AFSC PROCESSED REPORT 2026-06

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Results of California Channel Islands Pinniped Aerial Survey, July 2022

June 2026

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AFSC Processed Report

This document should be cited as follows:
Melin, S. R., Chinn, S. M., and Jaime, E. M. 2026. Results of California Channel Islands pinniped aerial survey, July 2022. AFSC Processed Rep. 2026-06, 22 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

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Results of California Channel Islands Pinniped Aerial Survey, July 2022

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June 2026

ABSTRACT

The U.S. Navy Base Ventura County (USNBV) and National Marine Fisheries Service (NMFS) partnered to complete an aerial pinniped survey of the California Channel Islands from 6 to 12 July 2022. The abundance of pinnipeds on the islands is needed by the two agencies to meet requirements under the Marine Mammal Protection Act. For the Navy, the data are needed to determine take numbers related to Navy activities around the Channel Islands. For NMFS, the data support stock assessments. We conducted crewed aerial surveys of five of the eight California Channel Islands. Three islands, Santa Cruz, Santa Rosa and Santa Barbara, were not surveyed due to adverse weather conditions during the survey window. The surveys were timed to capture the peak abundance of California sea lions, but all species were photographed and counted to provide minimal seasonal abundance for all pinnipeds on the islands. We photographed the entire coastline of each island, created mosaics of each island coastline and counted the pinnipeds by island, area, species and age class We counted 114,749 live pinnipeds. California sea lions were the most abundant species (n = 107,937) followed by northern elephant seals (n = 3,264) and northern fur seals (n = 3,232). A low number of Pacific harbor seals (n = 315) and one Guadalupe fur seal were recorded. The highest percentage of each species occurred at San Miguel Island, except for harbor seals for which most were observed at San Nicolas Island. Together San Miguel and San Nicolas Islands represented 96.6% of the California sea lions, 99.8% of the northern elephant seals and 95.6% of the Pacific harbor seals. Northern fur seals and a single Guadalupe fur seal were only observed at San Miguel Island. The decline of 33.7% for Pacific harbor seals between 2019 and 2022 continues a declining trend since 2015 on the surveyed islands and is cause for concern.

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INTRODUCTION

Six pinniped species including California sea lions (*Zalophus californianus*), northern elephant seals (*Mirounga angustirostris*), northern fur seals (*Callorhinus ursinus*), Pacific harbor seals (*Phoca vitulina*), Steller sea lions (*Eumetopias jubatus*), and Guadalupe fur seals (*Arctocephalus townsendii*) inhabit the California Channel Islands, located off the coast of southern California. The Marine Mammal Laboratory (MML) at the NOAA-NMFS Alaska Fisheries Science Center has conducted aerial surveys of pinnipeds of the California Channel Islands and along the West Coast since 2020. The surveys provide abundance data used in marine mammal stock assessments that are mandated by the federal Marine Mammal Protection Act. The U.S. Navy Ventura County (USNBV) also uses the information to monitor pinniped populations at the military-owned islands of San Nicolas, San Clemente and San Miguel. In 2022, the MML partnered with the USNBV to conduct pinniped surveys of the California Channel Islands. The surveys were timed to capture the peak abundance of California sea lions, but other pinniped species were counted as well. Here we report counts of pinnipeds hauled out at five of the eight California Channel Islands during summer of 2022, describe inter- and intra-island patterns, and compare the counts to 2019 in Lowry et al. (2021) to assess if abundance changed between the years.

METHODS

Aerial Survey Description

From 6 to 12 July 2022, we conducted crewed aerial surveys of five of the eight California Channel Islands. Three islands, Santa Cruz, Santa Rosa and Santa Barbara, were not surveyed due to weather conditions during the survey window. The survey was conducted after California sea lions finished annual pupping (approximately 30 June) and within the peak pupping period for northern fur seals (2-7 July). The timing of the surveys provided complete live pup counts of California sea lions and approximately 50% of the live pup count for northern fur seals. However, the reported counts of non-pups for these two species represent the minimum abundance of animals because they do not include animals that were not hauled out at the time of the survey. Northern elephant seals and Pacific harbor seals in California have peak numbers in the winter and spring, respectively. Thus, summer count data of elephant seals and harbor seals at the Channel Islands are not used for population assessments but rather represent seasonal abundance.

The aerial survey methods followed Lowry et al. (2021) and are summarized here. We conducted aerial photographic surveys from a Partenavia P-68 Observer model aircraft. We flew at a ground speed of 185 km/h (100 knots) and at 244 m (800 ft.) altitude. The low altitude and lens configuration ensured that California sea lions could be reliably detected, identified and counted by age and sex classes from the photographs. Overlapping transects over the island coastlines ensured that most pinniped habitat was surveyed and most hauled out California sea lions were photographed. Surveys were conducted without regard to tidal conditions and at any time of day between approximately 2 hours after sunrise and 2 hours before sunset. The methods were designed to result in the highest detection of California sea lions, the target species of the survey, that are difficult to count because of their dense aggregations and the small size and cryptic

coloring of pups on rocky substrates. The methods were also suitable for detection of the other pinniped species that are larger in size, more dispersed, or haul out on high contrast substrate that makes them easier to count. However, the counts of harbor seals occurred during the rising tide which may have resulted in lower counts due to fewer animals being hauled out.

We counted pinnipeds from vertical aerial photographs taken with a Canon EOS Mark IV, full-frame 21.1-megapixel digital single lens reflex (DSLR) camera mounted with a manual-focus Zeiss 85-mm f/1.4 lens. Image motion compensation was achieved by using a custom-made rocking mechanism in the camera mount manufactured by Aerial Imaging Solutions[1]. The focus ring of the Zeiss 85-mm lens was immobilized with tape when focused at 244 m. The camera was connected to a laptop computer which was connected to a GPS receiver in the aircraft. Software developed by Aerial Imaging Solutions controlled the camera's forward motion compensation mechanism and fired the camera on command. A video camera and monitor provided a view through the camera's viewfinder that allowed the observer to see the coastline and animals during each pass. For each photograph, the computer recorded the focal length of the lens, geographical position, date, and time the photograph was taken in a comma separated values (csv) file.

The camera was oriented vertically in the belly hatch of the aircraft, attached to a gimbal camera-mount, and manually leveled at the vertical position with a bubble level. The computer controlled all camera functions. Camera aperture was set at f/5.6 in aperture priority shooting mode and shutter speed was set at or above 1/800 second by changing the ISO image sensor setting between 100 and 1,000. Photographs were overexposed by +1/3 f-stop (for sunny conditions) or +2/3 f-stop (for overcast conditions). White balance in the camera was set on automatic, and all photographs were taken in JPEG image file format set at fine image quality and a 3:2 aspect ratio. The camera was operated at a cycle rate that achieved 40% overlap between adjacent photographs.

We used Adobe Bridge CS5 to review and select digital photographs which were then sent to Adobe Photoshop Creative Cloud 2015 to create photographic mosaics from multiple overlapping digital photographs of the island coastline section. The photographs were projected onto a 27-inch Dell ultra-sharp computer monitor. While creating the mosaics, photographs were merged manually using the move and transpose tools. Under-exposed or over-exposed images were brightened or darkened, respectively, with image tools in Adobe Photoshop. The brush tool was used to draw a line to separate and mark animals and to code areas on the mosaic that would be counted. Adjacent mosaic files of photographs were compared, and a brush-line was inserted onto the mosaic to separate counted animals from uncounted ones, and to demarcate areas where animals should or should not be counted. Mosaics were saved in the native Photoshop file format (.psd) then converted to .jpeg for count analysis. Age/sex categories were manually counted using an open-source counting tool, DotDotGoose (v. 1.6.0; Ersts 2023). We assigned each animal to pre-defined age/sex class designations for each species and marked each animal corresponding to their unique category. Count tallies were exported as csv files, transferred into a Microsoft Access database and compiled for analysis.

[1] Aerial Imaging Solutions, LLC, 5 Myrica Way, Old Lyme, CT 06371. info@aerialimagingsolutions.com

Species Identification and Counting Categories

We identified all pinnipeds by age-sex class descriptions similar to Lowry et al. (2017b). The following age/sex classes were enumerated individually: live pups, adult females, sub-adult males, and adult males. We also enumerated juvenile northern elephant seals because they were easy to distinguish from other age classes. However, because California sea lions and northern fur seals were tightly aggregated in large groups and it was difficult to assign every animal to a specific age class, we created a Mixed Non-pups category that included any California sea lion or northern fur seal that was not a pup and that could not be reliably assigned to the other age classes because distinguishing characteristics were not visible. We then summed up the Mixed Non-pups and other non-pup categories to derive the Total Non-Pups. Pacific harbor seals were not enumerated by age or sex class and were included only as a total Non-pup count. We did not count dead animals for any of the species because pup carcasses disappear quickly and identifying decomposing carcasses to species from photographs is difficult resulting unreliable counts.

Intra-island and Mainland Coastal Distribution

To compare intra-island distributions of pinnipeds, the perimeter of each of the California Channel Islands was divided into small area units. These units were either the Bureau of Land Management (BLM) numerical system in Bonnell et al. (1980) or alphabetical codes that were created to divide or group the BLM codes as described by Lowry et al. (2021) (Fig. 1).

RESULTS

Inter-Island Species Distribution and Trend

We counted 114,749 live pinnipeds among five of the California Channel Islands: Santa Catalina (CAT; n = 285), San Clemente (SCI; n = 2,599), Anacapa (ACI; n = 837), San Nicolas (SNI; n = 42,176), and San Miguel (SMI; n = 68,852) (Table 1). California sea lions were the most abundant species (107,937) followed by northern elephant seals (3,264) and northern fur seals (3,232). Only 315 Pacific harbor seals and one Guadalupe fur seal were counted. The highest percentage of each species occurred at SMI, except for harbor seals, which were most abundant at SNI. The highest percentage of each species occurred at SMI, except for harbor seals which were most abundant at SNI. Together SMI and SNI represent 96.6% of the California sea lions, 99.8% of the northern elephant seals and 95.6% of the Pacific harbor seals. Northern fur seals and a single Guadalupe fur seal were only observed at SMI. No Steller sea lions were observed on any of the islands.

The number of California sea lions in 2022 was similar to the count in 2019 reported in Lowry et al. (2021) but the distribution showed different patterns with a large increase at ACI (33.9%) and large decrease at CAT (20.9%) (Table 2). Northern elephant seals had an overall decrease of 18% among the surveyed islands; a large increase at SCI (25.0%) was offset by a similar decrease at SMI (-22.3%). Northern fur seals declined by 26.2% between 2019 and 2022. Harbor seals

showed significant declines at SCI (84.6%) and SMI (53.1%) however they increased at ACI (20.0%). The surveys in 2019 and 2022 at SCI, SMI and ACI were conducted during similar rising tide conditions, so the decline in 2022 is not due to fewer animals being hauled out due to a rising tide.

Inter-Island Age Class Distribution

California sea lions

The highest percentage of California sea lion pups was at SMI (54.4%) followed by SNI (43.1%) (Table 1). The remaining Islands contributed less than 3% of the total pups. Most of the California sea lions at SNI (76.9%), SMI (69.4%) and SCI (75.6%) were pups and adult females whereas at ACI, mixed non-pups and males represented most of the animals (70.9%) and at CAT, most of the animals were mixed non-pups or adult females (76.7%). The percentage of pups relative to the other age classes was highest at SNI (47.0%) followed by SMI (38.3%), SCI (37.8%), CAT (19.0%) and ACI (11.5%). Mixed non-pups and sub-adult males represented the highest percentage of the age classes at ACI; adult females were the highest percentage at CAT (40.1%).

Northern elephant seals

Only juveniles, sub-adult males and adult male northern elephant seals were present at the islands. The highest percentage of northern elephant seals was at SMI (66.4%) followed by SNI (33.4%) and SCI and CAT contributing less than 1% of the total (Table 1). Sub-adult males were the most abundant age class representing 78.4%, 80.0% and 90.1% of the animals SMI, SCI and SNI, respectively. One juvenile northern elephant seal was counted at CAT. No elephant seals were counted at ACI.

Pacific harbor seals

Harbor seals were not counted by age class. SNI had the highest percentage of harbor seals (57.8%) followed by SMI (37.8%), ACI (3.8%), and SCI (0.6%) (Table 1). No harbor seals were counted at CAT.

Northern fur seals

Most of the northern fur seals at SMI were adult females (38.6%) followed by juveniles (30.2%), pups (13.1%), adult males (12.7%) and sub-adult males (3.2%) (Table 1).

Guadalupe fur seals

A single adult male Guadalupe fur seal was counted at SMI.

Intra-Island Area and Age Class Distributions

California sea lions

At SMI, the highest number of California sea lions was counted in Area H (n = 26,483) representing 41.8% of the animals followed by Area J (n = 13,761) with 21.7% (Table 3). The remaining areas were all below 10%. Area H also had the highest percentage of pups (49.6%) followed by Area J (21.9%) and Area G (12.7%); the other areas were less than 6%. At SNI, Area L had the highest number of animals (n = 7,250) representing 17.7% of the population. In general, the distribution of California sea lions was more dispersed at SNI than at SMI, with similar percentages of animals in Areas M (13.1%), H (11.6%) and D (12.2%). Area L had the highest percentage of pups (19.2%) followed by Area D (15.2%), Area H (13.9%), Area M (13.2%), and Area F (11.8%). At SCI, most of the animals were in Area 406 (1,550) representing 59.8% of the total and also the highest percentage of pups (63.2%). Area 407 had a high percentage of sub-adult (61.4%) and adult males (55.4%) compared to Area 407. At CAT, most (99.3%) of the animals were in 502C and at Anacapa Island, all 825 California sea lions were counted in Area 680.

Northern elephant seals

Northern elephant seals were distributed among all areas at SMI, but the highest number (n = 425) were in Area K accounting for 19.6% of the total (Tables 4). Areas H (12.5%), D (10.4%), and J (10.1%) were other areas with higher percentages of animals. At SNI, elephant seals were present in all the areas, but Areas M (n = 257) and K (n = 240) had the highest number of elephant seals representing 23.6% and 22.0%, respectively. Each of the remaining areas contributed less than 10% to the total. At SCI and CAT, elephant seals only occurred in Area 502C and 406, respectively.

Pacific harbor seals

Peak numbers of harbor seals were in different areas than the other species at all the islands (Table 5). At SMI, most (42) occurred in Area N representing 35.3% with markedly lower percentages of animals in Areas D (16.8%), E (13.4%) and H (12.6%). At SNI, most occurred in Area Q (37.4%) followed by Area O (20.9%) and Area N (15.9%). Harbor seals also occurred in low numbers in Areas C, D, E, F, L and M. Harbor seals only occurred at Area 660 at ACI and Area 407 at SCI.

Northern fur seals

Most northern fur seals were present in Area H (68.1%), followed by Area O (31.3%) and Area N (0.5%) (Table 6) on SMI.

DISCUSSION

Inter-Island Comparisons

The July 2022 pinniped counts showed similar patterns to the July 2019 survey that targeted California sea lions, however the total number of pinnipeds among the islands was lower for most species (Lowry et al. 2021). Most of the pinnipeds were concentrated at SMI and SNI. As resources to conduct the surveys decline, these two islands could be used as index sites to capture trends on short time scales for California sea lions, particularly if the primary interest is pups and juvenile age classes that drive the population dynamics (Laake et al. 2017). The age class distributions in 2022 were similar to 2019 with most California sea lions being pups and adult females and most elephant seals being sub-adult or adult males. A 33.7% decline in total harbor seals from 2019 is cause for concern and continues a declining trend since 2015 (Lowry et al. 2017). Northern fur seals showed a 26.2% decline whereas California sea lions and northern elephant seals showed smaller declines between the years. The overall lower abundance of all the pinniped species among the Channel Islands that were surveyed may reflect a temporary decline or the cumulative impacts of more than a decade of frequent ocean warming events and disease outbreaks. The reported declines over the 3-year period highlight the value of monitoring the populations frequently, particularly as the changes in the ocean environment accelerate.

Intra-island Comparisons

None of the species was distributed uniformly at any of the islands, indicating some habitat preferences and segregation among the species. At SMI, Area H at the west end of the island, had the greatest percentage of all species except for harbor seals, which were mostly in Area N on the southeast side of the island. SMI has the most suitable habitat compared to the other islands with several large, wide sandy beaches and rocky areas that allow for large concentrations of animals to share the same space. At SNI, California sea lions were distributed around the island whereas elephant seals were concentrated at the west end of the island and harbor seals were mostly on the north side of the island. At ACI, SCI and CAT, all the species were concentrated in a few areas because of limited habitat on these islands. As rising sea levels reduce the amount of sandy beach habitat for pinniped haul out and breeding, populations may redistribute to new areas. Regular monitoring of all the islands will allow us to determine if changes in the numbers of animals in specific areas are reflections of population changes or redistribution to new areas.

ACKNOWLEDGMENTS

Aerial photographic surveys of pinnipeds at the Channel Islands were supported by Martin K. Ruane, Greg Sanders and Elizabeth Seacord (U.S. Naval Base Ventura County) who provided funds for the chartered aircraft for the surveys and counting the animals from digital aerial photographs of pinnipeds at the Channel Islands. Aspen Helicopters provided the charter aircraft and pilot for the flights. The Marine Mammal Laboratory, Alaska Fisheries Science Center and NOAA-NMFS West Coast Region provided additional funds. All surveys were conducted under NMFS Marine Mammal Research Permit 22678 issued to the Alaska Fisheries Science Center, Marine Mammal Laboratory and National Marine Sanctuary Permit MULTI-2022-12. Jame Lee and Tony Orr provided comments on the manuscript.

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Table 1. -- Counts and percentages of California sea lions, northern elephant seals, Pacific harbor seals, northern fur seals and Guadalupe fur seals by age class from aerial surveys conducted at the California Channel Islands, July 2022. Islands: ACI = Anacapa, SCI = San Clemente, SMI=San Miguel, SNI=San Nicolas, CAT=Santa Catalina. Northern fur seals and Guadalupe fur seals were only seen at San Miguel Island.

	Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-Pups		Total Non-pups		Total Live	
Island	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
								California sea lion								
ACI	95	0.2	---	---	145	0.2	178	2.9	9	0.2	398	2.1	730	1.2	825	0.8
SCI	980	2.2	---	---	979	3.6	127	2.1	168	3.6	338	1.8	1,612	2.5	2,592	2.4
SMI	24,274	**54.4**	---	---	19,662	**49.1**	3,289	**53.1**	2,297	**49.1**	13,810	**71.6**	39,058	**61.7**	63,332	**58.7**
SNI	19,223	43.1	---	---	12,245	46.9	2,594	41.9	2,192	46.9	4,650	24.1	21,681	34.2	40,904	37.9
CAT	54	0.1	---	---	114	0.2	4	0.1	8	0.2	104	0.5	230	0.4	284	0.3
Total	44,626		---	---	33,145		6,192		4,674		19,300		63,311		107,937	
								Northern elephant seal								
ACI	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
SCI	0	0.0	0	0.0	0	0.3	4	0.1	1	0.3	0	0.0	5	0.2	5	0.2
SMI	0	0.0	207	**87.0**	0	**76.8**	1,700	**63.3**	261	**76.8**	0	0.0	2,168	**66.4**	2,168	**66.4**
SNI	0	0.0	30	12.6	0	22.9	982	36.6	78	22.9	0	0.0	1,090	33.4	1,090	33.4
CAT	0	0.0	1	0.4	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0	1	0.0
Total	0		238		0		2,686		340		0		3,264		3,264	
								Pacific harbor seal								
ACI	---	---	---	---	---	---	---	---	---	---	---	---	12	3.8	12	3.8
SCI	---	---	---	---	---	---	---	---	---	---	---	---	2	0.6	2	0.6
SMI	---	---	---	---	---	---	---	---	---	---	---	---	119	37.8	119	37.8
SNI	---	---	---	---	---	---	---	---	---	---	---	---	182	**57.8**	182	**57.8**
CAT	---	---	---	---	---	---	---	---	---	---	---	---	0	**0.0**	0	**0.0**
Total	---	---	---	---	---	---	---	---	---	---	---	---	315		315	
								Northern fur seal								
SMI	422		975	100.0	1,248	100.0	105	100.0	412	100.0	70	100.0	2,810	100.0	3,232	100.0

Table 1. -- Continued.

	Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-Pups		Total Non-pups		Total Live	
Island	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
								Guadalupe fur seal								
SMI	0	0.0	0	0.0	0	100.0	0	0.0	1	100.0	0	0.0	1	100.0	1	100.0
All Total	45,048	39.3	1,213	1.1	34,393	30.0	8,983	7.8	5,427	4.7	19,370	16.9	69,701	60.7	114,749	

Table 2. -- Counts of California sea lions, northern elephant seals, Pacific harbor seals, and northern fur seals from aerial surveys at the California Channel Islands in July 2022 and percent change from Lowry et al. (2021). Islands: ACI = Anacapa, SCI = San Clemente, SMI=San Miguel, SNI=San Nicolas, CAT=Santa Catalina. Northern fur seals and Guadalupe fur seals were only seen at San Miguel Island.

Species	Island	2019	2022	2019-2022% change
California sea lion	ACI	616	825	33.9
	SCI	2,979	2,592	-13.0
	SMI	60,277	63,332	5.1
	SNI	42,942	40,904	-4.7
	CAT	359	284	-20.9
	Total	109,192	107,937	-1.1
Northern elephant seal	SCI	4	5	25.0
	SMI	2,791	2,168	-22.3
	SNI	1,185	1,090	-8.0
	CAT	0	1	0.0
	Total	3,980	3,264	-18.0
Pacific harbor seal	ACI	10	12	20.0
	SCI	13	2	-84.6
	SMI	254	119	-53.1
	SNI	190	182	-4.2
	CAT	8	0	-100.0
	Total	475	315	-33.7
Northern fur seal	SMI	4,377	3,232	-26.2

Table 3. -- Intra-island counts and percent of California sea lions by area and age class determined from aerial surveys at the California Channel Islands, July 2022. Dashes '---' indicate that age class was not counted. Mixed Non-pups includes juveniles and adults that could not be identified reliably into the specific age classes. Islands: ACI = Anacapa, SCI = San Clemente, SMI=San Miguel, SNI=San Nicolas, CAT=Santa Catalina. Islands not listed indicate animals were present.

		Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
Island	Area	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
ACI	660	0	0.0	---	---	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
	680	95	100.0	---	---	145	100.0	178	100.0	9	100.0	398	100.0	730	100.0	825	100.0
Total		95		---		145		178		9		398		730		825	
SCI	406	619	63.2	---	---	622	63.5	49	38.6	75	44.6	185	54.7	931	57.8	1,550	59.8
	407	361	36.8	---	---	357	36.5	78	61.4	93	55.4	153	45.3	681	42.2	1,042	40.2
Total		980		---		979		127		168		338		1,612		2,592	
SMI	A	2	0.0	---	---	15	0.1	640	19.5	164	7.1	819	5.9	1,638	4.2	1,640	2.6
	B	1,000	4.1	---	---	1,339	6.8	44	1.3	44	1.9	2,410	17.5	3,837	9.8	4,837	7.6
	C	1,371	5.6	---	---	1,004	5.1	67	2.0	96	4.2	676	4.9	1,843	4.7	3,214	5.1
	D	0	0.0	---	---	0	0.0	3	0.1	14	0.6	1	0.0	18	0.0	18	0.0
	E	0	0.0	---	---	0	0.0	30	0.9	34	1.5	22	0.2	86	0.2	86	0.1
	F	169	0.7	---	---	132	0.7	412	12.5	241	10.5	395	2.9	1,180	3.0	1,349	2.1
	G	3,088	12.7	---	---	2,004	10.2	57	1.7	149	6.5	709	5.1	2,919	7.5	6,007	9.5
	H	12,040	49.6	---	---	9,386	47.7	666	20.2	757	33.0	3,634	26.3	14,443	37.0	26,483	41.8
	I	476	2.0	---	---	679	3.5	510	15.5	360	15.7	664	4.8	2,213	5.7	2,689	4.2
	J	5,323	21.9	---	---	4,305	21.9	666	20.2	251	10.9	3,216	23.3	8,438	21.6	13,761	21.7
	K	0	0.0	---	---	0	0.0	56	1.7	71	3.1	14	0.1	141	0.4	141	0.2
	L	292	1.2	---	---	260	1.3	60	1.8	18	0.8	962	7.0	1,300	3.3	1,592	2.5
	M	0	0.0	---	---	0	0.0	16	0.5	8	0.3	1	0.0	25	0.1	25	0.0
	N	1	0.0	---	---	1	0.0	61	1.9	49	2.1	7	0.1	118	0.3	119	0.2
	O	512	2.1	---	---	537	2.7	1	0.0	41	1.8	280	2.0	859	2.2	1,371	2.2
Total		24,274		---		19,662		3,289		2,297		13,810		39,058		63,332	

Table 3. -- Continued.

		Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
Island	Area	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SNI	A	289	1.5	---	---	174	1.4	130	5.0	32	1.5	238	5.1	574	2.6	863	2.1
	B	723	3.8	---	---	433	3.5	9	0.3	39	1.8	71	1.5	552	2.5	1,275	3.1
	C	524	2.7	---	---	277	2.3	178	6.9	126	5.7	82	1.8	663	3.1	1,187	2.9
	D	2,929	15.2	---	---	1,690	13.8	13	0.5	145	6.6	219	4.7	2,067	9.5	4,996	12.2
	E	594	3.1	---	---	414	3.4	277	10.7	119	5.4	118	2.5	928	4.3	1,522	3.7
	F	2,263	11.8	---	---	1,291	10.5	61	2.4	159	7.3	305	6.6	1,816	8.4	4,079	10.0
	G	178	0.9	---	---	117	1.0	393	15.2	181	8.3	126	2.7	817	3.8	995	2.4
	H	2,675	13.9	---	---	1,376	11.2	70	2.7	231	10.5	390	8.4	2,067	9.5	4,742	11.6
	I	829	4.3	---	---	415	3.4	124	4.8	90	4.1	139	3.0	768	3.5	1,597	3.9
	J	1,873	9.7	---	---	1,180	9.6	83	3.2	150	6.8	354	7.6	1,767	8.1	3,640	8.9
	K	0	0.0	---	---	0	0.0	134	5.2	109	5.0	16	0.3	259	1.2	259	0.6
	L	3,698	19.2	---	---	2,548	20.8	88	3.4	293	13.4	623	13.4	3,552	16.4	7,250	17.7
	M	2,541	13.2	---	---	1,808	14.8	274	10.6	290	13.2	464	10.0	2,836	13.1	5,377	13.1
	N	0	0.0	---	---	0	0.0	37	1.4	41	1.9	4	0.1	82	0.4	82	0.2
	O	0	0.0	---	---	0	0.0	0	0.0	3	0.1	0	0.0	3	0.0	3	0.0
	P	0	0.0	---	---	0	0.0	7	0.3	19	0.9	3	0.1	29	0.1	29	0.1
	Q	107	0.6	---	---	522	4.3	716	27.6	165	7.5	1,498	32.2	2,901	13.4	3,008	7.4
Total		19,223		---		12,245		2,594		2,192		4,650		21,681		40,904	
CAT	502C	54	100.0	---	---	113	99.1	4	100.0	7	87.5	104	100.0	228	99.1	282	99.3
	502D	0	0.0	---	---	0	0.0	0	0.0	1	12.5	0	0.0	1	0.4	1	0.4
	503	0	0.0	---	---	1	0.9	0	0.0	0	0.0	0	0.0	1	0.4	1	0.4
Total		54		---		114		4		8		104		230		284	

Table 4. -- Intra-island counts and percent of northern elephant seals by area and age class determined from aerial surveys at the California Channel Islands, July 2022. Dashes '---' indicate that age class was not counted. Mixed Non-pups includes juveniles and adults that could not be identified reliably into the specific age classes. Islands: ACI = Anacapa, SCI = San Clemente, SMI=San Miguel, SNI=San Nicolas, CAT=Santa Catalina. Islands not listed indicate animals were present.

		Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
Island	Area	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SCI	406	0	0.0	0	0.0	0	0.0	4	100.0	1	100.0	---	---	5	100.0	5	100.0
	407	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	---	---	0	0.0	0	0.0
Total		0		0		0		4		1		---		5		5	
SMI	A	0	0.0	2	1.0	0	0.0	119	7.0	5	1.9	---	---	126	5.8	126	5.8
	B	0	0.0	0	0.0	0	0.0	12	0.7	0	0.0	---	---	12	0.6	12	0.6
	C	0	0.0	35	16.9	0	0.0	104	6.1	4	1.5	---	---	143	6.6	143	6.6
	D	0	0.0	55	26.6	0	0.0	169	9.9	2	0.8	---	---	226	10.4	226	10.4
	E	0	0.0	39	18.8	0	0.0	119	7.0	1	0.4	---	---	159	7.3	159	7.3
	F	0	0.0	12	5.8	0	0.0	96	5.6	0	0.0	---	---	108	5.0	108	5.0
	G	0	0.0	31	15.0	0	0.0	86	5.1	18	6.9	---	---	135	6.2	135	6.2
	H	0	0.0	13	6.3	0	0.0	201	11.8	57	21.8	---	---	271	12.5	271	12.5
	I	0	0.0	14	6.8	0	0.0	125	7.4	56	21.5	---	---	195	9.0	195	9.0
	J	0	0.0	1	0.5	0	0.0	168	9.9	49	18.8	---	---	218	10.1	218	10.1
	K	0	0.0	5	2.4	0	0.0	364	21.4	56	21.5	---	---	425	19.6	425	19.6
	L	0	0.0	0	0.0	0	0.0	72	4.2	3	1.1	---	---	75	3.5	75	3.5
	M	0	0.0	0	0.0	0	0.0	39	2.3	9	3.4	---	---	48	2.2	48	2.2
	N	0	0.0	0	0.0	0	0.0	19	1.1	1	0.4	---	---	20	0.9	20	0.9
	O	0	0.0	0	0.0	0	0.0	7	0.4	0	0.0	---	---	7	0.3	7	0.3
Total		0		207		0		1,700		261		---		2,168		2,168	

Table 4. -- Continued.

Island	Area	Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
		n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SNI	A	0	0.0	0	0.0	0	0.0	36	3.7	5	6.4	---	---	41	3.8	41	3.8
	B	0	0.0	0	0.0	0	0.0	1	0.1	0	0.0	---	---	1	0.1	1	0.1
	C	0	0.0	0	0.0	0	0.0	12	1.2	0	0.0	---	---	12	1.1	12	1.1
	D	0	0.0	0	0.0	0	0.0	35	3.6	4	5.1	---	---	39	3.6	39	3.6
	E	0	0.0	0	0.0	0	0.0	92	9.4	4	5.1	---	---	96	8.8	96	8.8
	F	0	0.0	0	0.0	0	0.0	2	0.2	1	1.3	---	---	3	0.3	3	0.3
	G	0	0.0	3	10.0	0	0.0	34	3.5	0	0.0	---	---	37	3.4	37	3.4
	H	0	0.0	1	3.3	0	0.0	2	0.2	1	1.3	---	---	4	0.4	4	0.4
	I	0	0.0	1	3.3	0	0.0	7	0.7	1	1.3	---	---	9	0.8	9	0.8
	J	0	0.0	0	0.0	0	0.0	9	0.9	1	1.3	---	---	10	0.9	10	0.9
	K	0	0.0	22	73.3	0	0.0	198	20.2	20	25.6	---	---	240	22.0	240	22.0
	L	0	0.0	1	3.3	0	0.0	7	0.7	0	0.0	---	---	8	0.7	8	0.7
	M	0	0.0	0	0.0	0	0.0	241	24.5	16	20.5	---	---	257	23.6	257	23.6
	N	0	0.0	0	0.0	0	0.0	63	6.4	4	5.1	---	---	67	6.1	67	6.1
	O	0	0.0	0	0.0	0	0.0	65	6.6	3	3.8	---	---	68	6.2	68	6.2
	P	0	0.0	0	0.0	0	0.0	75	7.6	9	11.5	---	---	84	7.7	84	7.7
	Q	0	0.0	2	6.7	0	0.0	103	10.5	9	11.5	---	---	114	10.5	114	10.5
Total		0		30		0		982		78		---		1,090		1,090	
CAT	502C	0	0.0	1	100.0	0	0.0	0	0.0	0	0.0	---	---	1	100.0	1	100.0
	502D	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	---	---	0	0.0	0	0.0
	503	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	---	---	0	0.0	0	0.0
Total		0		1		0		0		0		---		1		1	

Table 5. -- Intra-island counts and percent of Pacific harbor seals by area determined from aerial surveys at the California Channel Islands, July 2022. Dashes '---' indicate that age class was not counted. Islands: ACI = Anacapa, SCI = San Clemente, SMI=San Miguel, SNI=San Nicolas, CAT=Santa Catalina. Islands not listed indicate animals were present.

		Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
Island	Area	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
ACI	660	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12	100.0
	680	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
Total		---		---		---		---		---		---		---		12	
SCI	406	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	407	---	---	---	---	---	---	---	---	---	---	---	---	---	---	2	100.0
Total		---		---		---		---		---		---		---		2	
SMI	A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	2.5
	B	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	C	---	---	---	---	---	---	---	---	---	---	---	---	---	---	9	7.6
	D	---	---	---	---	---	---	---	---	---	---	---	---	---	---	20	16.8
	E	---	---	---	---	---	---	---	---	---	---	---	---	---	---	16	13.4
	F	---	---	---	---	---	---	---	---	---	---	---	---	---	---	1	0.8
	G	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	15	12.6
	I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	12	10.1
	K	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	L	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.8
	N	---	---	---	---	---	---	---	---	---	---	---	---	---	---	42	35.3
	O	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
Total		---		---		---		---		---		---		---		118	

Table 5. -- Continued.

		Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
Island	Area	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
SNI	A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	B	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	C	---	---	---	---	---	---	---	---	---	---	---	---	---	---	15	8.2
	D	---	---	---	---	---	---	---	---	---	---	---	---	---	---	3	1.6
	E	---	---	---	---	---	---	---	---	---	---	---	---	---	---	6	3.3
	F	---	---	---	---	---	---	---	---	---	---	---	---	---	---	5	2.7
	G	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	H	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	I	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	K	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	L	---	---	---	---	---	---	---	---	---	---	---	---	---	---	14	7.7
	M	---	---	---	---	---	---	---	---	---	---	---	---	---	---	4	2.2
	N	---	---	---	---	---	---	---	---	---	---	---	---	---	---	29	15.9
	O	---	---	---	---	---	---	---	---	---	---	---	---	---	---	38	20.9
	P	---	---	---	---	---	---	---	---	---	---	---	---	---	---	0	0.0
	Q	---	---	---	---	---	---	---	---	---	---	---	---	---	---	68	37.4
Total		---		---		---		---		---		---		---		182	

Table 6. -- Intra-island counts and percent of northern fur seals and Guadalupe fur seals by area and age class determined from aerial surveys at the California Channel Islands, July 2022. Dashes '---' indicate that age class was not counted. Mixed Non-pups includes juveniles and adults that could not be identified reliably into the specific age classes. Islands: ACI = Anacapa, SCI = San Clemente, SMI=San Miguel, SNI=San Nicolas, CAT=Santa Catalina. Islands not listed indicate animals were present.

			Pups		Juveniles		Adult females		Sub-adult males		Adult males		Mixed Non-pups		Total Non-pups		Total Live	
Species	Island	Area	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Northern fur seal	SMI	H	0	0.0	975	100.0	838	67.1	82	78.1	237	57.5	70	100.0	2,202	78.4	2,202	68.1
		N	0	0.0	0	0.0	0	0.0	0	0.0	17	4.1	0	0.0	17	0.6	17	0.5
		O	422	100.0	0	0.0	410	32.9	23	21.9	158	38.3	0	0.0	591	21.0	1,013	31.3
	Total		422		975		1,248		105		412		70		2,810		3,232	
Guadalupe fur seal	SMI	H	0	0.0	0	0.0	0	0.0	0	0.0	1	100.0		0.0	1	100.0	1	100.0



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