE S	H&L	26	101	678	1456102.0	481.5	1293.1	0.37	Pinniped unidentified	0	0.29	0.21	0.01	1.01	0.31	0	1	
2006	LE S	H&L	19	68	470	939951.0	295.9	1377.3	0.21	Pinniped unidentified	0	0.39	0.29	0.02	1.29	0.33	0	1	
2007	LE S	H&L	22	75	517	1034046.0	298.5	1080.7	0.28	Pinniped unidentified	0	0.28	0.21	0.01	1.01	0.34	0	1	
2008	LE S	H&L	18	77	540	1244141.0	338.1	1094.7	0.31	Pinniped unidentified	0	0.28	0.20	0.01	0.92	0.33	0	1	
2009	LE S	H&L	8	45	287	648980.0	97.8	1447.6	0.07	Pinniped unidentified	0	0.59	0.44	0.02	1.99	0.37	0	2	
2010	LE S	H&L	21	143	762	1761173.0	345.8	1304.2	0.27	Pinniped unidentified	0	0.35	0.26	0.01	1.15	0.38	0	2	
2011	LE S	H&L	23	98	673	1405444.0	240.7	1153.5	0.21	Pinniped unidentified	0	0.34	0.25	0.02	1.20	0.37	0	2	
2012	LE S	H&L	17	88	532	1580075.0	239.3	1075.0	0.22	Pinniped unidentified	0	0.31	0.23	0.02	1.06	0.37	0	2	
2013	LE S	H&L	18	58	353	1047526.0	166.4	751.1	0.22	Pinniped unidentified	0	0.22	0.16	0.01	0.76	0.36	0	2	
2014	LE S	H&L	17	85	495	1200615.0	203.2	745.2	0.27	Pinniped unidentified	0	0.21	0.16	0.01	0.71	0.29	0	1	
2015	LE S	H&L	26	97	632	1536820.0	392.0	938.5	0.42	Pinniped unidentified	1	1.19	1.15	1.01	1.66	0.46	0	2	
2016	LE S	H&L	21	94	671	1743233.0	338.1	1025.3	0.33	Pinniped unidentified	0	0.24	0.19	0.01	0.84	0.44	0	2	
2002	LE S	H&L	25	68	391	779624.0	190.8	788.5	0.24	Sea lion unidentified	0	0.52	0.45	0.10	1.27	0.52	0	2	
2003	LE S	H&L	15	48	351	733602.0	222.8	1034.9	0.22	Sea lion unidentified	0	0.71	0.64	0.14	1.70	0.62	0	2	
2004	LE S	H&L	17	45	326	492009.0	180.0	1309.4	0.14	Sea lion unidentified	0	1.00	0.89	0.21	2.52	0.74	0	2	
2005	LE S	H&L	26	101	678	1456102.0	481.5	1293.1	0.37	Sea lion unidentified	0	0.69	0.62	0.16	1.70	0.73	0	2	
2006	LE S	H&L	19	68	470	939951.0	295.9	1377.3	0.21	Sea lion unidentified	0	0.93	0.82	0.20	2.28	0.77	0	2	
2007	LE S	H&L	22	75	517	1034046.0	298.5	1080.7	0.28	Sea lion unidentified	0	0.67	0.60	0.16	1.61	0.80	0	2	
2008	LE S	H&L	18	77	540	1244141.0	338.1	1094.7	0.31	Sea lion unidentified	0	0.65	0.57	0.15	1.58	0.79	0	2	
2009	LE S	H&L	8	45	287	648980.0	97.8	1447.6	0.07	Sea lion unidentified	0	1.25	1.08	0.24	3.25	0.84	0	3	
2010	LE S	H&L	21	143	762	1761173.0	345.8	1304.2	0.27	Sea lion unidentified	1	1.82	1.70	1.18	2.93	1.06	0	3	
2011	LE S	H&L	23	98	673	1405444.0	240.7	1153.5	0.21	Sea lion unidentified	2	2.79	2.70	2.17	3.94	1.44	0	4	
2012	LE S	H&L	17	88	532	1580075.0	239.3	1075.0	0.22	Sea lion unidentified	0	0.73	0.65	0.14	1.81	1.45	0	4	
2013	LE S	H&L	18	58	353	1047526.0	166.4	751.1	0.22	Sea lion unidentified	0	0.52	0.45	0.09	1.25	1.42	0	4	
2014	LE S	H&L	17	85	495	1200615.0	203.2	745.2	0.27	Sea lion unidentified	0	0.47	0.42	0.09	1.17	1.27	0	3	
2015	LE S	H&L	26	97	632	1536820.0	392.0	938.5	0.42	Sea lion unidentified	0	0.46	0.40	0.10	1.12	1.00	0	3	
2016	LE S	H&L	21	94	671	1743233.0	338.1	1025.3	0.33	Sea lion unidentified	0	0.59	0.52	0.12	1.43	0.55	0	2	

Table 13 (continued). Limited entry sablefish marine mammal bycatch and observer coverage statistics by year for vessels fishing hook and line gear. Key: *LE S* = limited entry sablefish, *H&L* = hook and line, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed				Landed Proportion				Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Sets	Hooks (no.)	Catch (mt)	catch (mt)	landed	observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE S	H&L	25	68	391	779624.0	190.8	788.5	0.24	Sperm whale	0	0.23	0.18	0.01	0.75	0.23	0	1	
2003	LE S	H&L	15	48	351	733602.0	222.8	1034.9	0.22	Sperm whale	0	0.32	0.24	0.02	0.97	0.28	0	1	
2004	LE S	H&L	17	45	326	492009.0	180.0	1309.4	0.14	Sperm whale	0	0.45	0.35	0.02	1.40	0.33	0	1	
2005	LE S	H&L	26	101	678	1456102.0	481.5	1293.1	0.37	Sperm whale	0	0.29	0.23	0.01	0.92	0.32	0	1	
2006	LE S	H&L	19	68	470	939951.0	295.9	1377.3	0.21	Sperm whale	0	0.40	0.31	0.02	1.26	0.34	0	1	
2007	LE S	H&L	22	75	517	1034046.0	298.5	1080.7	0.28	Sperm whale	1	1.29	1.22	1.01	1.91	0.55	0	2	
2008	LE S	H&L	18	77	540	1244141.0	338.1	1094.7	0.31	Sperm whale	0	0.29	0.21	0.02	0.92	0.54	0	2	
2009	LE S	H&L	8	45	287	648980.0	97.8	1447.6	0.07	Sperm whale	0	0.60	0.48	0.03	1.81	0.57	0	2	
2010	LE S	H&L	21	143	762	1761173.0	345.8	1304.2	0.27	Sperm whale	0	0.35	0.28	0.02	1.09	0.58	0	2	
2011	LE S	H&L	23	98	673	1405444.0	240.7	1153.5	0.21	Sperm whale	0	0.35	0.27	0.02	1.03	0.57	0	2	
2012	LE S	H&L	17	88	532	1580075.0	239.3	1075.0	0.22	Sperm whale	0	0.32	0.25	0.02	1.06	0.38	0	2	
2013	LE S	H&L	18	58	353	1047526.0	166.4	751.1	0.22	Sperm whale	0	0.23	0.19	0.01	0.71	0.37	0	2	
2014	LE S	H&L	17	85	495	1200615.0	203.2	745.2	0.27	Sperm whale	0	0.20	0.17	0.01	0.63	0.29	0	1	
2015	LE S	H&L	26	97	632	1536820.0	392.0	938.5	0.42	Sperm whale	0	0.20	0.16	0.01	0.63	0.26	0	1	
2016	LE S	H&L	21	94	671	1743233.0	338.1	1025.3	0.33	Sperm whale	0	0.25	0.20	0.01	0.80	0.24	0	1	
2002	LE S	H&L	25	68	391	779624.0	190.8	788.5	0.24	Steller sea lion	0	0.39	0.32	0.04	1.08	0.39	0	2	
2003	LE S	H&L	15	48	351	733602.0	222.8	1034.9	0.22	Steller sea lion	0	0.52	0.45	0.05	1.50	0.45	0	2	
2004	LE S	H&L	17	45	326	492009.0	180.0	1309.4	0.14	Steller sea lion	0	0.74	0.63	0.09	2.04	0.55	0	2	
2005	LE S	H&L	26	101	678	1456102.0	481.5	1293.1	0.37	Steller sea lion	0	0.51	0.43	0.07	1.41	0.54	0	2	
2006	LE S	H&L	19	68	470	939951.0	295.9	1377.3	0.21	Steller sea lion	0	0.69	0.58	0.09	1.82	0.57	0	2	
2007	LE S	H&L	22	75	517	1034046.0	298.5	1080.7	0.28	Steller sea lion	0	0.49	0.41	0.07	1.38	0.59	0	2	
2008	LE S	H&L	18	77	540	1244141.0	338.1	1094.7	0.31	Steller sea lion	0	0.47	0.41	0.06	1.33	0.58	0	2	
2009	LE S	H&L	8	45	287	648980.0	97.8	1447.6	0.07	Steller sea lion	0	0.98	0.83	0.08	2.84	0.63	0	2	
2010	LE S	H&L	21	143	762	1761173.0	345.8	1304.2	0.27	Steller sea lion	0	0.61	0.52	0.07	1.73	0.65	0	2	
2011	LE S	H&L	23	98	673	1405444.0	240.7	1153.5	0.21	Steller sea lion	0	0.60	0.51	0.06	1.65	0.63	0	2	
2012	LE S	H&L	17	88	532	1580075.0	239.3	1075.0	0.22	Steller sea lion	0	0.53	0.46	0.08	1.52	0.64	0	2	
2013	LE S	H&L	18	58	353	1047526.0	166.4	751.1	0.22	Steller sea lion	0	0.38	0.33	0.04	1.09	0.62	0	2	
2014	LE S	H&L	17	85	495	1200615.0	203.2	745.2	0.27	Steller sea lion	0	0.35	0.30	0.04	0.92	0.49	0	2	
2015	LE S	H&L	26	97	632	1536820.0	392.0	938.5	0.42	Steller sea lion	0	0.34	0.29	0.05	0.98	0.44	0	2	
2016	LE S	H&L	21	94	671	1743233.0	338.1	1025.3	0.33	Steller sea lion	2	2.43	2.38	2.05	3.25	0.81	0	2	

Table 14. Limited entry sablefish marine mammal bycatch and observer coverage statistics by year for vessels fishing pot gear. These vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Key: *LE S* = limited entry sablefish, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed				Landed Proportion			Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Sets	Pots (no.)	Catch (mt)	catch (mt)	landed observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE S	Pot	6	23	247	5438.0	82.5	352.2	0.23	Humpback whale	0	0.18	0.13	0.01	0.59	0.18	0	1
2003	LE S	Pot	6	35	362	9017.0	148.3	604.2	0.25	Humpback whale	0	0.29	0.21	0.01	0.93	0.23	0	1
2004	LE S	Pot	3	13	139	5378.0	82.7	619.6	0.13	Humpback whale	0	0.36	0.27	0.02	1.15	0.28	0	1
2005	LE S	Pot	7	39	492	13822.0	281.2	615.0	0.46	Humpback whale	0	0.20	0.15	0.01	0.65	0.26	0	1
2006	LE S	Pot	7	39	289	10708.0	200.5	581.8	0.34	Humpback whale	0	0.24	0.18	0.01	0.81	0.25	0	1
2007	LE S	Pot	4	30	154	5816.0	90.0	428.4	0.21	Humpback whale	0	0.22	0.18	0.02	0.74	0.26	0	1
2008	LE S	Pot	6	24	329	13638.0	244.9	433.0	0.57	Humpback whale	0	0.11	0.09	0.00	0.37	0.23	0	1
2009	LE S	Pot	3	27	67	3883.0	66.5	489.1	0.14	Humpback whale	0	0.30	0.22	0.00	0.92	0.21	0	1
2010	LE S	Pot	7	43	314	11294.0	140.4	503.5	0.28	Humpback whale	0	0.23	0.17	0.01	0.76	0.22	0	1
2011	LE S	Pot	3	22	227	9029.0	137.4	371.9	0.37	Humpback whale	0	0.15	0.11	0.01	0.50	0.20	0	1
2012	LE S	Pot	5	19	351	14218.0	101.1	286.0	0.35	Humpback whale	0	0.12	0.09	0.00	0.39	0.18	0	1
2013	LE S	Pot	3	14	47	1934.0	40.5	283.1	0.14	Humpback whale	0	0.19	0.15	0.00	0.60	0.19	0	1
2014	LE S	Pot	4	16	195	7574.0	104.0	338.1	0.31	Humpback whale	1	1.15	1.11	1.01	1.48	0.36	0	2
2015	LE S	Pot	9	35	299	11329.0	218.8	358.2	0.61	Humpback whale	0	0.08	0.06	0.00	0.27	0.34	0	1
2016	LE S	Pot	7	55	596	21219.0	254.3	359.0	0.71	Humpback whale	0	0.06	0.05	0.00	0.20	0.32	0	1

Limited Entry Fixed Gear Daily Trip Limit, 2002–16

Table 15. Limited entry fixed gear daily trip limit fishery, marine mammal bycatch and observer coverage statistics by year and gear. These vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Key: *LE FG DTL* = limited entry fixed gear daily trip limit, *H&L* = hook and line, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed				Landed Proportion		Species	Observed number	Bayes				Bayes 5 yr.			
			Vessels	Trips	Sets	Hooks (no.)	Catch (mt)	catch (mt)			landed observed	Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE FG DTL	H&L	4	11	22	46000.0	1.7	231.9	0.01	Bottlenose dolphin	0	2.64	2.10	0.07	8.49	2.64	0	6
2003	LE FG DTL	H&L	17	130	219	537817.0	14.3	213.5	0.07	Bottlenose dolphin	0	1.26	0.92	0.07	4.00	1.95	0	4
2004	LE FG DTL	H&L	14	62	130	318048.0	3.7	161.1	0.02	Bottlenose dolphin	0	1.30	1.05	0.06	4.00	1.73	0	4
2005	LE FG DTL	H&L	11	35	60	198150.0	2.4	245.3	0.01	Bottlenose dolphin	0	2.25	1.79	0.10	7.30	1.86	0	4
2006	LE FG DTL	H&L	21	121	201	533830.0	7.0	200.5	0.03	Bottlenose dolphin	0	1.40	1.09	0.06	4.46	1.77	0	4
2007	LE FG DTL	H&L	36	158	304	724389.0	16.5	241.6	0.07	Bottlenose dolphin	0	1.42	1.09	0.09	4.97	1.53	0	4
2008	LE FG DTL	H&L	32	122	221	631689.0	9.3	323.5	0.03	Bottlenose dolphin	0	2.08	1.55	0.10	6.86	1.69	0	4
2009	LE FG DTL	H&L	34	138	273	669091.0	12.0	484.0	0.02	Bottlenose dolphin	1	4.11	3.37	1.15	11.06	2.25	0	5
2010	LE FG DTL	H&L	38	226	472	1103073.0	33.8	699.9	0.05	Bottlenose dolphin	0	3.94	2.95	0.22	13.46	2.59	0	5
2011	LE FG DTL	H&L	38	201	426	1154241.0	52.5	889.4	0.06	Bottlenose dolphin	0	4.92	3.67	0.31	16.07	3.29	0	7
2012	LE FG DTL	H&L	26	128	252	706437.0	15.1	552.9	0.03	Bottlenose dolphin	0	3.44	2.60	0.19	10.65	3.70	1	7
2013	LE FG DTL	H&L	22	124	248	705827.0	17.7	584.9	0.03	Bottlenose dolphin	0	3.53	2.67	0.20	11.40	3.99	1	8
2014	LE FG DTL	H&L	18	77	154	493845.0	15.7	537.5	0.03	Bottlenose dolphin	0	3.25	2.44	0.20	10.56	3.82	1	7
2015	LE FG DTL	H&L	21	65	144	453472.0	29.2	534.3	0.05	Bottlenose dolphin	0	3.03	2.27	0.18	9.86	3.64	0	7
2016	LE FG DTL	H&L	16	41	70	247067.0	19.4	522.3	0.04	Bottlenose dolphin	0	3.14	2.32	0.14	10.10	3.28	0	6
2002	LE FG DTL	H&L	4	11	22	46000.0	1.7	231.9	0.01	California sea lion	0	3.77	3.23	0.33	9.96	3.77	1	7
2003	LE FG DTL	H&L	17	130	219	537817.0	14.3	213.5	0.07	California sea lion	0	2.06	1.80	0.24	5.26	2.92	0	6
2004	LE FG DTL	H&L	14	62	130	318048.0	3.7	161.1	0.02	California sea lion	1	2.96	2.67	1.22	6.15	2.93	0	6
2005	LE FG DTL	H&L	11	35	60	198150.0	2.4	245.3	0.01	California sea lion	0	3.36	2.83	0.32	9.35	3.04	0	6
2006	LE FG DTL	H&L	21	121	201	533830.0	7.0	200.5	0.03	California sea lion	0	2.17	1.83	0.28	5.73	2.86	0	6
2007	LE FG DTL	H&L	36	158	304	724389.0	16.5	241.6	0.07	California sea lion	1	3.31	2.99	1.32	6.95	2.77	0	6
2008	LE FG DTL	H&L	32	122	221	631689.0	9.3	323.5	0.03	California sea lion	0	3.43	2.86	0.53	9.06	3.05	0	6
2009	LE FG DTL	H&L	34	138	273	669091.0	12.0	484.0	0.02	California sea lion	0	5.01	4.27	0.59	13.08	3.46	0	7
2010	LE FG DTL	H&L	38	226	472	1103073.0	33.8	699.9	0.05	California sea lion	0	6.65	5.79	1.04	17.16	4.12	1	8
2011	LE FG DTL	H&L	38	201	426	1154241.0	52.5	889.4	0.06	California sea lion	0	8.27	7.26	1.24	21.07	5.34	1	9
2012	LE FG DTL	H&L	26	128	252	706437.0	15.1	552.9	0.03	California sea lion	0	5.59	4.71	0.81	14.30	5.79	2	10
2013	LE FG DTL	H&L	22	124	248	705827.0	17.7	584.9	0.03	California sea lion	0	5.81	5.09	0.79	14.21	6.27	2	11
2014	LE FG DTL	H&L	18	77	154	493845.0	15.7	537.5	0.03	California sea lion	0	5.37	4.74	0.74	13.63	6.34	2	11
2015	LE FG DTL	H&L	21	65	144	453472.0	29.2	534.3	0.05	California sea lion	0	5.12	4.31	0.78	13.02	6.03	2	10
2016	LE FG DTL	H&L	16	41	70	247067.0	19.4	522.3	0.04	California sea lion	0	5.17	4.48	0.73	13.36	5.41	1	9

Table 15 (continued). Limited entry fixed gear daily trip limit fishery, marine mammal bycatch and observer coverage statistics by year and gear. Key: *LE FG DTL* = limited entry fixed gear daily trip limit, *H&L* = hook and line, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed							Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Sets	Hooks (no.)	Catch (mt)	Landed catch (mt)	Proportion landed observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
2002	LE FG DTL	H&L	4	11	22	46000.0	1.7	231.9	0.01	Harbor seal	0	2.55	2.03	0.09	8.74	2.55	0	5
2003	LE FG DTL	H&L	17	130	219	537817.0	14.3	213.5	0.07	Harbor seal	0	1.18	0.91	0.07	3.78	1.87	0	4
2004	LE FG DTL	H&L	14	62	130	318048.0	3.7	161.1	0.02	Harbor seal	0	1.22	0.95	0.08	4.05	1.65	0	4
2005	LE FG DTL	H&L	11	35	60	198150.0	2.4	245.3	0.01	Harbor seal	0	2.25	1.78	0.08	7.19	1.80	0	4
2006	LE FG DTL	H&L	21	121	201	533830.0	7.0	200.5	0.03	Harbor seal	0	1.29	0.97	0.08	4.00	1.70	0	4
2007	LE FG DTL	H&L	36	158	304	724389.0	16.5	241.6	0.07	Harbor seal	0	1.30	0.98	0.09	4.17	1.45	0	4
2008	LE FG DTL	H&L	32	122	221	631689.0	9.3	323.5	0.03	Harbor seal	0	2.00	1.54	0.09	5.91	1.61	0	4
2009	LE FG DTL	H&L	34	138	273	669091.0	12.0	484.0	0.02	Harbor seal	1	3.89	3.28	1.18	10.03	2.15	0	5
2010	LE FG DTL	H&L	38	226	472	1103073.0	33.8	699.9	0.05	Harbor seal	0	3.70	2.87	0.30	11.63	2.43	0	5
2011	LE FG DTL	H&L	38	201	426	1154241.0	52.5	889.4	0.06	Harbor seal	0	4.59	3.52	0.32	14.39	3.09	0	6
2012	LE FG DTL	H&L	26	128	252	706437.0	15.1	552.9	0.03	Harbor seal	0	3.19	2.48	0.23	10.29	3.47	0	7
2013	LE FG DTL	H&L	22	124	248	705827.0	17.7	584.9	0.03	Harbor seal	0	3.36	2.48	0.16	11.03	3.74	1	7
2014	LE FG DTL	H&L	18	77	154	493845.0	15.7	537.5	0.03	Harbor seal	0	3.01	2.29	0.19	9.46	3.57	0	7
2015	LE FG DTL	H&L	21	65	144	453472.0	29.2	534.3	0.05	Harbor seal	0	2.86	2.17	0.21	8.93	3.40	0	7
2016	LE FG DTL	H&L	16	41	70	247067.0	19.4	522.3	0.04	Harbor seal	0	2.93	2.21	0.21	9.14	3.07	0	6
2002	LE FG DTL	H&L	4	11	22	46000.0	1.7	231.9	0.01	Pinniped unidentified	0	2.58	1.94	0.07	8.59	2.58	0	5
2003	LE FG DTL	H&L	17	130	219	537817.0	14.3	213.5	0.07	Pinniped unidentified	0	1.21	0.97	0.08	3.57	1.89	0	4
2004	LE FG DTL	H&L	14	62	130	318048.0	3.7	161.1	0.02	Pinniped unidentified	0	1.22	0.97	0.02	3.80	1.67	0	4
2005	LE FG DTL	H&L	11	35	60	198150.0	2.4	245.3	0.01	Pinniped unidentified	0	2.26	1.76	0.09	6.97	1.82	0	4
2006	LE FG DTL	H&L	21	121	201	533830.0	7.0	200.5	0.03	Pinniped unidentified	0	1.32	1.09	0.06	3.85	1.72	0	4
2007	LE FG DTL	H&L	36	158	304	724389.0	16.5	241.6	0.07	Pinniped unidentified	1	2.34	2.07	1.07	5.15	1.67	0	4
2008	LE FG DTL	H&L	32	122	221	631689.0	9.3	323.5	0.03	Pinniped unidentified	0	2.00	1.59	0.15	6.10	1.83	0	4
2009	LE FG DTL	H&L	34	138	273	669091.0	12.0	484.0	0.02	Pinniped unidentified	0	2.93	2.29	0.18	9.19	2.17	0	5
2010	LE FG DTL	H&L	38	226	472	1103073.0	33.8	699.9	0.05	Pinniped unidentified	0	3.73	2.91	0.27	11.58	2.47	0	5
2011	LE FG DTL	H&L	38	201	426	1154241.0	52.5	889.4	0.06	Pinniped unidentified	0	4.62	3.49	0.23	13.88	3.13	0	6
2012	LE FG DTL	H&L	26	128	252	706437.0	15.1	552.9	0.03	Pinniped unidentified	0	3.23	2.46	0.22	9.41	3.30	0	7
2013	LE FG DTL	H&L	22	124	248	705827.0	17.7	584.9	0.03	Pinniped unidentified	0	3.32	2.49	0.20	10.23	3.57	0	7
2014	LE FG DTL	H&L	18	77	154	493845.0	15.7	537.5	0.03	Pinniped unidentified	0	3.16	2.45	0.19	9.20	3.61	0	7
2015	LE FG DTL	H&L	21	65	144	453472.0	29.2	534.3	0.05	Pinniped unidentified	0	2.93	2.17	0.20	9.02	3.45	0	7
2016	LE FG DTL	H&L	16	41	70	247067.0	19.4	522.3	0.04	Pinniped unidentified	0	2.97	2.21	0.20	9.12	3.12	0	6

Open Access Fixed Gear, 2003–16

Table 16. Open access fixed gear fishery marine mammal bycatch and observer coverage statistics by year and gear. These vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Key: OA FG = open access fixed gear, H&L = hook and line, FG = fixed gear, Mean/Median = the mean/median estimate from the Bayesian analysis, LCL/UCL = the lower/upper 95% confidence interval, Bayes 5 yr. = the five-year rolling mean from the Bayesian analysis.

Year	Sector	Gear	Observed							Species	Observed number	Bayes				Bayes 5 yr.		
			Vessels	Trips	Sets	FG units	Catch (mt)	Landed catch (mt)	Proportion landed observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
2003	OA FG	H&L	13	41	49	86518	16.6	548.4	0.03	-	0	-	-	-	-	-	-	-
2004	OA FG	H&L	14	42	52	85895	16.2	477.9	0.03	-	0	-	-	-	-	-	-	-
2005	OA FG	H&L	10	34	37	58384	9.8	632.6	0.02	-	0	-	-	-	-	-	-	-
2006	OA FG	H&L	7	10	11	29296	4.5	491.4	0.01	-	0	-	-	-	-	-	-	-
2007	OA FG	H&L	25	51	67	55215	10.5	267.3	0.04	-	0	-	-	-	-	-	-	-
2008	OA FG	H&L	33	58	68	73885	16.3	409.9	0.04	-	0	-	-	-	-	-	-	-
2009	OA FG	H&L	34	69	104	119849	22.3	650.1	0.03	-	0	-	-	-	-	-	-	-
2010	OA FG	H&L	37	70	105	160570	23.1	758.1	0.03	-	0	-	-	-	-	-	-	-
2011	OA FG	H&L	40	69	101	162419	20.2	436.2	0.05	-	0	-	-	-	-	-	-	-
2012	OA FG	H&L	24	34	53	82597	11.5	324.0	0.04	-	0	-	-	-	-	-	-	-
2013	OA FG	H&L	14	23	30	51870	4.7	194.0	0.02	-	0	-	-	-	-	-	-	-
2014	OA FG	H&L	21	28	39	71459	11.8	219.8	0.05	-	0	-	-	-	-	-	-	-
2015	OA FG	H&L	20	38	54	124895	17.5	364.3	0.05	-	0	-	-	-	-	-	-	-
2016	OA FG	H&L	31	57	78	111092	15.7	309.3	0.05	-	0	-	-	-	-	-	-	-
2003	OA FG	Pot	7	16	50	345	2.9	186.6	0.02	Humpback whale	0	2.22	1.73	0.10	7.40	2.22	0.00	5.00
2004	OA FG	Pot	17	96	185	1950	17.0	186.0	0.09	Humpback whale	0	1.53	1.16	0.08	5.18	1.88	0.00	4.00
2005	OA FG	Pot	14	43	50	835	10.7	379.4	0.03	Humpback whale	0	3.44	2.57	0.25	11.45	2.40	0.00	5.00
2006	OA FG	Pot	15	38	39	666	7.9	443.3	0.02	Humpback whale	0	4.33	3.32	0.34	14.30	2.88	0.00	6.00
2007	OA FG	Pot	21	46	75	624	8.8	257.9	0.03	Humpback whale	0	2.44	1.87	0.13	7.95	2.79	0.00	6.00
2008	OA FG	Pot	20	55	75	833	10.4	240.9	0.04	Humpback whale	0	2.21	1.66	0.14	7.27	2.79	0.00	6.00
2009	OA FG	Pot	18	30	45	540	8.5	372.6	0.02	Humpback whale	0	3.62	2.74	0.19	11.90	3.21	0.00	6.00
2010	OA FG	Pot	26	40	71	646	10.7	318.3	0.03	Humpback whale	0	2.95	2.27	0.21	9.58	3.11	0.00	6.00
2011	OA FG	Pot	29	61	85	831	18.9	255.8	0.07	Humpback whale	0	2.20	1.71	0.11	7.36	2.68	0.00	6.00
2012	OA FG	Pot	19	35	70	610	9.1	127.2	0.07	Humpback whale	0	1.12	0.85	0.07	3.79	2.42	0.00	5.00
2013	OA FG	Pot	17	25	48	590	6.3	72.2	0.09	Humpback whale	0	0.67	0.49	0.04	2.16	2.11	0.00	5.00
2014	OA FG	Pot	21	41	63	686	11.7	147.8	0.08	Humpback whale	0	1.30	0.98	0.07	4.24	1.65	0.00	4.00
2015	OA FG	Pot	17	49	64	604	14.6	234.3	0.06	Humpback whale	0	2.03	1.57	0.13	6.93	1.47	0.00	4.00
2016	OA FG	Pot	28	56	74	717	15.4	206.5	0.07	Humpback whale	1	2.76	2.35	1.09	6.69	1.58	0.00	4.00

Nearshore, 2003–16

Table 17. Oregon and California nearshore hook and line fisheries, marine mammal bycatch and observer coverage statistics by year. These vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Key: *NS* = nearshore, *H&L* = hook and line, *Mean/Median* = the mean/median estimate from the Bayesian analysis, *LCL/UCL* = the lower/upper 95% confidence interval, *Bayes 5 yr.* = the five-year rolling mean from the Bayesian analysis.

State	Year	Sector	Gear	Observed							Species	Observed number	Bayes				Bayes 5 yr.		
				Vessels	Trips	Sets	Hooks (no.)	Catch (mt)	Landed catch (mt)	Proportion landed observed			Mean	Median	LCL	UCL	Mean	LCL	UCL
OR	2004	NS	H&L	31	109	184	25112	9.7	204.5	0.05	Harbor seal	0	2.39	2.01	0.30	6.34	2.39	0	5
OR	2005	NS	H&L	48	138	170	44235	11.8	176.2	0.07	Harbor seal	0	1.95	1.62	0.30	5.34	2.17	0	5
OR	2006	NS	H&L	55	238	365	69772	18.7	160.5	0.12	Harbor seal	0	1.68	1.39	0.23	4.53	2.00	0	5
OR	2007	NS	H&L	36	164	230	54286	15.3	176.5	0.09	Harbor seal	0	1.93	1.64	0.27	5.35	1.99	0	5
OR	2008	NS	H&L	43	149	183	47677	14.5	184.6	0.08	Harbor seal	2	4.02	3.71	2.24	7.45	2.39	0	5
OR	2009	NS	H&L	45	151	197	59983	13.4	220.5	0.06	Harbor seal	0	2.49	2.10	0.38	6.87	2.41	0	5
OR	2010	NS	H&L	56	162	209	60178	13.4	169.1	0.08	Harbor seal	0	1.86	1.57	0.28	5.02	2.39	0	5
OR	2011	NS	H&L	57	205	244	80497	15.9	191.5	0.08	Harbor seal	0	2.06	1.76	0.31	5.78	2.47	0	5
OR	2012	NS	H&L	60	235	290	109675	20.7	193.8	0.11	Harbor seal	0	2.04	1.72	0.29	5.66	2.50	0	5
OR	2013	NS	H&L	65	209	259	74698	15.6	203.8	0.08	Harbor seal	0	2.25	1.94	0.30	6.06	2.14	0	5
OR	2014	NS	H&L	57	174	194	60396	16.5	200.2	0.08	Harbor seal	0	2.17	1.88	0.28	6.30	2.08	0	5
OR	2015	NS	H&L	57	189	235	65441	18.3	210.9	0.09	Harbor seal	0	2.29	1.92	0.34	6.30	2.16	0	5
OR	2016	NS	H&L	53	214	263	79133	21.7	176.3	0.12	Harbor seal	0	1.79	1.56	0.26	4.91	2.11	0	5
CA	2003	NS	H&L	30	98	177	52829	5.7	190.7	0.03	California sea lion	0	2.19	1.64	0.15	6.70	2.19	0	5
CA	2004	NS	H&L	57	220	334	115083	17.7	235.1	0.08	California sea lion	0	2.31	1.74	0.17	7.43	2.25	0	5
CA	2005	NS	H&L	43	151	192	79707	11.4	232.9	0.05	California sea lion	0	2.47	1.90	0.22	8.19	2.32	0	5
CA	2006	NS	H&L	39	100	148	51072	8.0	217.3	0.04	California sea lion	1	3.44	2.93	1.25	8.95	2.60	0	5
CA	2007	NS	H&L	40	133	214	76767	10.8	238.5	0.05	California sea lion	0	2.54	1.94	0.21	8.19	2.59	0	5
CA	2008	NS	H&L	24	70	79	62042	6.3	247.4	0.03	California sea lion	0	2.85	2.11	0.23	8.58	2.72	0	6
CA	2009	NS	H&L	28	89	121	72765	6.7	222.6	0.03	California sea lion	0	2.58	2.08	0.18	8.42	2.77	0	6
CA	2010	NS	H&L	22	87	108	131934	6.6	184.2	0.04	California sea lion	0	2.07	1.64	0.16	6.52	2.69	0	6
CA	2011	NS	H&L	32	145	214	146393	8.5	178.5	0.05	California sea lion	0	1.94	1.51	0.16	6.33	2.39	0	5
CA	2012	NS	H&L	31	138	211	155080	9.9	158.7	0.06	California sea lion	0	1.67	1.28	0.13	5.35	2.22	0	5
CA	2013	NS	H&L	34	131	173	119332	9.6	178.4	0.05	California sea lion	0	1.87	1.44	0.16	6.30	2.03	0	5
CA	2014	NS	H&L	32	119	151	111841	8.9	196.7	0.05	California sea lion	0	2.15	1.68	0.14	6.88	1.94	0	4
CA	2015	NS	H&L	33	176	230	165065	18.9	282.2	0.07	California sea lion	0	2.83	2.16	0.18	9.24	2.09	0	5
CA	2016	NS	H&L	23	87	99	75487	9.7	205.7	0.05	California sea lion	0	2.22	1.67	0.16	7.34	2.15	0	5

Table 18. Oregon and California nearshore pot fisheries marine mammal bycatch and observer coverage statistics by state and year. Pink shrimp vessels carried a scientific observer for the proportion of landings given under *Proportion landed observed*. Values for Oregon and California are combined to maintain confidentiality. Key: NS = nearshore, * = confidential, - = not observed.

State	Year	Sector	Gear	Observed					Landed catch (mt)	Proportion landed observed	Species
				Vessels	Trips	Sets	Pots (no.)	Catch (mt)			
OR/CA	2003	NS	Pot	5	14	31	2121	2.4	68.6	0.04	-
OR/CA	2004	NS	Pot	24	64	126	4500	6.1	58.9	0.10	-
OR/CA	2005	NS	Pot	7	21	27	801	1.6	47.2	0.03	-
OR/CA	2006	NS	Pot	5	16	33	667	1.3	43.1	0.03	-
OR/CA	2007	NS	Pot	4	26	31	878	1.9	38.7	0.05	-
OR/CA	2008	NS	Pot	4	8	12	306	0.5	49.7	0.01	-
OR/CA	2009	NS	Pot	*	*	*	*	*	*	*	*
OR/CA	2010	NS	Pot	6	9	13	403	0.6	36.5	0.02	-
OR/CA	2011	NS	Pot	6	14	24	807	1.5	43.0	0.03	-
OR/CA	2012	NS	Pot	8	16	28	1058	2.0	43.2	0.05	-
OR/CA	2013	NS	Pot	7	16	25	1125	2.5	43.1	0.06	-
OR/CA	2014	NS	Pot	11	22	33	1586	2.7	49.0	0.06	-
OR/CA	2015	NS	Pot	12	39	49	5296	4.1	51.4	0.08	-
OR/CA	2016	NS	Pot	17	37	61	3890	4.1	44.2	0.09	-

List of Species

The following species are mentioned in this report. To save space in the tables, their scientific names are listed here.

In general

dolphins	Delphinidae
flatfish	Pleuronectiformes
greenlings	Hexagrammidae
porpoises	Phocoenidae
rockfish	<i>Sebastes</i> spp.
sea turtles	Cheloniidae
sharks	Chondrichthyes

To species

bottlenose dolphin	<i>Tursiops truncatus</i>
cabezon	<i>Scorpaenichthys marmoratus</i>
California halibut	<i>Paralichthys californicus</i>
California sea lion	<i>Zalophus californianus</i>
Dall's porpoise	<i>Phocoenoides dalli</i>
harbor porpoise	<i>Phocoena phocoena</i>
harbor seal	<i>Phoca vitulina</i>
humpback whale	<i>Megaptera novaeangliae</i>
northern elephant seal	<i>Mirounga angustirostris</i>
northern fur seal	<i>Callorhinus ursinus</i>
northern right whale dolphin	<i>Lissodelphis borealis</i>
Pacific hake	<i>Merluccius productus</i>
Pacific white-sided dolphin	<i>Lagenorhynchus obliquidens</i>
pink shrimp	<i>Pandalus jordani</i>
Risso's dolphin	<i>Grampus griseus</i>
sablefish	<i>Anoplopoma fimbria</i>
sperm whale	<i>Physeter macrocephalus</i>
Steller sea lion	<i>Eumetopias jubatus</i>