

Estimates of the number of Steller sea lions by year and geographical area for the Western U.S. stock for the 1960s through 1994. Numbers are adjusted to account for missed sites and animals at-sea by the methods of Loughlin et al. (1992). The percentage of the U.S. population each area represents is also shown. Estimates from 1960 through 1989 from Loughlin et al. (1992) for the Bering Sea have been adjusted based on new data (NMFS unpubl. data, National Marine Mammal Laboratory, 7600 Sand Point Way, NE, Seattle, WA 98115).

Area	1960s	%	1970s	%	1985	%	1989	%	1994	%
Gulf of Alaska	88,700	36	70,700	34	48,900	33	40,600	46	22,000	33
Aleutians	127,300	51	115,700	56	78,400	53	24,400	27	19,000	28
Bering Sea	11,600	5	5,200	2	3,800	3	1,200	1	2,200	3
Total	227,600	92	191,600	92	131,100	89	66,200	75	43,200	64

Estimates of the number of Steller sea lions by year and geographical area for the Eastern stock for the 1960s through 1994. Numbers are adjusted to account for missed sites and animals at-sea by the methods of Loughlin et al. (1992). The percentage of the U.S. population each area represents is also shown.

Area	1960s	%	1970s	%	1985	%	1989	%	1994	%
Oregon and California	10,300	4	6,400	3	6,700	4	6,800	8	9,300	14
Southeast Alaska	9,000	4	10,300	5	10,300	7	15,800	18	14,600	22
Total	19,300	8	16,700	8	17,000	11	22,600	26	23,900	36

Population estimates of marine mammals in the Bering Sea (BS). Estimates may also include counts from Bristol Bay (BB), Cook Inlet (CI), Gulf of Alaska (GOA), rangewide Alaska south of the Bering Sea (AK), or North Pacific (NP) surveys as noted. Estimates were obtained from 1994 stock assessment summaries by the National Marine Mammal Laboratory.

<u>Species</u>	<u>population</u>	<u>region</u>	<u>status</u>
¹ Steller sea lion	49,130	AK	declining
² northern fur seal	984,000	NP and BS	stable
harbor seal	25,183	GOA and BS	declining
spotted seal	3,548	BS, AK coast	unknown
bearded seal	NA	BS	unknown
ringed seal	NA	BS	unknown
ribbon seal	NA	BS	unknown
walrus	201,039	rangewide	stable
sea otter	NA	AK	healthy
minke whale			
beaked whale	NA	BS	unknown
beluga whale	1,000	BB	unknown
killer whale	NA	BS	unknown
harbor porpoise	4,946	BB, CI	unknown
Dall's porpoise	1,800	- BS	unknown
gray whale	20,869	E. NP	increasing
³ humpback whale	1,407	E. NP	unknown
³ northern right whale	NA	NP	declining
³ bowhead whale	8,000	W. Arctic	increasing
³ fin whale	NA	BS	unknown
³ sperm whale	NA	BS, E.NP	unknown

¹threatened under the Endangered Species Act

²depleted under the Marine Mammal Protection Act

³endangered under the Endangered Species act

Breeding and Pupping Characteristics of Pinniped Species
Occurring Close to Vandenberg AFB and the Northern Channel Islands

Species	Enter Rookeries	Pupping Season	Weaning Season
Pacific Harbor Seal	March - May	March - May, peak in late April/early May	Four to six weeks after birth
Steller Sea Lion	Early May	Early June - Early July	N/A ¹
California Sea Lion	Mid May	Mid-May - Late June, peak in first week in June	One year after birth
Guadalupe Fur Seal	N/A ²	N/A ²	N/A ²
Northern Fur Seal	May	Late May - July	September
Northern Elephant Seal	December	Late December - Mid-February	28 days after birth

Sources: Gaviota Terminal Company, 1993; CDFG, 1990

¹ Information not available

² Not known to breed in areas potentially affected by Titan launches

TABLE 55

-Censuses of California sea lions by sex and age at Los Islotes.

Date	Adult males	Subadult males	Females	Juveniles	Pups	Miscellaneous	Total
1978							
4 Jun	6	17	42	6		11	82
25 Jun	8	25	107	18	26	2	186
23 Jul	6	8	75	9	19		117
31 Jul	6	12	122	16	13	3	172
18 Aug	14	17	101	5	23		160
5 Sep	8	28	78	17	18		149
24 Sep	4	28	74	11	19	2	138
15 Oct	9	24	55	8	13		109
26 Oct	6	30	58	15	21		130
1 Nov	7	38	80	10	29		164
19 Nov	9	31	51	11	37	5	144
11 Dec	4	76	82	16	17		195
1979							
13 Jan	6	38	46	8	28		126
18 Feb	12	43	78	10	21		164
11 Mar	6	48	31	5	20		110
3 Apr	7	26	56	9	22	14	134
13 May	11	25	39	27	43		145
30 May	7	16	59	11	1		94
3 Jun	15	12	17	10	2		56
17 Jun	12	10	85	15	20		142
29 Jun	9	12	67	5	30		123
3 Jul	8	8	74	32	35		157
10 Jul	8	4	71	27	39	8	157
4 Aug	12	8	114	33	31		198
11 Aug	13	33	109	17	37		209
8 Sep	19	25	119	15	27		205
30 Sep	11	32	41	16	21	9	130
28 Oct	5	39	25	8	35	4	116
16 Dec	14	100	39	18	30		201
1980							
22 Jan	12	79	36	19	11		157
30 May	14	17	35	16			82
23 Aug	6	35	54	26	38		159
20 Sep	9	57	71	12	13		162
18 Oct	5	76	50	13	30		174
1 Nov	8	38	21	22	19	22	130
1 Dec	12	62	15	6	25	8	128
1981							
18 Jan	13	88	19	13	20	35	188
5 Feb	17	52	22	29	16	40	176
22 Feb	4	22	11	3	9	4	53
13 Mar	8	47	15	18	10		98
28 Mar	14	64	53	8	14	7	160
5 Apr	15	51	66	11	13	25	181
15 Apr	9	22	30	11	25	7	104
14 May	11	14	58	4	5		92
7 Jul	10	13	63	18	29		133
6 Sep	10	33	38	26	22		129
11 Oct	9	38	58	30	40		175
14 Nov	5	45	29	2	4	18	103
19 Dec	6	75	62	11	15	5	174

AURIOLLES
et al, 1983

Sur. --Censuses of sea lion colonies in the Gulf of California and Pacific Coast of Baja California

Locality	Date	Adult males	Subadult males	Females	Juveniles	Pups	Miscel- laneous	Total
Farallon de Topolobampo	21 Apr 1979	116	34	348	72	223	50	843
Farallon de Topolobampo	21 Jun 1981	7	4	158	36	73	80	358
Farallon de Topolobampo	20 Oct 1981	6	42	138	102	135	11	434
Farallon de Topolobampo	29 Dec 1981	21	118	247	110	128	81	705
Farallon de Topolobampo	16 Mar 1982	26	143	318	120	99	141	847
Farallon de Topolobampo	26 Apr 1982	28	89	275	78	53	57	580
Farallon de Topolobampo	29 Jun 1982	26	22	322	73	248	11	702
Punta Lobos ¹	13 Jul 1979	3	3	35	14			55
Los Frailes	2 Jul 1980	2	13	8	9			32
Margarita ¹	14 Jul 1979	69	196	2,676	114	1,202		4,257
Punta Lobos	18 Jan 1982	6	7	10	5	1	1	30
San Lucas	19 Jan 1982	1	16	5	14			36
Los Frailes	20 Jan 1982	1	16	12	11		3	43
Sto. Domingo	20 Jan 1982	28	156	47	50		10	291
Los Islotes	26 Jan 1982	19	179	64	17	25	17	321
Isla Ana	15 Feb 1982	14	55	20	15		19	123
Isla Margarita	13 Mar 1982	46	976	294	211	241	520	2,288
San Esteban	2-3 Jul 1979	275	153	1,848	414	877		3,567
El Rasito	4 Jul 1979	5	1	123	39	37		205
Los Machos	4 Jul 1979	61	65	709	58	431		1,324
Los Cantiles	5 Jul 1979	71	67	1,051	163	399		1,751
Roca Vela	5 Jul 1979	1	2	51	23			77
Isla Granito	5 Jul 1979	47	34	514	233	358		1,186
San Esteban	16 Feb 1980	15	154	948	464	628	31	2,240
El Rasito	28 Feb 1980	3	5	36	20	10	23	97
Los Machos	1 Mar 1980	3	31	221	72	165	36	528
Los Cantiles	1 Mar 1980	25	148	463	109	229	21	995
Roca Vela	1 Mar 1980		2	32	13	2	1	50
Isla Granito	1 Mar 1980	2	93	202	42	140		479

¹ Censuses from Le Boeuf et al. (1979).

TABLE 57

STEWART AND
KHEM, 1984Censuses of California sea lions (*Zalophus californianus*) at San Nicolas Island, California

1980-1982.

Date	Males	Subadult males/ females/juveniles	Live pups	Total
1980				
3 Feb	186	4649	0	4835
9 Mar	195	5822	0	6017
19 Apr	149	6260	4	6413
17 May	140	4096	34	4271
8 Jun	360	5205	1276	6841
6 Jul	284	7927	6096	14,307
12 Dec	232	3545	—	3777
27 Dec	60	3615	—	3675
1981				
10 Jan	62	3576	—	3638
23 Jan	75	3404	—	3479
6 Feb	74	3721	—	3795
19 Feb	148	4650	—	4798
21 Mar	119	5029	—	5148
3 Apr	201	6460	2	6663
*18 Apr	248	7703	0	7951
25 Apr	216	9244	5	9465
8 May	187	5572	0	5759
*16 May	153	5224	0	5377
22 May	157	5015	121	5293
12 Jun	925	10,204	3336	14,465
5 Jul	637	8668	6704	16,006
11 Jul	1437	8290	6626	16,353
24 Jul	458	7541	6676	14,654
7 Aug	33	4275	6370	10,678
22 Aug	19	5246	4851	10,116
		Subadult males	Females/ juveniles	
1982				
2 Jan	25	100	3990	4115
9 Jan	29	182	3573	3784
15 Jan	43	209	6728	6980
22 Jan	43	285	5033	5361
29 Jan	62	196	4839	5097
6 Feb	69	276	3315	3660
12 Feb	122	342	5473	5937
19 Feb	131	280	5655	6066
26 Feb	105	577	6696	7378
9 Mar	70	431	6365	6966
13 Mar	43	407	6757	7207
10 Apr	35	245	6610	6890
11 May	43	231	4124	4424
18 May	42	205	3839	4109
29 May	90	194	5793	6381
12 June	261	10,845	3396	14,502
4 July	519	12,035	7738	20,292
1 Oct	0	43	3296	7129

* Aerial survey; all others are ground counts.

Pup production of California sea lions at specific sites at San Nicolas Island, 1980-1982.

Site	Pup production		
	1980	1981	1982
266	0	0	0
264	0	0	0
263	0	0	0
262	483	527	474
261	281	293	355
243	859	864	1030
242	501	560	786
241	795	867	358
234	359	368	366
233	1078	1140	1422
232	469	503	1207
231	351	387	497
223	465	533	806
221	72	101	53
213	12	22	25
212	182	254	164
211	189	285	195
Total	6096	6704	7738

Number of California sea lions seen off Vancouver Island during 1972-84.

	1972 25 Feb.	1973 25 Jan.	1977 7-9 Feb.	1978 9 Feb.	1982 17-22 Feb.	1984 15-16 Feb.
SE Vancouver Island						
Race Rocks	35	38	70	13	320	799
Plumper Sound area	0	0	10	30	220	53
Porlier Pass area	10	0	0	0	418	764
Ada Island	0	0	29	58	39	84
Denman Island	0	0	0	0	20	0
Other	0	0	0	0	4	2
Subtotal	45	38	109	101	1 021	1 702
SW Vancouver Island						
Sombrio Pt	1	—	16 ^b	—	—	93
Folger Island	387	0	152 ^b	—	12	0
Wouwer Island	40	—	8 ^b	—	415	839
Florencia Bay	—	—	—	—	+	1 777
Solander Island	0 ^a	33	40 ^b	—	—	50
Other	0	0	2 ^b	—	72	35
Subtotal	428		218		499+	2 794
Total	473		327		1 520+	4 496

^a7 Dec. 1971.^b13 Dec. 1976.BIGG,
1985

Population censuses of California sea lions on the Pacific coast of Baja California, and the Gulf of California

Location	Date	AM ^a	SA	AF	J	P	M	Total
Santa Margarita	7/14/79	265		2676	114	1202	-	4257
	8/20/83	3	37	465	142	409	20	1157
	7/27/84	23	80	1908	267	1080	116	3474
	7/03/85	33	38	1108	166	925	-	2270
	7/08/78	4	19	78	21	40	3	165
Los Islotes	7/10/79	8	4	71	27	39	8	157
	8/23/80	6	35	54	26	38	-	159
	7/07/81	10	13	63	18	46	-	150
	7/10/82	12	4	68	29	54	10	177
	7/16/83	11	10	53	19	50	-	143
	8/19/84	3	41	42	13	49	6	154
	7/19/85	5	10	79	22	52	8	176
Topo- lobampo	6/29/82	26	22	322	73	248	22	702
	7/01/83/	23	6	226	40	222	34	551
	7/24/83	36	56	362	147	150	81	832
	7/04/84	48	19	325	116	127	122	757
	7/06/79	121	46	1398	632	1030	26	3253
San Jorge	7/06/83	136	129	1785	670	907	36	3663

^a AM Adult males; SA, subadult males; AF, adult females; J, juveniles; P, pups; M, miscellaneous.

Timing of annual peaks of California sea lions north of the breeding rookeries

Area	Peak numbers	Season	Census period	Source
Vancouver Is., B.C.	473	Winter	1972-78	Bigg (1985)
	4500	Winter	1982-84	Bigg (1985)
	3000	Winter	1985-87	Bigg (pers. comm.)
Puget Sound, WA	108, 296	Spring, winter	1976-79	Everitt et al. (1980)
	961	Spring	1984	Gearin et al. (1986a)
So. Jetty, OR	181	Spring	1980-82	Jefferies (1984)
	277	Spring	1984-85	Brown (1988)
Bodega Rock, CA	1077, 1096	Fall, winter	1980-82	Bonnell et al. (1983)
	1560, 1295	Fall, winter	1982-84	This study
Point Reyes, CA	314	Spring	1980-82	Bonnell et al. (1983)
	338, 270	Spring, winter	1982	This study
	763, 304	Summer, winter	1983	This study
So. Farallon Is., CA	1403	Spring	1974-76	Huber et al. (in press)
	3609	Fall	1978-82	Huber et al. (in press)
	6783	Summer	1983-84	Huber et al. (in press)
	2478	Spring	1985-86	Huber et al. (in press)
	13000	Fall	1961-74	Le Boeuf and Bonnell (1980)
Año Nuevo Is., CA				Bonnell et al. (1983)
	7319	Fall	1980-83	Miller et al. (1983)
Monterey Breakwater, CA	2000	Spring	1980-81	Nicholson (1986)
	1176, 868	Spring, summer	1983	Nicholson (1986)
	666	Spring	1984-85	Nicholson (1986)

Number of California Sea Lions seen off Vancouver Island during 1972 to 1984.

	1972 25 Feb.	1973 25 Jan.	1977 7-9 Feb.	1978 9 Feb.	1982 17-22 Feb.	1984 15-16 Feb.
SE Vancouver Island						
Race Rocks	35	38	70	13	320	799
Plumper Sound Area	0	0	10	30	220	53
Porlier Pass Area	10	0	0	0	418	764
Ada Island	0	0	29	58	39	84
Denman Island	0	0	0	0	20	0
Other	0	0	0	0	4	2
Subtotal	45	38	109	101	1021	1702
SW Vancouver Island						
Sombrio Pt	1	—	16 ^b	—	—	93
Folger Island	387	0	152 ^b	—	12	0
Wouwer Island	40	—	8 ^b	—	415	839
Florencia Bay	—	—	—	—	+	1777
Solander Island	0 ^a	33	40 ^b	—	—	50
Other	0	0	2 ^b	—	72	35
Subtotal	428	218	499+	2794		
Total	473	327	1520+	4496		

^a7 December 1971.^b13 December 1976.

Mean annual finite population growth rates calculated from the log-linear regressions fitted to June–August counts for the period 1973–88.

Region/ subarea	Census period	Number of censuses	Correlation Coefficient	Significance level	Rate of increase (%)
<i>Strait of Georgia</i>					
BBAY	1973–88	12	0.918	<0.001	8.6
FRASERR	1973–88	11	0.947	<0.001	9.4
HOWESD	1973–88	8	0.969	<0.001	16.2
SGULF	1973–88	6	0.954	0.003	9.0
GULFISL	1973–88	6	0.992	<0.001	15.4
NWGULF	1974–88	6	0.998	<0.001	24.7
NEGULF	1976–88	5	0.999	<0.001	20.9
Total ^a	1973–88	11	0.994	<0.001	13.6
<i>Skeena River</i>					
Total	1973–87	6	0.932	0.002	11.9
<i>Southwest Vancouver Island</i>					
SWVANISL	1976–87	2	1.000	—	17.2
BARKLYSD	1976–87	2	1.000	—	26.5
Total	1976–87	2	1.000	—	20.9

^aBased on weighted regression (see text).

Estimates of the actual population of seals (N) and the proportion of seals counted during censuses (P) using the bounded count method for replicated censuses.

Subarea(s) censused	Census period	Number counts	Adjusted counts		Mean count	N	P
			max	max - 1			
Strait of Georgia							
BBAY-FRASERR	Aug. 84	2	1688.7	1567.0	1627.9	1810.4	0.899
BBAR-FRASERR	Aug. 85	2	1591.9	1484.3	1538.1	1699.5	0.905
SGULF	Aug. 86	2	1943.7	1794.1	1868.9	2093.3	0.893
Complete	May-Aug. 88	2	14613.7	13340.4	13977.1	15887.0	0.880
Partial ^a	May-Sept. 88	3	6495.8	6073.0	6284.4	6918.6	0.848
BBAY-FRASERR	Aug. 1982-88	8	1688.7	1646.4	1519.8	1731.0	0.878
Mean							0.884
Skeena River							
Complete	Jun. 77	2	475.9	339.0	407.5	612.8	0.665
Complete	Jun. 83	2	775.5	648.4	712.0	902.6	0.789
Complete	Jun. 87	2	1294.2	1217.2	1255.7	1371.2	0.916
Mean							0.790

^aBased on portion of region surveyed in September: BBAY, FRASERR, HOWESD, 46.3% of SGULF, 22.6% of GULFISL, and 47.6% of NEGULF.

OLESEVUK
et al, 1990

Density of seals (seals $\cdot$ km $^{-1}$) in surveyed areas of British Columbia adjusted to 1988 levels.

Area	Population	Shoreline	Density
Strait of Georgia ^a	16 134.6	3221.1	5.01
Lower Skeena River	1 788.2	345.9	5.17
SW Vancouver Island	1 276.2	556.8	2.29
NE Queen Charlotte Islands	3 105.5	2093.6	1.48
Queen Charlotte Strait	577.3	300.2	1.92
Overall	22 881.8	6517.6	3.51

^aIncludes Jervis Inlet.

Marine mammal search effort at Santa Catalina Island, CA. (circum. = circumnavigations.)

Dates in field	Time spent searching		No. of circum. in boat
	Days	Hours	
10 Jan.-21 Mar. 1983	50	145	1
5 Dec. 1983-26 Mar. 1984	92	180	12
15-19 Nov. and 30 Nov. 1984-11 Mar. 1985	97	353	28
6-12 Feb. 1986	7	37	4
20-27 Jan. 1987	8	40	5
1-8 Feb. 1988	7	42	5
27 Jan.-3 Feb. 1989	8	46	4
15-18 Feb. 1990	3	17	3
28 Jan.-3 Feb. 1991	8	45	3

Maximum counts of California sea lions during the winters of 1983-91. The primary haul-out areas for each year refer to sites labeled with numbers on Fig. 1. (* = in water near commercial squid boats.)

Year	Max. count	Date of count	Primary haulouts
1983	898	14 Feb.	1, 8, 9, 10
1983-84	240	24 Jan.	9
1984-85	108	7 Feb.	*
1986	113	11 Feb.	7
1987	135	26 Jan.	6
1988	250	4 Feb.	6, 10, *
1989	249	3 Feb.	7
1990	204	15 Feb.	6, 7, 10
1991	220	31 Jan.	6, 7, 9, 10

California sea lion (*Zalophus californianus*) genotype distribution and abundance at the four sampling localities.

Genotypes	Pacific Coast			Gulf of California		Total
	Punta Banda	San Nicolas	San Miguel	Bahía de los Angeles		
PB2	1	1	1			3
PB3	1	2	3			6
SN1	1	12	4			17
SM26		2	1			3
SM28			1			1
SM32			1			1
SM34			1			1
G1				1		1
G2				3		3
G3				3		3
G5				1		1
Total	3	17	12	8		40

200

[illegible]

The regional variation of the pupping season of the ice-breeding and the land-breeding harbour seals in the North Pacific
(Information cited by Bigg, 1969 (no author))

THE LAND-BREEDING HARBOUR SEAL

Western coast of North America

9. Early March to early April: in Nome
10. April to May: in the north of the Pribilof Islands
11. Early May to ?; 20 May to ? : in the Pribilof Islands
12. 5 May to 25 June: in Tugidak Island
13. Late May to late June: in the Copper, Stikine and Skeena Rivers
14. 24 June to 6 September: in the southeast of Vancouver Island
15. Mid August to early September: in McNeil Island
16. Late June to early August: in the Nisqually Flata
17. 12 May to ? : in Willapa Bay.
18. Late April to early June: in Tillamouk Bay
19. 24 March to 7 May: in Humbolt Bay
20. Late March to late May: in Año Nuevo Island
21. Mid April to early May: in the Mugu Lagoon
- 8 March: in San Martin Island
22. Mid March: in the Bahía San Quintin

Aleutian Islands, Kurile Islands and Hokkaido

24. Late April to early May: in the Commander Islands
25. Early April: in the Commander Islands (Marakov, 1968)
26. Mid May: in the Kurile Islands (Belkin, 1964)
27. Late March to mid April: in the southern Kurile Islands
28. Mid May to late May: in the southeast of Hokkaido (Naito and Nishiwaki, 1975)

The suckling period of the harbour seal in the North Pacific

THE LAND-BREEDING *RICHARDSI* SEAL

- | | |
|------------------|--|
| 1. 3 to 4 weeks: | in Alaska (Bishop; cited from Bigg, 1969a) |
| 2. 4 to 6 weeks: | in Washington State (Scheffer and Slipp, 1944) |
| 3. 6 weeks: | in the Skeena River (Fisher, 1952) |
| 4. 6 weeks: | in California (Finch; cited from Bigg, 1969a) |
| 5. 5 to 6 weeks: | in southern Vancouver Island (Bigg, 1969a) |
| 6. 3 months: | in the southern Kurile Islands (Belkin, Kosygin and Panin, 1969) |
| 7. 4 to 6 weeks: | on the southeast coast of Hokkaido (Naito and Nishiwaki, 1975) |

—Maximum pup counts, number of non-pup animals present during counts, and number of pups expressed as a percentage of the total number of animals present for the 1978, 1979, 1980, and 1981 harbor seal pupping seasons at Netarts and Tillamook Bays, Oreg.

Year	Pups	Netarts	Tillamook Bay
1978	Pups	15	63
	Non-pups	55	381
	Pups/total (X100)	21.4%	14.2%
1979	Pups	9	58
	Non-pups	36	334
	Pups/total (X100)	20.0%	14.8%
1980	Pups	16	55
	Non-pups	80	254
	Pups/total (X100)	16.7%	17.8%
1981	Pups	15	70
	Non-pups	77	330
	Pups/total (X100)	16.3%	17.5%

TABLE 73

Aerial counts of harbor seals in the Columbia River at haulout locations, April 8, 1980 to September 12, 1982 (pups in parentheses and included in the total).

JEFFRIES,
1984

Date	South Jetty	Baker Bay	Desdemona Sands	Taylor Sands	Grays Bay	Miller Sands	Green Island	N. Woody Island	Wallace Island	TOTAL
<u>1980</u>										
Apr 8	0	0	603	260	0	108	0	0	0	971
Apr 18	0	0	670	144	0	0	0	0	0	814
Apr 25	0	0	884	210	0	88	0	0	0	1182
May 22	0	0	372(3)	0	0	0	0	0	0	372(3)
May 28	0	0	216(2)	0	0	0	0	0	0	216(2)
May 30	0	1	222(4)	4	3	0	6(3)	0	0	236(7)
Jun 4	0	NS*	186(5)	NS	NS	NS	NS	NS	NS	186(5)
Jun 5	0	NS	191(4)	0	NS	NS	NS	NS	NS	191(4)
Jun 6	0	NS	103(1)	NS	NS	NS	NS	NS	NS	103(1)
Jun 19	NS	NS	168	NS	NS	NS	NS	NS	NS	168
Jul 17	NS	NS	469(2)	6(1)	0	0	38(2)	NS	NS	514(5)
Jul 18	NS	NS	365	21(1)	0	0	34	NS	NS	420(1)
Aug 13	0	7	153(1)	0	0	0	35	0	NS	195(1)
Aug 14	3	NS	370	0	0	0	32	0	NS	405
Sep 12	NS	NS	400**	7	4	0	26	NS	NS	437
Sep 13	4	NS	415	4	0	0	21	NS	NS	444
Oct 24	0	0	46	NS	NS	NS	NS	NS	NS	46
Oct 25	0	19	223	59	NS	NS	NS	NS	NS	301
Dec 16	0	0	301	174	0	46	0	0	NS	521
<u>1981</u>										
Jan 13	0	NS	134	150	0	111	0	72	87	566
Jan 14	0	NS	178	218	0	100	0	46	195	739
Mar 11	1	0	264	348	0	82	0	3	0	898
Apr 7	0	NS	40	50	0	10	0	0	0	100
Apr 24	NS	0	538(1)	0	0	31	0	0	0	596(1)
Apr 29	0	NS	742	155	NS	NS	NS	NS	NS	897
May 13	NS	NS	568(3)	0	0	0	0	NS	NS	568(3)
May 22	NS	NS	389(4)	0	0	16(5)	0	0	NS	405(9)
May 26	0	NS	565(5)	0	NS	NS	NS	NS	NS	565(5)
May 27	0	NS	436(3)	NS	NS	NS	NS	NS	NS	436(3)
May 28	NS	NS	464(2)	NS	NS	NS	NS	NS	NS	464(2)
Jun 9	0	NS	273(7)	NS	NS	NS	NS	NS	NS	273(7)
Jun 10	0	NS	228(4)	NS	NS	NS	NS	NS	NS	228(4)
Jul 6	NS	NS	233	0	10	0	34(1)	NS	NS	277(1)
Jul 22	NS	0	494	NS	NS	NS	NS	NS	NS	494
Jul 23	0	NS	525	NS	NS	NS	NS	NS	NS	525
Aug 5	0	0	378	NS	NS	NS	NS	NS	NS	378
Sep 3	0	0	300	NS	NS	NS	NS	NS	NS	300
Sep 4	0	NS	50	NS	NS	NS	NS	NS	NS	50
Sep 17	0	NS	563	2	12	0	18	NS	NS	595
Oct 15	NS	25	177	NS	NS	NS	NS	NS	NS	202
Oct 22	0	NS	48	33	0	6	0	0	NS	87
<u>1982</u>										
Jan 5	NS*	NS	400**	155**	0	250**	0	25**	2	832
Jan 6	0	NS	566	444	1	381	0	30	NS	1422
Apr 1	NS	20**	150**	93	0	137	0	18	105	523
Apr 16	NS	NS	600**	0	0	80**	0	NS	NS	680
Apr 28	NS	NS	150**	0	0	0	0	NS	NS	150
May 29	NS	0	97(6)	NS	NS	NS	NS	NS	NS	97(6)
May 30	0	NS	2	0	4(1)	0	0	0	NS	6(1)
May 31	NS	NS	164(4)	0	NS	NS	NS	NS	NS	164(4)
Jun 12	0	0	5(2)	1	0	1	0	NS	NS	7(2)
Jun 13	NS	NS	15(2)	NS	NS	NS	NS	NS	NS	15(2)
Jun 14	NS	0	140(3)	1	8(1)	1	0	NS	NS	150(4)
Jul 27	NS	NS	305	NS	NS	NS	NS	NS	NS	305
Jul 28	0	NS	95	NS	NS	NS	NS	NS	NS	95
Sep 21	NS	11	350**	4	NS	NS	NS	NS	NS	365

*NS = not surveyed

** = estimated population

Censuses of harbor seals (*Phoca vitulina richardsi*) at San Nicolas Island, California, 1980-

1982.

Date	Pups	Total	Date	Pups	Total
1980			1982		
3 Feb		62	2 Jan		81
9 Mar	3	45	15 Jan		46
21 Apr	26	207	22 Jan		80
4 May	5	226	29 Jan		37
17 May	9	257	6 Feb	1	131
8 Jun		312	12 Feb		76
6 Jul		283	19 Feb		41
12 Dec		17	26 Feb		44
27 Dec		29	9 Mar	9	82
1981			13 Mar	38	346
10 Jan		7	3 Apr	84	304
23 Jan		211	21 Apr	48	229
6 Feb		39	11 May	39	605
19 Feb		122	18 May	26	609
21 Mar	47	184	29 May	7	566
3 Apr	63	227	2 June	13	694
*18 Apr	20	242	12 June	7	661
25 Apr	65	296	4 July	4	399
8 May	38	371			
*16 May	59	566			
23 May	40	530			
12 Jun	13	452			
*29 Jun	31	444			
5 Jul	25	350			
11 Jul	62	333			
24 Jul	28	177			
7 Aug	3	121			
22 Aug	3	192			
10 Oct		194			

* Aerial survey; all others are ground counts.

-Counts of harbor seals on 32 haulout areas (listed from north to south) along the Oregon coast, based on aerial censuses during the summer months between 1975 and 1983. Hyphens designate no count was taken. Each area is designated as an offshore (O), shoreline (S), or estuarine (E) haul-out habitat. Twelve haul-out sites were counted on most flights and are designated with a asterik.

Haul-out site		Month and year of count								
Location	Habitat	July 1975	July 1976	June 1977	June 1978	July 1979	July 1980	July 1981	August 1982	June 1983
Columbia River*	E	--	145	152	307	4	356	194	65	153
Tillamook Head	S	--	8	25	49	110	0	--	115	112
Ecola Point	S	--	--	4	0	0	--	--	0	--
Cape Falcon	S	--	60	102	0	0	0	31	55	15
Tillamook Bay*	E	312	85	247	367	385	279	203	545	527
Netarts Bay*	E	24	--	23	44	54	16	48	207	167
Cape Lookout	S	23	--	--	0	20	15	10	11	0
Cascade Head	S	--	--	31	27	18	28	3	0	0
Siletz Bay	E	--	--	43	0	0	0	0	0	0
Boiler Bay	S	--	--	--	--	--	--	--	--	8
Wahle Cove	S	--	--	--	--	--	--	0	--	19
Cape Foulweather*	O	50	25	18	0	38	64	49	11	30
Yaquina Head	S	--	--	11	13	55	4	0	54	50
Yaquina Bay	E	0	--	0	0	--	19	0	0	0
Seal Rock	S	--	0	0	0	--	--	0	6	0
Alsea Bay*	E	71	0	1	0	0	119	148	251	193
Strawberry Hill*	S	10	0	46	33	75	52	70	75	86
Siuslaw River*	E	0	0	10	4	0	20	0	121	60
Siltcoos outlet	S	53	--	25	--	--	--	--	0	--
Umpqua River*	E	454	443	596	464	382	549	210	280	774
Coos Bay*	E	113	35	--	85	95	35	117	222	233
Cape Arago*	S	670	125	425	530	483	440	104	985	683
Coquille Point*	O	91	106	61	81	79	62	55	75	120
Blacklock Point	S	--	--	--	--	8	--	--	9	--
Gull Rock	O	0	55	--	83	88	--	78	80	75
Blanco Reef	O	0	0	--	49	37	148	23	24	0
Orford Reef	O	60	0	0	0	15	--	19	75	0
The Heads	O	--	--	0	0	14	24	--	--	35
Island Rock	O	0	--	6	0	--	--	--	11	--
Hubbard Md. Reef*	O	--	90	126	182	0	98	100	20	166
Rogue Reef*	O	133	236	201	211	6	189	0	184	212
Hunter's Island*	O	180	151	148	49	106	--	84	30	15

Totals for 14 haul-out

sites designated with *: 2,108 1,441 2,054 2,357 1,707 2,279 1,382 3,071 3,419
Percent of total count: (93.9) (92.1) (89.3) (91.4) (82.4) (90.5) (89.4) (87.5) (89.8)

-Counts of harbor seals on 32 haulout areas (listed from north to south) along the Oregon coast, based on aerial censuses during the summer months between 1975 and 1983. Hyphens designate no count was taken. Each area is designated as an offshore (O), shoreline (S), or estuarine (E) haul-out habitat. Twelve haul-out sites were counted on most flights and are designated with a asterik.

Haul-out site		Month and year of count								
Location	Habitat	July 1975	July 1976	June 1977	June 1978	July 1979	July 1980	July 1981	August 1982	June 1983
Columbia River*	E	--	145	152	307	4	356	194	65	153
Tillamook Head	S	--	8	25	49	110	0	--	115	112
Ecola Point	S	--	--	4	0	0	--	--	0	--
Cape Falcon	S	--	60	102	0	0	0	31	55	15
Tillamook Bay*	E	312	85	247	367	385	279	203	545	527
Netarts Bay*	E	24	--	23	44	54	16	48	207	167
Cape Lookout	S	23	--	--	0	20	15	10	11	0
Cascade Head	S	--	--	31	27	18	28	3	0	0
Siletz Bay	E	--	--	43	0	0	0	0	0	0
Boiler Bay	S	--	--	--	--	--	--	--	--	8
Wahle Cove	S	--	--	--	--	--	--	0	--	19
Cape Foulweather*	O	50	25	18	0	38	64	49	11	30
Yaquina Head	S	--	--	11	13	55	4	0	54	50
Yaquina Bay	E	0	--	0	0	--	19	0	0	0
Seal Rock	S	--	0	0	0	--	--	0	6	0
Alsea Bay*	E	71	0	1	0	0	119	148	251	193
Strawberry Hill*	S	10	0	46	33	75	52	70	75	86
Siuslaw River*	E	0	0	10	4	0	20	0	121	60
Siltcoos outlet	S	53	--	25	--	--	--	--	0	--
Umpqua River*	E	454	443	596	464	382	549	210	280	774
Coos Bay*	E	113	35	--	85	95	35	117	222	233
Cape Arago*	S	670	125	425	530	483	440	104	985	683
Coquille Point*	O	91	106	61	81	79	62	55	75	120
Blacklock Point	S	--	--	--	--	8	--	--	9	--
Gull Rock	O	0	55	--	83	88	--	78	80	75
Blanco Reef	O	0	0	--	49	37	148	23	24	0
Orford Reef	O	60	0	0	0	15	--	19	75	0
The Heads	O	--	--	0	0	14	24	--	--	35
Island Rock	O	0	--	6	0	--	--	--	11	--
Hubbard Md. Reef*	O	--	90	126	182	0	98	100	20	166
Rogue Reef*	O	133	236	201	211	6	189	0	184	212
Hunter's Island*	O	180	151	148	49	106	--	84	30	15

Totals for 14 haul-out

sites designated with *: 2,108 1,441 2,054 2,357 1,707 2,279 1,382 3,071 3,419

Percent of total count: (93.9) (92.1) (89.3) (91.4) (82.4) (90.5) (89.4) (87.5) (89.8)

TABLE 76

Number of days and range of dates during which censuses of harbor seals were made at study sites in Glacier Bay, Alaska

	Muir Inlet			Johns Hopkins Inlet			Land sites		
	No. of days	Start date	End date	No. of days	Start date	End date	No. of days	Start date	End date
1982	30	30 May	22 Aug.	—			20	26 June	10 Aug.
1983	30	19 June	19 Aug.	—			21	12 June	24 Aug.
1984	15	8 June	20 Aug.	10	10 June	16 Aug.	34	6 June	27 Aug.

CALAM BOKIDIS
et al, 1987

Average number of harbor seals hauled out per iceberg in
Muir and Johns Hopkins inlets, Glacier Bay, Alaska

	No. of censuses	Seals/iceberg	
		Mean	SD
Muir, June 1983	56	2.8	0.9
Muir, July 1983	45	2.7	1.1
Muir, Aug. 1983	58	2.5	0.6
Muir, Aug. 1984	47	2.6	2.1
Johns Hopkins, Aug. 1984	27	1.4	0.2

High counts of harbor seals at land haul-out sites in Glacier Bay, Alaska, during June to August 1982 to 1984

	No. of seals		Max. no. of pups
	June	July Aug.	
Spider Is.	233	366	536
Hutchins Bay	88	97	—*
Leland Is.	43	66	280
Surgess Is.	28	40	103
Adams Inlet	170	276	224
Hugh Miller	—*	140	121
Other sites	153	18	177

*No counts made.

Census results for harbor seal haul-out areas in southern and central Puget Sound in 1984.

Site	<u>Obs. dates</u>		Land vis.	Obs. hr	Air surv.	<u>Peak counts</u>			<u>High count</u>		<u>Max. pups</u>	
	Start	end				n	mean	sd	#	date	#	date
Eld Inlet	4 /9	9 /28	46	46	8	18	28	12	53	9 /9	7	8 /3
Budd Inlet	1 /2	11/6	57	81	5	36	27	14	59	9 /15	8	9 /12
Henderson	1 /22	12/30	55	130	8	29	120	55	228	9 /16	52	8 /7
McMicken Is.	3 /6	9 /9	5	11	6	10	18	18	50	5 /12	0	8 /7
Gertrude Is.	4 /27	11/21	73	359	9	59	324	116	483	9 /24	77	10/5
Nisqually	4 /27	9 /9	0	0	5	2	11	8	28	8 /7	3	8 /7
Oakland Bay	4 /27	9 /9	0	0	6	6	5	6	16	8 /7	1	8 /7
Totten Inlet	6 /9	9 /9	0	0	4	4	2	3	6	9 /9	0	8 /7
Wyckoff Shoals	4 /27	9 /9	0	0	5	5	43	27	82	6 /9	1	8 /7
Eagle Is.	4 /27	9 /24	0	0	6	6	16	7	25	7 /11	2	9 /9
Cutts Is.	6 /9	9 /9	0	0	3	1	28	0	28	9 /9	0	9 /9
Poulsbo	8 /24	8 /24	0	0	1	0	0	0	11	8 /24	2	8 /24
Other Carr In.	6 /9	9 /9	0	0	3	1	10	0	10	6 /9	0	9 /9
Other Case In.	7 /11	8 /7	0	0	2	1	6	0	6	7 /11	2	8 /7

Land vis.--Number of visits by land to count seals

Obs. hr.--Hours spent counting seals

Air Surv.--Number of aerial surveys flown over site to count seals

Peak counts--Number of counts, mean of the high counts, and standard deviation for counts made when peak numbers of seals were expected

Changes in numbers of harbor seals at study sites. Census results from this study are compared to historical counts judged to be most similar in effort and methods to current study. Annual increase refers to yearly increase required to achieve observed growth. Mean of peak counts was calculated from the daily high counts of seals made when period of expected peak haul out was censused. Statistical significance refers to t-test between counts made in 1984 and those from previous study.

Site	Previous study Refer. Yr	High count Prev- 1984	High count Ann. incr.	Mean of peak counts Prev- 1984	Mean of peak counts Ann. Stat. incr. sign.	Pups born Prev- 1984	Pups born Ann. incr.	Growth index
<u>Southern Puget Sound</u>								
Gertrude Island	1 79	220	483 17%	-	-	38	83 17%	17%
Henderson Inlet	2 77	40	228 28%	18	120 31% ***	8	60 33%	31%
Budd Inlet	2 77	29	59 11%	14	27 10% ***	6	8 4%	8%
Eld Inlet	2 77	30	53 8%	15	28 9% ***	11	13 2%	7%
<u>Hood Canal</u>								
Skokomish Delta	2 77	342	428 3%	151	165 1% NS	-	-	2%
Duckabush "	2 77	163	302 9%	102	144 5% *	21	37 9%	8%
Dosewallips "	2 77	160	339 11%	99	166 8% ***	25	29 2%	7%
<u>North of Puget Sound</u>								
Smith Island	2 77	245	546 12%	125	181 5% *	41	105 14%	10%
San Juan Islands	3 78	899	1800 12%	562	1553 18% ***	-	-	15%
	3 79	818	1800 17%	732	1553 16% ***	-	-	17%
Skipjack-Bare Is.	2 77	93	216 13%	70	143 11% ***	8	16 10%	11%

References: 1--Skidmore and Babson (1981), 2--Calambokidis et al. (1978), and 3--Everitt et al. (1979, 1980)
 Ann. incr.=Annual increase in seal numbers
 Stat. sign.=Statistical significance (NS-not significant, *-p<0.05, ***-p<0.001)

TABLE 8/

CALAMBOKIDIS
et al, 1985

Pupping seasons of harbor seals at different study sites in 1984 measured by several techniques.

Sites	Dates nursing pups seen		Dates birth remains found		Date high count of pups w/ mothers
	first	last	first	last	
<u>Southern Puget Sound</u>					
Gertrude Island	3 Aug.	27 Oct.	30 July	21 Sept.	12 Sept.
Henderson Inlet	4 July	2 Sept.	5 July	11 Aug.	7 Aug.
Eld Inlet	16 July	26 Aug.	8 July	31 July	3 Aug.
Budd Inlet	11 July	15 Sept.	ND		5 Aug.
<u>Hood Canal</u>					
Skokomish	4 Aug.	7 Nov.*	7 Aug.	2 Oct.	19 Sept.
Lamma Hamma	8 Aug.	19 Sept.	ND		13 Sept.
Duckabush	27 July	27 Sept.	27 July	30 Aug.	30 Aug.
Dosewallips	27 July	27 Sept.	18 July	6 Sept.	13 Sept.
<u>North of Puget Sound</u>					
Smith Island	2 June	29 Aug.	2 June	12 Aug.	16 July
Protection Is.	11 July	13 Sept.	17 July	13 Aug	8 Aug.

* Last day observations made, so pups with females may have been present later.

ND Not determined

The average number of seals at sites in the Gulf of the Farallones, by season in 1982-83 and 1983-84.¹

Year		Coastal Sites ²	South Farallon Islands
1982-83			
Breeding/molt			
$\bar{x}$		1841.3	54.8
SE.....		131.1	2.3
range.....		1214-2502	36-78
n.....		11	24
Nonbreeding			
$\bar{x}$		928.3	42.4
SE.....		91.0	2.2
range.....		501-1559	20-63
n.....		13	29
1983-84			
Breeding/molt			
$\bar{x}$		1740.4	53.9
SE.....		115.8	4.2
range.....		1242-2449	13-90
n.....		11	21
Nonbreeding			
$\bar{x}$		997.3	51.6
SE.....		115.8	4.2
range.....		621-1591	33-76
n.....		16	25

¹ $\bar{x}$ is the mean number of seals, SE is the standard error of the sample, and n is the sample size.² Simultaneous counts conducted at all sites except South Farallon Islands.

Maximum number of pups counted in May (1982 and 1983) in the Gulf of the Farallones for each location; percentage is of the total pup count.

LOCATION									
	Tomales Bay	Tomales Point	Point Reyes	Drakes Estero	Double Point	Dux-bury Reef	Bolinas Lagoon	South Farallons	Total
1982									
Total.....	58	135	19	170	263	1	17	0	566
Percentage.....	10.3	23.9	3.4	30.0	46.5	0.2	3.0		
1983									
Total.....	45	122	0	122	262	3	17	0	527
Percentage.....	8.5	22.8	0	23.2	49.7	0.6	3.2		

TABLE 84

Summary of repetitive counts of harbor seals on the southwestern Tugidak Island, Alaska, hauling area during the molting period, 1976-1988.

Year	Mean count	Coefficient of variation	Minimum	Maximum	n
1976	6,919	0.280	2,800	9,300	12
1977	6,617	0.005	6,595	6,640	2
1978	4,839	0.270	2,532	6,817	12
1979	3,836	0.200	2,572	4,886	21
1982	1,575	0.390	660	2,323	10
1984	1,390	0.380	789	2,187	9
1986	1,270	0.230	639	1,673	10
1988	1,014	0.240	605	1,437	10

PITCHER,
1990

Summary of repetitive counts of harbor seals on the southwestern Tugidak Island, Alaska, hauling area during the pupping period, 1976-1986.

Year	Mean count	Coefficient of variation	Minimum	Maximum	n
1976	2,184	0.35	1,039	3,566	11
1977	1,173	0.36	770	1,900	7
1978	1,182	0.35	714	2,086	25
1979	1,022	0.25	398	1,356	14
1986	616	0.12	517	676	4

TABLE 86

LOYA-SALINAS
al, 1992

Conteos de foca de bahía (*Phoca vitulina richardsi*) dentro del Estero de Punta Banda (B.C.). Se incluye: la fecha (año-mes-día) y la estación climática (P, V, O, I); la hora del conteo (sin corrección); el nivel del mar (en metros); y el número total de individuos (# indiv.) (el número de crías se indica a la derecha y la suma de ambos es el total para esa visita).

Bay seal (*Phoca vitulina richardsi*) counts at Punta Banda Estuary (B.C.), including the date (year-month-day) and season (P = spring, V = summer, O = autumn, I = winter); time (without correction); sea level (in meters) and the total number of individuals (# indiv.) (the number of pups is indicated on the right and the sum of both is the total for this visit).

Fecha	Hora	Nivel	# Indiv.
88-11-13 (O)	14:30	0.775	26
88-11-20 (O)	14:28	0.153	18
88-11-27 (O)	15:15	0.576	24
88-12-18 (O)	13:43	0.226	20
89-01-08 (I)	14:00	0.088	25
89-01-15 (I)	14:27	0.567	53
89-01-22 (I)	13:00	0.583	28
89-02-05 (I)	13:38	-0.195	35
89-02-12 (I)	14:40	0.714	18
89-02-26 (I)	12:25	0.784	48
89-03-12 (I)	11:15	0.586	109
89-04-09 (P)	12:46	0.848	65
89-04-25 (P)	8:28	0.049	96
89-09-23 (O)	12:20	0.872	30
89-11-11 (O)	15:20	-0.021	45
89-11-25 (O)	14:00	0.012	38
89-12-09 (O)	15:40	0.311	48
90-01-20 (I)	13:10	0.235	70
90-02-03 (I)	15:00	0.555	32
90-02-09 (I)	14:40	-0.278	82
90-02-17 (I)	13:35	0.485	51
90-02-17 (I)	14:35	0.546	35
90-02-24 (I)	13:40	-0.131	69+27
90-03-04 (I)	11:00	-0.003	98+53
90-03-10 (I)	13:28	0.018	35+5
90-03-17 (P)	13:47	0.637	33+9
90-03-21 (P)	10:30	0.128	31
90-03-23 (P)	14:55	0.095	56+15
90-03-30 (P)	12:48	0.842	78+10
90-04-07 (P)	13:35	0.009	58+7
90-04-14 (P)	9:00	0.284	58
90-04-14 (P)	9:20	0.314	64+10
90-04-21 (P)	15:00	0.159	44+4
90-05-05 (P)	12:35	0.244	110
90-05-12 (P)	16:40	0.641	85
90-06-03 (V)	13:00	0.476	25
90-06-10 (V)	16:00	0.689	23
90-07-15 (V)	16:40	1.504	2
90-07-22 (V)	14:40	0.628	16
90-08-26 (V)	9:00	0.857	72

Total counts of harbor seals in the water and hauled out around Catalina Island, CA, during winter in 1984-91. No counts were made in 1983 or 1987. Tidal state during the count is described with the relative tidal height given in parentheses. (int. = intermediate; * = incomplete count.)

	3/4/84	3/9/85	2/11/86	2/2/88	2/1/89	2/15/90	1/30/91
# Adults	91	144	37	109	—	211	52
# Pups	57	64	7	12	—	56	1
Total #	148	208	44*	121	79	267	53
Tide	falling (high)	high	rising (high)	falling (low)	falling (low)	falling (int.)	falling (int.)

—Stomach contents of white sharks collected off the California coast from 1975 to 1978. Specimens 1-5 were collected by Sea World of San Diego, no. 6 by K. Skaug and M. Riedman, and no. 7 by an anonymous fisherman.

Specimen number	Date of collection	Location	Sex	Total length (m)	Weight of shark (kg)	Stomach contents
1	24 June 1975	8 km northeast of Santa Catalina Island	F	3.9	623.7	Anterior portion of stomach contained harbor seal remains (18.2 kg). Posterior stomach held unidentified pinniped.
2	1 Aug. 1975	110 m west of Laguna Beach	F	2.4	138.8	A 4-in patch of pinniped pelage.
3	6 Sept. 1975	Near Anacapa Island	F	4.9	1,428.8	Harbor seal, well digested.
4	7 Sept. 1975	11.3 km southeast of Anacapa Island	F	5.0	1,560.4	Skull and posterior portion of a juvenile elephant seal, plus large amounts of fur and digested material.
5	13 June 1976	West end of Catalina Island	F	5.5	1,882.4	Nearly digested. Bulk suggested a large animal, probably a marine mammal.
6	3 Feb. 1977	Año Nuevo Bay	F	4.7	?	Approximately one-third of a recently eaten 4-yr-old male elephant seal.
7	25 Sept. 1978	1.6 km offshore near Aptos	M	3.9	540	The head of a harbor seal.

LeBOEUF
et al, 1982

mammals found on systematic beach walks
and their proportion of the total

	No. of individuals	% of total
California sea lion (<i>Zalophus californianus</i>)	116	59.8
Sea otter (<i>Enhydra lutris</i>)*	33	17.0
Harbor seal (<i>Phoca vitulina</i>)	26	13.4
Northern elephant seal (<i>Mirounga angustirostris</i>)	11	5.7
Common dolphin (<i>Delphinus delphis</i>)	2	1.0
Pacific white-sided dolphin (<i>Lagenorhynchus obliquidens</i>)	1	0.5
Rough-toothed dolphin (<i>Steno bredanensis</i>)	1	0.5
Unidentified cetacean	1	0.5
Unidentified pinniped	3	1.5
Total	194	100.0

*Twenty-three additional sea otter carcasses were removed from the study site between survey periods.

. Number and annual rate of occurrence ($\text{no.} \cdot \text{km}^{-1} \cdot \text{year}^{-1}$) of California sea lion, sea otter, and harbor seal carcasses found during surveys as a function of month, year, sex, and age (includes 23 sea otters removed from beaches between surveys)

(A) Month

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
California sea lion	7	17	7	12	6	6	11	14	10	5	14	7	116
Sea otter	4	10	7	8	1	1	8	6	4	1	5	1	56
Harbor seal	3	3	3	10	1	2	0	0	2	1	1	0	26

(B) Year

	1980	1981	1982	1983	1984	1985	1986	Avg. no. $\cdot$ $\text{km}^{-1} \cdot \text{year}^{-1}$
California sea lion	14 (0.97)	13 (0.90)	12 (0.83)	57 (3.9)	9 (0.62)	7 (0.48)	4 (0.28)	1.14
Sea otter	14 (0.97)	12 (0.83)	8 (0.55)	8 (0.55)	6 (0.41)	2 (0.14)	6 (0.41)	0.55
Harbor seal	4 (0.28)	6 (0.41)	5 (0.28)	4 (0.28)	6 (0.41)	0 (0.00)	1 (0.07)	0.26

(C) Sex

	Male	Female	Not determined
California sea lion	38	27	51
Sea otter	22	27	7
Harbor seal	6	8	12

(D) Age

	Young of the year	Juvenile	Subadult	Adult
California sea lion	0	17	22	22
Sea otter	13	13	3	27
Harbor seal	15	2	—	6

TABLE 91

Observer effort and number of interactions witnessed for California, British Columbia and Alaska for all years.

Location	Type of Interaction			Observer hours for all years	Number of Observers
	Non-predatory	Harass	Kill		
California	0	0	0	59,962	6
BC	159	9	12	1,023,130	29
Southeast Alaska	102	3	6	865,592	26
Gulf of Alaska	112	4	10	1,409,636	39
Bering Sea	2	2	1	321,255	17
Aleutians	57	0	3	105,360	5
TOTAL	432	18	32	3,784,935	122

BARRETT-LENNARD
et al, 1995

Age classes of sea lions reported during predatory attacks by killer whales.

NON-LETHAL ATTACKS

LETHAL ATTACKS

NON-LETHAL ATTACKS		LETHAL ATTACKS	
# Attacked	Age Class	# Killed	Age Class
20 Reported Attacks:	pups	2 (6 %)	pups
0 (0 %)	juveniles	5 (16%)	juveniles
3 (15%)	adults	16 (50%)	adults*
12 (60%)	not stated	9 (28%)	not stated
5 (25%)			

*in 16 reports of fatal attacks on adults, the majority of sea lions were small adults. In the single account of a large sea lion bull that was taken, 15-20 killer whales were present.

Summary of prey recovered from eight killer whale stomachs containing marine mammals.

Prey Species	Number of Stomachs (n=8)
Harbour seal	8 (100%)
Porpoise	3 (38%)
Whale	3 (38%)
Sea lion	2 (25%)
Elephant seal	1 (13%)
Bird	2 (25%)
Squid	1 (13%)

Age classes of southern sea lions attacked by killer whales in Argentina and of Steller sea lions attacked by killer whales in this study.

	Hoelzel 1991 (southern sea lions)		This study (Steller sea lions)	
	Non-lethal Attacks	Kills	Non-lethal Attacks	Kills
Pups	127 (53.8%)	82 (99%)	0 (0%)	2 (6%)
Subadults	13 (5.5%)	1 (1%)	3 (15%)	5 (16%)
Adults	96 (40.7%)	0 (0%)	12 (60%)	16 (50%)
Not Stated			5 (25%)	9 (28%)
Total	236	83	20	32

Number of individuals of each pinniped species from which the respective serotype(s) were isolated.

	California sea lion	Northern fur seals
Salmonella Serotypes		
newport	16	22
heidelberg	—	4
oranienburg	3	—
newport and oranienburg	1	2
oranienburg and heidelberg	—	1
newport and heidelberg	—	1

Pup mortality^a during the first 2 months of life in the California sea lion for study sites 232 and 233 and for the total population on San Nicolas Island (number of dead pups in parentheses)

	1982	1983	1984
Area 232	12%	17%	13%
Area 233	10%	12%	13%
Total island ^b	10%	18%	17%
		(92)	(79)
		(78)	(66)
		(813)	(983)
			(62)
			(66)
			(883)

^aCalculated as No. of dead pups/(peak pup count + No. of dead pups).^bTotal pup numbers corrected for disappearance of carcasses and scanning error (see text for explanation).

TABLE 97

CALAMBOKIDIS

E+al, 1985

Primary and contributing causes of death of harbor seal pups recovered between 22 Oct. 1983 and 29 Jan. 1985 by region. Three pups found dead in central Puget Sound are included with the southern Puget Sound figures. Includes one premature pup reported to us before the pupping season from Eld Inlet, and two pups from the 1983 pupping season. One pup from Grays Harbor was not included. P-Primary, C-Contributing. SPS+CPS-Central and southern Puget Sound, HC-Hood Canal, NPS-North of Puget Sound.

Cause of death	SPS+CPS		HC		NPS		All sites	
	P	C	P	C	P	C	P	C
Premature	2	1	1	0	19	0	22	1
Stillborn (not premature)	3	1	3	0	4	4	10	5
Emaciation pre-weaning	3	0	2	0	9	1	14	1
post-weaning	3	0	0	0	0	0	3	0
Coyote kill	7	0	0	0	0	0	7	0
Incidental catch-fisheries	5	0	0	0	0	0	5	0
Shot	1	0	0	0	1	0	2	0
Blow to head	3	0	1	0	2	0	6	0
Drowning *	2	5	0	0	0	1	2	6
Septicemia	2	3	0	0	2	3	4	6
Other suspected disease agents	0	4	0	0	1	3	1	7
Myocardial necrosis	0	0	0	0	1	0	1	0
Pneumonia	0	1	0	0	0	0	0	1
Died or euthen. in captivity	2	0	0	0	1	0	3	0
Not determined or unsuitable	11	-	9	-	10	-	30	-
Total examined	44		16		50		110	

* Does not include animals that drowned as a result of other injuries included in another category (i.e. emaciation or incidental catch).

Cause of death of adult and subadult harbor seals recovered between 5 October 1983 and 29 January 1985 by region: southern Puget Sound (SPS), Hood Canal (HC), and north of Puget Sound (NPS).

Cause of death	SPS	HC	NPS	All sites
Blow to head	2	4	-	6
Shot	1	1	-	2
Other trauma	1	-	-	1
Incidental catch-fisheries	1	-	-	1
Drowning*	2	-	-	2
Suspected infectious agent	-	-	1	1
Not determined or unsuitable	11	3	2	16
	—	—	—	—
Total	18	8	3	29

* Does not include animals that drowned as a result of other injuries included in another category (i.e. trauma).

TABLE 99

CALAMBOKIDIS
et al, 1985

Samples collected for histopathology, microbiology, and future contaminant analysis from harbor seals by region and age/sex class, 5 October 1983 to 29 January 1985. Table does not include the one harbor seal pup from Grays Harbor.

Region & Age class	# Exam.	# Animals Sampled								
		Chlor. Hydro.	Heavy Metal	Hist.	Bact.	Vir.	Lepto. Pup	Prot.	Repro. Tract.	
<u>Southern Puget Sound (n=62)</u>										
Adult	M	2	2	2	0	0	0	-	0	-
	F	4	4	4	4	0	0	-	3	3
	U	2	0	0	0	0	0	-	0	-
Subadult		10	6	5	3	2	1	-	2	-
Pup		43	42	38	27	23	23	8	19	-
Fetus		<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>-</u>
SPS total		62	55	50	35	24	24	8	24	3
<u>Hood Canal (n=26)</u>										
Adult	M	0								
	F	5	5	5	4	2	2	-	1	1
	U	2	0	0	0	0	0	-	0	-
Subadult		1	1	1	1	1	1	-	1	-
Pup		16	7	5	3	3	4	1	2	-
Fetus		<u>2</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>0</u>	<u>1</u>	<u>-</u>
HC total		26	15	13	9	7	8	1	5	1
<u>North of Puget Sound (n=53)</u>										
Adult	M	1	1	1	1	1	0	-	0	-
	F	0								
	U	0								
Subadult		2	1	0	0	0	0	-	0	-
Pup		50	39	35	29	17	16	9	16	-
Fetus		<u>0</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
NPS total		<u>53</u>	<u>41</u>	<u>36</u>	<u>30</u>	<u>18</u>	<u>16</u>	<u>9</u>	<u>16</u>	<u>0</u>
Total		141	112	100	74	49	48	18	45	4

Codes: # Exam.= # animals examined, Chlor. Hydro= Chlorinated Hydrocarbons, Hist.= Histopathology, Bact.= Bacteriology, Vir.= Virology, Lepto. Pup= Leptospirosis of pups, Prot.= Protein analysis, Repro. Tract.= Reproductive tracts of adult females.

TABLE 100

CALAMBOKIDIS

et al, 1985

Results of microbiological examination of harbor seals by region. Table lists number of animals from which specific bacteria or viruses were identified. All virology and Leptospira samples and all but three general bacteriology samples were from pups. See Appendix Table B-1 for listings by specimen. Tissues sampled with culturette for general bacteriology consisted of brain, with liver and lung also occasionally sampled. A random sample of 24 virology samples was examined by electron microscopy for influenza or other viruses (reovirus).

Description	S. Puget Sound	Hood Canal	North of Puget Sound	All
<u>General Bacteriology</u>				
Number sampled	22	7	21	50
E. coli	2	0	11	13
Corynebacterium sp.	1	0	0	1
Pasteurella sp.	1	0	0	1
b-streptococcus sp.	2	0	2	4
a-streptococcus sp.	1	0	0	1
Acinetobacter sp.	2	0	0	2
Proteus sp.	2	3	10	15
Pseudomonas sp.	1	0	0	1
Enterobacter sp.	1	0	0	1
<u>Virology</u>				
Number sampled	24	5	20	49
San Miguel Sea Lion Virus	0	0	0	0
Influenza-like virus	1	0	3	4
Reo-like virus	0	0	1	1
<u>Leptospira</u>				
Number sampled	10	3	10	23
Leptospira found	0	0	0	0

TABLE 101

CALAMBOKIDIS
et al, 1985

Total birth rates of harbor seals at different sites in 1984. Total pups born was calculated as the sum of the high pup count, dead pups found before the high pup count, and the number of births that occurred after the high pup count. Total birth rate was calculated as the total pups born taken as a percent of the non-pup high count.

Site	<u>High pup count</u>		Dead pups before count	Births after count	Total pups born	Non-pup high count	Birth rate
	date	#					
<u>Southern Puget Sound</u>							
Gertrude	12 Sept.	72	9	2	83	384	22%
Henderson	7 Aug.	52	8	0	60	197	30%
Eld Inlet	--	0*	2	11	13	35	37%
Budd Inlet	5 Aug.	6	2	0	8	38	21%
Combined SPS region					164	654	25%
<u>Hood Canal</u>							
Skokomish	22 Aug.	25**	2	46	63	315	20%
Duckabush	30 Aug.	33	4	0	37	268	14%
Dosewallips	13 Sept.	27	2	0	29	312	9.3%
Combined HC region					129	895	14%
<u>North of Puget Sound</u>							
Smith Is.	16 July	75	25	5	105	414	26%
Protection	8 Aug.	50	10	3	63	333	19%
Combined NPS region					168	747	22%
All locations					461	2296	20%

* Total birthsites exceeds high count of 7; birthsites used to calculate birth rate.

** High pup count of 29 not used due to the prolonged pupping time; combination of pup count and birthsites used to determine pups born.

Summary of reproductive status of adult female harbor seals at Gertrude Island and Henderson Inlet directly before and during the pupping season. Samples are for seals showing their ventral surface to the observer so as to allow sex and age class to be determined.

Period	No. adults and sub-ad.	(a)		(b)		(c)		b+c		a-(b+c)	
		Adult #	fem. %	Preg. #	fem. %	Fem. #	w/ pup %	Reprod. #	fem. %	Non-reprod. #	fem. %
<u>Gertrude Island</u>											
July	126	38	30	33	26	0	0	33	26	5	4
August	484	140	29	50	10	65	13	115	24	25	5
Sept. 1-15	892	275	31	39	4	165	19	204	23	71	8
Sept. 16-31	376	116	31	4	1	72	19	76	20	40	11
Total	1878	569	30	126	7	302	16	428	23	141	7
<u>Henderson Inlet</u>											
June - Aug.	70	29	43	4	6	15	22	19	28	10	15

Fem.=Female, Preg.=Pregnant, Reprod.=Reproductively active

TABLE 103

Results of serologic testing for SN antibodies to SMSV-6 and SMSV-7 in populations of marine mammals

	Location and year of sample collection	Serologic results			
		No. positive/no. sampled		% positive	
		SMSV-6	SMSV-7	SMSV-6	SMSV-7
Otariid pinnipeds					
California sea lion	San Miguel Island, California (1977) ^a	3/43	0/43	7	0
	Fort Cronkhite, California (1983)	1/10	0/10	10	0
	San Miguel Island, California (1984) ^a	0/29	0/29	0	0
	Total	4/82	0/82	4.9	0
Steller sea lion	Eastern Bering Sea (1976)	1/5	0/5	20	0
	Fort Cronkhite, California (1983)	0/1	0/1	0	0
	Near Kodiak Island, Alaska (1985)	5/74	2/74	6.7	2.7
	Near Kodiak Island, Alaska (1985) ^b	0/29	1/29	0	3.4
	Rogue Reef, Oregon (1985) ^a	9/37	1/37	24.3	2.7
	Total	15/146	4/146	10.3	2.7
Northern fur seal	San Miguel Island, California (1976) ^a	0/13	0/13	0	0
	St. Paul Island, Alaska (1978)	0/40	0/40	0	0
	Fort Cronkhite, California (1983)	0/2	0/2	0	0
	San Miguel Island, California (1984)	0/1	0/1	0	0
	San Miguel Island, California (1984) ^a	0/13	0/13	0	0
	Total	0/69	0/69	0	0
Pacific walrus	Western Bering Sea (1984)	0/68	0/68	0	0
Phocid pinnipeds					
Northern elephant seal	Fort Cronkhite, California (1983)	0/10	0/10	0	0
	San Miguel Island, California (1985)	0/56	0/56	0	0
	Total	0/66	0/66	0	0
Hawaiian monk seal	Hawaiian Leeward Islands (1985)	0/4	0/4	0	0
	Hawaiian Leeward Islands (1985) ^a	0/1	0/1	0	0
	Total	0/5	0/5	0	0
Ringed seal	Barrow, Alaska (1975)	0/1	0/1	0	0
Spotted seal	Eastern Bering Sea (1976)	0/10	0/10	0	0
Ribbon seal	Eastern Bering Sea (1976)	0/4	0/4	0	0
Pacific harbor seal	Eastern Bering Sea (1976)	0/2	0/2	0	0
	Grays Harbor, Washington (1979)	0/30	0/30	0	0
	Fort Cronkhite, California (1983)	0/17	0/17	0	0
	Total	0/49	0/49	0	0
Bearded seal	Eastern Bering Sea (1976)	0/1	0/1	0	0
Cetaceans					
Killer whale	Victoria, British Columbia (1985)	0/3	0/3	0	0
Atlantic bottlenosed dolphin	San Diego, California (1979)	0/16	0/16	0	0
Pacific bottlenosed dolphin	San Diego, California (1979)	0/3	0/3	0	0
^a Pups ^b Fetuses					

BARLOUGH
et al, 1988

Serum neutralizing (SN) antibodies to SMSV-13 in various marine mammals.

SN* antibody titer	California sea lion	Northern fur seal	Northern elephant seal	Stellar sea lion	Harbor seal
<1:20	55	16	68	126	17
1:20	1	0	0	6	0
1:40	5	0	0	3	0
1:80	11	0	0	5	0
1:160	7	0	0	1	0
1:320	2	0	0	0	0
Total seropositive	27/82	0/16	0/68	15/146	0/17
Percentage	32.9%	0%	0%	10.3%	0%

* Titer expressed as the highest dilution of serum that completely neutralized 100 TCID₅₀ of virus.

Calicivirus isolation and type-specific neutralizing antibodies in ocean species

Species	Type virus isolated	Serum antibodies*
California sea lion	SMSV 1-7, 9, 12, 13 Cetacean calicivirus	VESV A, C-G, I-K SMSV 1-13 Tillamook calicivirus Cetacean calicivirus
Steller sea lion	SMSV 6**	SMSV 2, 5, 6, 13 Tillamook calicivirus
Northern fur seal	SMSV 1, 5, 8, 10, 11	SMSV 2, 5
Northern elephant seal	SMSV 7	SMSV 2
Hawaiian monk seal		SMSV 1 VESV I
Walrus	Walrus calicivirus	Walrus calicivirus
Bowhead whale		VESV J and K SMSV 5
Sperm whale		VESV A and I SMSV 5
California gray whale		VESV A, D-G, I and J SMSV 2 and 5
Fin whale		VESV A and I SMSV 5
Opaleye fish	SMSV 6 and 7	

* Not all species have been tested for all known serotypes; positive results only are reported

** Unpublished

Weights of California sea lion pups at approximately 4 months of age, San Miguel and San Clemente Island 1982-1986

Year	<i>San Miguel Island</i>				SD
	Male	n	Female	n	
1982	21.7	66	18.9	83	3.47
1983	15.5	136	13.3	151	3.27
1984	17.0	55	13.7	44	2.83
1985	22.3	59	17.2	41	2.62
1986	21.5	81	18.8	83	3.47
<i>San Clemente Island</i>					
1982	21.5	54	18.8	62	2.89
1983	16.1	66	13.6	76	4.00
1984	14.6	74	13.1	70	2.74
1985	21.7	74	18.1	57	2.13
1986	23.2	51	19.6	56	2.63

DeLONG
et al, 1991

TABLE 107

California sea lion pups tagged on San Clemente Island and recovered dead on the island during the following 8 months, 1982-1986

Cohort	No. tagged	Tags recovered			Total	%
		Males	Females			
1981	71	0	0		0	0
1982	134	0	1		1	0.7
1983	145	7	5		12	8.3
1984	145	0	1		1	0.7
1985	132	0	0		0	0
1986	107	0	0		0	0

DeLong
et al, 1991

¹⁴C residues in Californian Sea Lion blubber ($\mu\text{g}\cdot\text{g}^{-1}$ wet wt.), mean $\pm$ SD. NA = not analysed, ND = not detected, NR = not reported, SMSV = San Miguel Sea Lion Virus (see text), Calc. = author's recalculated data.

Sample type	Site	Date	Number, sex	% Lipid	$P, P' - \text{DDE}$	ΣDDT	PCB	<i>Leptospira</i> present	SMSV present	Reference
Healthy	Southern California	Fall 1970	4, M	74.3 (Calc.)	852 (Calc.)	906 $\pm$ 640	NA	NR	NR	Le Boeuf and Bonnell 1971
Sick, killed	Southern California	Fall 1970	6, M	67.4 (Calc.)	648 (Calc.)	689 $\pm$ 164	NA	NR	NR	Le Boeuf and Bonnell 1971
Dead, stranded	Southern California	Fall 1970	14, M	59.6 (Calc.)	945 (Calc.)	1006 $\pm$ 645	NA	NR	NR	Le Boeuf and Bonnell 1971
Full-term 12 yr	Southern California	Spring 1970	4, F	85	80-93% ΣDDT	103 $\pm$ 70	17 $\pm$ 6.1	NR	NR	DeLong et al. 1973
Premature 8 yr	Southern California	Spring 1970	6, F	84	80-93% ΣDDT	824 $\pm$ 168	112 $\pm$ 24	ND	NR	DeLong et al. 1973
Full-term 12 yr	Southern California	Spring 1972	10, F	NR	83 $\pm$ 102	88 $\pm$ 105	13.2 $\pm$ 11.6	1 (or 2?) /10	All	Gilmartin et al. 1976
Premature 8 yr	Southern California	Spring 1972	10, F	NR	630 $\pm$ 258 (n = 8) (Calc.)	652 $\pm$ 254 (n = 8) (Calc.)	57 $\pm$ 17 (n = 8) (Calc.)	4/10	All	Gilmartin et al. 1976
Healthy 4-8 yr	Oregon	Fall 1971	6, M	41.6 $\pm$ 25.3	253 $\pm$ 116	272 (Calc.)	34 $\pm$ 21	NR	NR	Buhler et al. 1975
Healthy 4-6 yr	Oregon	Fall 1973	3, M	64.7 $\pm$ 6.8	342 $\pm$ 234	NR	21 $\pm$ 2	NR	NR	Buhler et al. 1975
Sick	Oregon	Fall 1970	7, M	56.4 $\pm$ 10.6	358 $\pm$ 213	NR	24.2 $\pm$ 11.5	Inferred	NR	Buhler et al. 1975
Sick	Oregon	Fall 1971	2, M	35.3 $\pm$ 27.4	475 $\pm$ 311	NR	28.5 $\pm$ 2.1	Inferred	NR	Buhler et al. 1975

ADDISON,
1989

OC residues in California Sea Lion liver and brain ($\mu\text{g}\cdot\text{g}^{-1}$ lipid, mean $\pm$ SD).

Sample type	Tissue	Site	Date	Number, sex	% Lipid	p, p' - DDE	Σ DDT	PCB	Reference
Full-term adult, 12 yr	Liver	Southern California	Spring 1970	4, F	4.4	80-93% Σ DDT	6.7 ± 5.1	1.3 ± 0.8	DeLong et al. 1973
Premature adult, 8 yr	Liver	Southern California	Spring 1970	6, F	1.7	80-93% Σ DDT	25 ± 4	5.7 ± 3.5	DeLong et al. 1973
Full-term pup	Brain	Southern California	Spring 1970	4, ?	4.8	80-93% Σ DDT	1.2 ± 1.1	0.2 ± 0.05	DeLong et al. 1973
Premature pup	Brain	Southern California	Spring 1970	6, ?	3.3	80-93% Σ DDT	2.4 ± 1.3	0.5 ± 0.3	DeLong et al. 1973

Estimates of age specific mortality rates of harbor seals from southern Alaska.

Age	Female mortality rate	Male mortality rate
0	0.550	0.600
1	0.240	0.270
2	0.150	0.180
3	0.110	0.130
4	0.109	0.106
5	0.100	0.102
6	0.092	0.096
7	0.090	0.093
8	0.088	0.088
9	0.090	0.088
10	0.085	0.088
11	0.085	0.087
12	0.092	0.095
13	0.083	0.093
14	0.091	0.090
15	0.089	0.099
16	0.098	0.094
17	0.108	0.100
18	0.106	0.105
19	0.110	0.150
20	0.125	0.170
21	0.135	0.200
22	0.150	0.250
23	0.175	0.320
24	0.210	0.400
25	0.245	0.550
26	0.290	0.667
27	0.330	1.000
28	0.340	
29	0.450	
30	0.670	
31	1.000	

Blood chemistries from Steller pups at Marmot Island, AK and reference values.

Sample date	Subject ID no.	Mass (kg)	SG WB (gm/ml)	SG PL (gm/ml)	Plasma %water	Blood %water	RBC %water	HCT (%)	Hb (gm%)	MCHC	Ketones (mM)	Glucose (mM)	FFA (mM)	BUN (mg%)
6/26/90	801	17	1.049	1.021	94.3	78.3	66.9	60.0	19.4	32.3	0.32		1.75	14.1
6/27/90	802	28	1.061	1.024	94.0	83.7	70.8	46.5	15.3	32.9	0.44	8.4	0.69	10.2
6/27/90	803	27	1.049	1.018	93.3	80.5	68.3	53.0	18.1	34.2	0.15	9.1	0.22	16.2
6/27/90	804	27	1.042	1.021	93.6	81.0	67.4	50.0	16.7	33.4	0.27	8.1	0.42	14.0
6/27/90	805	21	1.055	1.018	93.1	83.4	70.2	44.7	14.8	33.1	0.21	12.4	0.59	11.0
6/27/90	806	21	1.044	1.022	94.2	82.9	67.7	44.7	14.8	33.1	0.43	7.7	0.57	16.0
6/27/90	807	21		1.018	93.8			55.0	17.5	31.8	0.45	5.9	0.54	10.9
6/27/90	808	33		1.019	93.6			51.5	17.0	33.0	0.31	7.2	0.79	4.8
6/27/90	809	32		1.014	94.1			48.5	16.2	33.4	0.24	8.2	0.37	8.3
6/30-7/4/91	301	25		1.016	92.9						0.25	11.4	1.34	14.0
6/30-7/4/91	303	20		1.017	93.1						0.2	8.6	0.73	14.3
6/30/91	305	22		1.012	93.2						0.16	9.9	1.42	12.9
6/30-7/4/91	307	25		1.016	93.3						0.23	9.6	1.82	19.0
6/30-7/4/91	309	28		1.013	92.7						0.19	9.6	1.57	11.5
7/4/91	311	24		1.013	93.1						0.13	7.7	2.11	11.8
6/30-7/4/91	313	21		1.014	93.0						0.18	8.7	1.54	12.6
6/30/91	315	19		1.018	93.3						0.11	7.8	2.05	19.9
7/4/91	317	14		1.018	93.5						0.35	6.2	3.3	15.4
Mean			1.050	1.017	93.4	81.6	68.5	50.4	16.6	33.0	0.26	8.6	1.2	13.2
SD			0.006	0.003	0.4	1.9	1.5	4.8	1.5	0.6	0.10	1.6	0.8	3.5
(a) Steller pups (1968)			na	na	na	na	na	48.6	16.2	33.3	na	5.9	na	21.3
(b) Northern fur seal			na	na	91.1	77.1	70.9	46.3	16.3	35.3	na	8.3	na	40.8
(c) California sea lion			1.063	1.025	90.3	77.2	69.8	48	12-20	32-38	na	8.6	na	17.5
(d) Suckling elephant seal pup			1.071	1.022	90-93	72.9	67-68	48.4	18-22	33-39	0.1	7-9	1-3	25-35

References: (a) Hubbard 1968; (b) Hubbard 1968, Castellini and Castellini 1989; (c) Hubbard 1968, Castellini and Castellini 1989, Bossart and Dierauf 1990; (d) Costa and Ortiz 1982, Castellini and Castellini 1989, Castellini and Costa 1990, Castellini *et al.* 1990, Castellini and Rea 1992.

Key: SG = specific gravity; WB = whole blood; PL = plasma; RBC = red blood cells; HCT = hematocrit; Hb = hemoglobin; MCHC = mean corpuscular hemoglobin concentration; FFA = free fatty acids; BUN = blood urea nitrogen.

Eumetopias jubatus. Differential and total white blood cell (WBC) counts from Steller sea lion pups. Data reported as means $\pm$ 1 SD. All values reported as percentages except for total WBCs, which are reported as cells μl^{-1} . GOA: Gulf of Alaska; SEA: Southeast Alaska

	White Sisters (N = 4)	Hazy Island (N = 1)	Forrester Island (N = 3)	Outer Island (N = 4)	Seal Rocks (N = 5)	SEA (N = 8)	GOA (N = 9)	All (N = 17)
Neutrophils	66.0 $\pm$ 6.7	62.7 $\pm$ 5.8	66.0 $\pm$ 3.2	68.6 $\pm$ 8.3	70.3 $\pm$ 6.2	65.6 $\pm$ 5.4	69.5 $\pm$ 7.1	67.7 $\pm$ 6.6
Banded neutrophils	1.1 $\pm$ 1.4	6.0 $\pm$ 2.7	2.1 $\pm$ 1.4	2.1 $\pm$ 1.2	2.5 $\pm$ 1.6	2.1 $\pm$ 2.2	2.3 $\pm$ 1.4	2.2 $\pm$ 1.8
Monocytes	8.3 $\pm$ 2.6	18.7 $\pm$ 4.6	11.7 $\pm$ 4.4	13.1 $\pm$ 6.0	11.2 $\pm$ 3.4	10.9 $\pm$ 4.8	12.0 $\pm$ 4.7	11.5 $\pm$ 4.8
Lymphocytes	18.3 $\pm$ 5.1	9.7 $\pm$ 1.2	18.2 $\pm$ 4.7	13.4 $\pm$ 4.0	13.1 $\pm$ 6.3	17.2 $\pm$ 5.3	13.2 $\pm$ 5.3	15.1 $\pm$ 5.6
Eosinophils	6.2 $\pm$ 3.1	3.0 $\pm$ 2.6	2.0 $\pm$ 1.0	2.8 $\pm$ 2.0	2.9 $\pm$ 2.7	4.2 $\pm$ 3.1	2.8 $\pm$ 2.4	3.5 $\pm$ 2.8
Total WBCs	7833 $\pm$ 1337	11333 $\pm$ 1155	7111 $\pm$ 1054	9000 $\pm$ 1348	9333 $\pm$ 1633	8000 $\pm$ 1769	9185 $\pm$ 1495	8627 $\pm$ 1720

Eumetopias jubatus. Red blood cell (RBC) morphology and counts from Steller sea lion pups. Data reported as means $\pm$ 1 SD. All values reported as percentages. GOA: Gulf of Alaska; SEA: Southeast Alaska

	White Sisters (N = 4)	Hazy Island (N = 1)	Forrester Island (N = 3)	Outer Island (N = 4)	Seal Rocks (N = 5)	SEA (N = 8)	GOA (N = 9)	All (N = 17)
Normal RBCs	87.2 $\pm$ 5.7	81.5 $\pm$ 7.8	77.9 $\pm$ 6.9	78.5 $\pm$ 9.9	65.7 $\pm$ 12.0	83.0 $\pm$ 7.5	71.4 $\pm$ 12.7	76.9 $\pm$ 12.0
Poikilocytes	6.7 $\pm$ 3.9	10.3 $\pm$ 4.0	20.5 $\pm$ 7.0	10.3 $\pm$ 5.4	5.5 $\pm$ 5.1	12.3 $\pm$ 8.3	7.6 $\pm$ 5.7	9.8 $\pm$ 7.4
Target cells	6.1 $\pm$ 5.2	7.5 $\pm$ 4.5	0.9 $\pm$ 1.2	11.0 $\pm$ 8.7	27.5 $\pm$ 15.2	4.3 $\pm$ 4.7	20.2 $\pm$ 15.1	12.7 $\pm$ 13.9
Polychromasia	0.1 $\pm$ 0.2	0.7 $\pm$ 0.3	0.4 $\pm$ 0.6	0.1 $\pm$ 0.2	0.7 $\pm$ 0.6	0.3 $\pm$ 0.5	0.4 $\pm$ 0.6	0.4 $\pm$ 0.5
Howell-Jolly bodies	0.0	0.0	0.2 $\pm$ 0.2	0.1 $\pm$ 0.3	0.1 $\pm$ 0.3	0.1 $\pm$ 0.2	0.1 $\pm$ 0.3	0.1 $\pm$ 0.2
Spherocytes	0.0	0.0	0.0	0.0	0.0 $\pm$ 0.1	0.0	0.0 $\pm$ 0.1	0.0
Stomatocytes	0.0 $\pm$ 0.1	0.0	0.0	0.0 $\pm$ 0.1	0.5 $\pm$ 0.7	0.0 $\pm$ 0.1	0.3 $\pm$ 0.6	0.2 $\pm$ 0.4

Steller sea lion, *Eumetopias jubatus*, mean pup masses (kg) by date, sex, and rookery, collected during 1987-94. *n* indicates number of pups weighed, and SD indicates standard deviation of the mean value. *T*-value represents the Student's *t* calculated for the comparison of male and female masses for the site and year combination. All *t*-tests were significant at $P < 0.01$.

Site	Weighing date	Female mass			Male mass			<i>t</i> -value	
		<i>n</i>	Mean (kg)	SD	<i>n</i>	Mean (kg)	SD		
Oregon									
Rogue Reef	30 Jun 1987	56	20.70	3.39	44	24.90	3.33	6.20	
	29 Jun 1888	46	20.00	3.38	54	23.40	3.66	4.79	
	7 Jul 1990	20	21.38	2.90	25	23.88	3.85	2.41	
SE Alaska (Forrester Island Complex)									
North Rock	28 Jun 1990	56	24.10	3.03	49	26.40	4.69	3.02	
Cape Horn Rock and Lowrie	29 Jun 1990	64	25.70	3.31	70	29.60	4.89	5.36	
Gulf of Alaska									
Sugarloaf	1 Jul 1992	23	23.30	3.57	27	27.30	3.88	5.84	
Marmot	30 Jun 1987	89	25.40	3.68	60	29.20	4.20	2.81	
	30 Jun 1988	29	26.40	4.05	21	29.70	4.16	3.54	
	8 Jul 1993	19	29.70	5.51	32	35.60	5.89	3.77	
Chirikof	26 Jun 1990	27	22.20	3.18	34	28.00	4.60	5.50	
Atkins	30 Jun 1991	24	28.40	3.70	26	31.60	4.60	2.70	
Aleutian Islands									
Ugamak	2 Jul 1990	28	27.40	3.70	22	32.50	6.70	3.42	
	3 Jul 1991	25	30.30	3.60	25	36.40	4.30	5.44	
	3 Jul 1993	15	28.10	4.05	35	33.90	5.57	3.63	
Akutan	7 Jul 1992	20	31.80	4.72	30	37.80	5.75	3.87	
Bogoslof	5 Jul 1990	23	28.70	3.90	27	36.00	5.60	5.26	
Seguam	27 Jun 1994	27	26.98	5.00	23	35.51	4.96	6.01	
Ulak	3 Jul 1994	25	30.44	4.28	25	38.50	5.53	5.79	

Stellar sea lion, *Eumetopias jubatus*, pup masses (kg) by date, sex, and rookery, collected during 1965 and 1975 at Sugarloaf and Marmot Islands in the Gulf of Alaska. *n* indicates number of pups weighed, and SD indicates standard deviation of the mean value.

Site	Weighing date	Female mass			Male mass		
		<i>n</i>	Mean (kg)	SD	<i>n</i>	Mean (kg)	SD
Sugarloaf	1 Jul 1965	7	19.70	2.27	13	24.90	2.73
	14 Jul 1965	9	23.80	3.13	11	29.30	5.83
	13 Jul 1975	16	23.90	3.04	35	27.40	6.99
Marmot	17 Jul 1975	21	25.30	3.92	29	30.80	4.35

Geometric means and ranges ($\mu\text{g}\cdot\text{g}^{-1}$ wet wt.) of Cd, Pb, Hg, Se, As, and organochlorine concentrations in 23 harbor seals from Kodiak, Alaska.

	Total (23)	Male (15)	Female (8)	Range	Frequency (%)	sex (significant diff. $P \leq 0.05$)	age ($P \leq 0.05$)
Kidney							
Cd	6.6	11.2	2.5	0.3 - 44.0	100	F=7.68(3,19) ^a	t=4.44(19) ^b
Pb	0.8	0.7	0.9	0.3 - 2.2	100		
Liver							
As	0.08	0.09	0.08	n.d. ^c - 0.9	56		
Pb	0.7	0.7	0.7	0.2 - 2.1	100		t=2.87(19) ^b
Hg	5.0	4.8	5.5	0.4 - 72.0	100		t=4.32(19) ^b
Se	1.6	1.4	1.9	0.2 - 18.0	100		
Blubber ^d							
DDE	0.9	1.2	0.6	0.2 - 2.4	100		
DDT	0.1	0.2	0.07	n.d. - 0.4	68	F=3.79(3,18)	
Oxychlorane	0.09	0.1	0.06	n.d. - 0.3	55		
PCBs	2.2	2.1	2.3	n.d. - 6.6	95		

^a () = degrees of freedom.^b significant in male seals only - no correlation of age and residues in females.^c n.d. = not detected.^d residues from 22 seals.

TABLE 117

CALAMBOXIDIS

Petal, 1984

Summary of PCB and DDE residues (ppm wet wt) in blubber of harbor seals separated by location, sex, and age class. Samples analyzed at the Evergreen State College. Geometric means and standard deviation intervals given. Two samples with incomplete results (one in Table 4, and one in Table 7) are not included in these summaries.

Description		n	PCB		DDE		PCB/DDE Ratio	
			geom. mean	s.d. int.	geom. mean	s.d. int.	geom. mean	s.d. int
<u>Southern Puget Sound</u>								
Male	Pup	3	31	15-64	2.6	0.93-7.4	12	8.4-16
	Subadult	4	72	38-130	6.7	3.9-11	11	9.7-12
	Adult	3	240	210-280	17	15-20	14	12-16
Female	Pup	4	97	58-160	12	7.2-21	7.9	6.2-10
	Subadult	5	310	170-570	30	21-41	10	7.8-14
	Adult	1	21	- -	1.3	- -	16	- -
All SPS samples		20	110	39-310	10	3.5-29	11	8.2-15
<u>Hood Canal</u>								
Male	Pup	6	12	7.4-21	1.8	1.0-3.1	6.8	5.8-7.9
	Subadult	0	-	- -	-	- -	-	-
	Adult	2	93	82-100	13	12-14	7.3	7.1-7.4
Female	Pup	1	8.3	- -	1.0	- -	8.3	-
	Subadult	0	-	- -	-	- -	-	-
	Adult	0	-	- -	-	- -	-	-
All HC samples		9	18	6.7-51	2.6	0.95-7	7.0	6.2-8.0
<u>Northern Puget Sound</u>								
Male	Pup	1	9.8	- -	2.6	- -	3.8	-
	Subadult	0	-	- -	-	- -	-	-
	Adult	2	27	24-30	9.5	8.4-11	2.8	2.3-3.5
Female	Pup	6	8.3	4.5-15	2.3	1.1-4.8	3.7	2.4-5.7
	Subadult	0	-	- -	-	- -	-	-
	Adult	0	-	- -	-	- -	-	-
All NPS samples		9	11	5.4-22	3.2	1.3-7.5	3.5	2.4-5.3
<u>Outer Coast</u>								
Male	Pup	5	6.2	3.1-13	2.9	1.5-5.8	2.1	1.5-2.9
	Subadult	11	16	9.4-28	9.3	5.6-15	1.7	1.4-2.1
	Adult	6	24	15-39	12	9.5-16	2.0	1.4-2.9
Female	Pup	1	1.9	- -	0.80	- -	2.4	-
	Subadult	3	13	7.9-22	5.7	1.9-17	2.3	1.2-4.4
	Adult	7	17	6.5-43	6.3	2.6-15	2.7	2.0-3.5
All OC samples		33	14	6.1-32	6.7	2.9-16	2.1	1.5-2.9

DDT plus PCB concentrations (ppm wet wt) in the blubber of harbor seals collected in 1971 from Southern Puget Sound, reported by Anas (1974a). Author did not separate PCB from DDT residues.

Location	Tissue	Age (yrs)	N	PCB+DDT	
				geom mean	(range) ppm wet wt
Puget Sound, WA	blubber	1	2	862.7	(459-1620)

PCB and DDE concentrations (ppm wet wt) in the blubber of harbor seals from Washington State, reported by Arndt (1973).

Location	Tissue	N	Total DDT		PCB	
			arith mean(range)	ppm wet wt	arith mean(range)	ppm wet wt
Southern Puget Sound	blubber	10	9.7 (.52-30.)		131 (4.1-374)	
	liver	11	0.18 (0-.55)		2.5 (0-9.6)	
Northern Puget Sound	blubber	7	6.6 (2.1-16.5)		44 (12.8-78)	
	liver	8	.11 (.04-.43)		.69 (.28-2.2)	
Grays Harbor	blubber	13	5.34 (.88-14.4)		47.8 (13.8-136)	
	liver	14	.16 (.04-.33)		1.1 (.17-2.4)	

CALAMBOKIDIS
et al, 1984

PCB concentrations (ppm) reported in blubber of pinnipeds. See Table Explanation for description.

LOC	SPEC. LOCATION	YR	AGE	SEX	W	N	MEAN	LOW	HIGH	REFERENCE
<i>Uca vitulina</i>										
	Southern Puget Sound	72	M	M	W	9	145.00	16.20	374.00	Arndt 1973
1	Northern Puget Sound	72	M	M	W	7	44.00	12.80	77.70	Arndt 1973
1	Grays Harbor, WA	72	M	M	W	13	47.80	13.80	136.00	Arndt 1973
1	California coast	75	N	B	L	4	43.10	4.50	120.00	Risebrough 1978
1	San Francisco Bay	76	N	B	L	4	66.00	16.00	120.00	Risebrough 1978
1	San Francisco Bay	76	A	F	L	2	195.00	140.00	250.00	Risebrough 1978
1	San Francisco Bay	75	A	M	L	1	500.00			Risebrough 1978
1	Willapa Bay, WA	76	A	F	D	1	46.00			Risebrough 1978
1	So. Puget Sound, WA	75	T	B	D	10	134.00	26.00	370.00	Risebrough 1978
3	Gulf of Maine	71	U	B	W	6	92.50	27.90	240.20	Gaskin et al 1973
3	New Brunswick	71	U	M	W	3	52.30	43.00	63.00	Gaskin et al 1973
3	New Brunswick	71	L	F	W	1	7.10			Gaskin et al 1973
3	New Brunswick	71	U	F	W	1	7.10			Gaskin et al 1973
4	Geraan N Sea coast	75	T	U	W	56	152.00	27.30	564.00	Drescher et al 1977
4	Shetland, Scotland		N	B	W	4	4.00	2.00	6.00	Holden 1972
4	Scotland	69	N	B	W	17	12.00	5.00	20.00	Holden 1972
4	Clyde, W. Scotland		M	B	W	3 ^a	75.00	58.00	99.00	Holden 1972
4	Scroby, E England		M	F	W	3	131.00	93.00	185.00	Holden 1972
4	Wash, E England		N	B	W	12	15.00	7.00	24.00	Holden 1972
4	W. Scotland		A	U	W	8	65.80			Holden 1978
4	Swedish west coast		U	U	N	3	12.00	5.70	19.00	Jensen and Olsson 1976
4	North Sea, E of Scot	78	S	B	L	3	446.00	120.00	661.00	Kerkhoff et al 1981
8	Dutch Wadden Sea	78	M	M	W	7	189.00	22.00	576.00	Duinker et al 1979
6	Baltic proper		U	U	N	1	31.00			Jensen and Olsson 1976
8	Sweden, Baltic	68	U	U	W	2 ^a	15.00	8.50	21.00	Jensen et al 1969
8	Wadden Sea, Dutch	71	M	U	W	8	1009.00	47.00	2530.00	Koeman et al 1972
8	W Coast of Sweden	75	U	U	L	11	230.00			Olsson 1978
8	W Coast of Sweden	71	T	B	L	6	60.00	28.00	116.00	Olsson et al 1975
8	Baltic, Sweden	71	T	B	L	3	707.00 ^c	630.00	750.00	Olsson et al 1975
8	Wadden Sea, Ger & Dan	75	S	U	W	8	113.80	23.00	340.00	Reijnders 1980
8	Wadden Sea, Ger & Dan	75	A	U	W	6	76.40	40.50	123.00	Reijnders 1980
8	Wadden Sea, Meth	75	S	U	W	6	134.00	5.00	680.00	Reijnders 1980
8	Wadden Sea, Meth	75	A	U	W	8	701.00	87.00	1447.00	Reijnders 1980
8	Wadden Sea, S Dutch	81	U	U	L	7		119.00	2516.00	Reijnders 1982b
<i>Zalophus californianus</i>										
1	Oregon coast	71	A	U	W	6	34.10			Buhler et al 1975
1	Oregon coast	73	A	M	W	3	21.20			Buhler et al 1975
1	San Miguel Is, CA	70	S	F	W	6 ^b	112.40	85.00	145.00	DeLong et al 1973
1	San Miguel Is, CA	70	A	F	W	4	17.10	12.00	25.00	DeLong et al 1973
1	San Miguel Is, CA	72	S	F	W	8 ^b	57.20	33.00	92.40	Gilmartin et al 1976
1	San Miguel Is, CA	72	A	F	W	10	13.20	4.73	39.50	Gilmartin et al 1976

See Table Explanations for footnote descriptions.

Cascadia Research, 10/15/83

Contaminant concentrations in various tissues of pinnipeds.
Explanations of headings and footnotes.

LOC = location code:
 1 = North Pacific, east coast (south of Arctic)
 2 = North Pacific, west coast (south of Arctic)
 3 = North Atlantic, west coast (south of Arctic)
 4 = North Atlantic, east coast (south of Arctic)
 5 = Arctic
 6 = Antarctic
 8 = Protected European

SPEC. LOCATION = specific location

YR = year sample collected, if samples were collected over several years, the midpoint was reported

AGE = age class of sample:
 A = adults
 S = subadults
 N = pup
 T = all age classes mixed
 M = mixed age classes, select groups (e.g., mothers and pups)
 L = lactating female
 P = pregnant female
 F = fetus
 U = unknown

SEX = sex of sample:
 F = female
 M = male
 B = mixed sexes
 U = unknown

W = weight basis of the pollutant concentration:
 L = lipid weight
 D = dry weight
 V = wet weight

N = number in sample

MEAN, LOW, and HIGH — Concentrations as reported or calculated for each data set, all values listed with 2 decimal places regardless of number of significant figures reported, 0 = below level of detection or <0.01 ppm.

REFERENCE — source of information, see References section for full citation

Footnotes
 a = some samples of a different species may be mixed in
 b = sample consists of animals that were showing some type of dysfunction
 c = residue values for these animals identified as unusually high by the author, possibly due to the condition of the animal (or other unknown factors)
 d = residue levels reported as p,p'DDE only, not total DDT
 e = Total DDT = sum of all DDT and metabolites reported, may include combinations of some or all of the following: p,p'DDE, o,p'DDE, p,p'DDD, o,p'DDD, p,p'DDT, and o,p'DDT.
 g = geometric mean

Total DDT concentrations (ppm) in blubber of pinnipeds. See Table Explanation for description.

LOC	SPEC. LOCATION	YR	AGE	SEX	W	M	MEAN	LOW	HIGH	REFERENCE
<i>Phoca vitulina</i>										
1	Southern Puget Sound	72	M	M	W	9	9.49	0.27	29.60	Arndt 1973
1	Northern Puget Sound	72	M	M	W	7	6.63	2.07	16.50	Arndt 1973
1	Grays Harbor, WA	72	M	M	W	13	5.34	0.88	14.40	Arndt 1973
1	California coast	75	M	B	L	4	26.30	13.00	37.20	Risebrough 1978
1	San Francisco Bay	76	M	B	L	4	14.80	9.50	21.00	Risebrough 1978
1	San Francisco Bay	76	A	F	L	2	55.70	46.90	64.40	Risebrough 1978
1	San Francisco Bay	75	A	M	L	1	163.00			Risebrough 1978
1	Willapa Bay, WA	76	A	F	D	1	38.00 ^d			Risebrough 1978
1	So. Puget Sound, WA	75	T	B	D	10	22.70 ^d	6.30	51.00	Risebrough 1978
1	So. Puget Sound, WA	75	T	B	D	10	22.70 ^d	6.30	51.00	Risebrough 1978
1	Central Calif waters	70	U	M	W	1	18.00			Shaw 1971
1	Central Calif waters	70	U	F	W	1	158.00			Shaw 1971
3	Gulf of Maine	71	U	B	W	6	65.40	25.30	139.10	Gaskin et al 1973
3	New Brunswick	71	U	M	W	3	38.40	29.10	52.10	Gaskin et al 1973
3	New Brunswick	71	L	F	W	1	8.64			Gaskin et al 1973
4	German N Sea coast	75	T	U	W	56	8.75	2.20	27.20	Drescher et al 1977
4	Shetland, Scotland		M	B	W	4	2.60	1.60	3.50	Holden 1972
4	Mull, W Scotland	69	M	B	W	17	5.40	1.80	8.80	Holden 1972
4	Clyde, W Scotland		M	B	W	3 ^a	25.20	19.00	31.00	Holden 1972
4	Wash, E England		M	B	W	12	6.50	3.50	9.70	Holden 1972
4	Scroby, E England		M	B	W	3	23.90	15.60	23.00	Holden 1972
4	W. Scotland		A	U	W	8	22.30			Holden 1978
4	Swedish west coast		U	U	M	3	22.00	6.90	49.00	Jensen and Olsson 1976
4	North Sea, E of Scot	78	S	B	L	3	24.70	12.00	47.00	Kerkhoff et al 1981
8	Dutch Wadden Sea	78	M	M	W	7	10.90	1.70	25.40	Duinker et al 1979
8	Baltic proper		U	U	M	1	210.00			Jensen and Olsson 1976
8	Sweeden, Baltic	68	U	U	W	2 ^a	66.00	58.00	74.00	Jensen et al 1969
8	Wadden Sea, Netherlan	64	U	U	W	3	16.40	9.60	27.40	Koeman and Genderen 1966
8	Wadden Sea, Dutch	71	A	U	W	5	9.50	6.50	17.30	Koeman et al 1972
8	W Coast of Sweeden	75	U	U	L	11	84.00			Olsson 1978
8	West coast, Sweden	71	T	B	L	6	46.00	12.00	82.00	Olsson et al 1975
8	Baltic, Sweden	71	T	B	L	3	1063.00 ^c	340.00	1900.00	Olsson et al 1975
8	Wadden Sea, Ger & Dan	75	S	U	W	8	16.90	4.00	47.10	Reijnders 1980
8	Wadden Sea, Ger & Dan	75	A	U	W	6	8.50	3.70	15.20	Reijnders 1980
8	Wadden Sea, Neth	75	S	U	W	6	29.80	3.30	127.00	Reijnders 1980
8	Wadden Sea, Neth	75	A	U	W	8	47.30	6.60	178.00	Reijnders 1980
<i>Zalophus californianus</i>										
1	Oregon coast	71	A	U	W	6	253.00 ^d			Buhler et al 1975
1	Oregon coast	73	A	M	W	3	342.00 ^d			Buhler et al 1975
1	San Miguel Is, CA	70	S	F	W	6 ^b	824.40	626.00	1039.00	DeLong et al 1973
1	San Miguel Is, CA	70	A	F	W	4	103.20	51.00	203.00	DeLong et al 1973
1	San Miguel Is, CA	72	S	F	W	8 ^b	651.00	365.00	974.00	Gilmartin et al 1976
1	San Miguel Is, CA	72	A	F	W	10	87.60	18.50	351.00	Gilmartin et al 1976
1	California coast	70	U	U	W	25	911.00	41.00	2678.00	LeBoeuf and Bonnell 1971

See Table Explanations for footnote descriptions.

Cascadia Research, 10/15/83

Contaminant concentrations in various tissues of pinnipeds.
Explanations of headings and footnotes.

LOC = location codes:
 1 = North Pacific, east coast (south of Arctic)
 2 = North Pacific, west coast (south of Arctic)
 3 = North Atlantic, west coast (south of Arctic)
 4 = North Atlantic, east coast (south of Arctic)
 5 = Arctic
 6 = Antarctic
 8 = Protected European

SPEC. LOCATION = specific location

YR = year sample collected, if samples were collected over several years, the midpoint was reported

AGE = age class of sample:
 A = adults
 S = subadults
 M = pup
 T = all age classes mixed
 N = mixed age classes, select groups (e.g., mothers and pups)
 L = lactating female
 P = pregnant female
 F = fetus
 U = unknown

SEX = sex of sample:
 F = female
 M = male
 B = mixed sexes
 U = unknown

W = weight basis of the pollutant concentration:
 L = lipid weight
 D = dry weight
 V = wet weight

N = number in sample

MEAN, LOW, and HIGH -- Concentrations as reported or calculated for each date set, all values listed with 2 decimal places regardless of number of significant figures reported, 0 = below level of detection or <.01 ppm.

REFERENCE -- source of information, see References section for full citation

Footnotes

- a = some samples of a different species may be mixed in
 b = sample consists of animals that were showing some type of dysfunction
 c = residue values for these animals identified as unusually high by the author, possibly due to the condition of the animal (or other unknown factors)
 d = residue levels reported as p,p'DDE only, not total DDT
 e = Total DDT = sum of all DDT and metabolites reported, may include combinations of some or all of the following: p,p'DDE, o,p'DDE, p,p'DDD, o,p'DDD, p,p'DDT, and o,p'DDT.
 f = geometric mean

TABLE 122

Samples collected from marine mammals for histopathology and future contaminant analysis, from 5 October 1983 to 29 January 1985.

Species	# animals examined	# samples collected							
		Chlor hydro.				Heavy metals			Histo path
		Bl	Mu	Li	Br	Li	Ki	Sp	
Harbor seal <u>Phoca vitulina</u>	142	112	91	95	55	94	97	87	74
California sea lion <u>Zalophus californianus</u>	2	2	1	2	-	2	2	-	2
Northern sea lion <u>Eumatopias jubatus</u>	2	2	-	1	-	1	1	1	1
Northern fur seal <u>Callorhinus ursinus</u>	1	1	1	1	-	1	1	1	1
Killer whale <u>Orcinus orca</u>	1	1	1	1	-	1	1	1	1
Minke whale <u>Balaenoptera</u> <u>acutorostrata</u>	1	1	1	1	-	1	1	-	-
Gray whale <u>Eschrichtius robustus</u>	3	3	1	1	1	1	1	-	-
River otter <u>Lutra canadensis</u>	23	23	22	23	-	23	23	20	-

Codes: Bl=blubber, Mu=muscle, Li=liver, Br=brain, Ki=kidney, Sp=spleen.

CALAMBOUKIATIS
et al, 1985

THE CONCENTRATIONS OF HEAVY METALS AND METALLOTHIONEIN IN THE LIVER AND KIDNEY OF THE HARBOR SEAL (*Phoca vitulina*)

ID	Sex	Body length (cm)	Liver (µg/g wet tissue)				Kidney (µg/g wet tissue)					
			Cd	Cu	I-Hg	Zn	MT	Cd	Cu	I-Hg	Zn	MT
1	— ^a	150	2.83	17.5	7.04	50.1	215	7.09	9.64	0.88	34.2	271
2	— ^a	140	N.D.	15.8	0.90	42.5	223	5.11	7.34	0.38	30.8	273
3	— ^a	135	8.08	23.8	1.91	52.0	342	25.58	6.73	0.69	45.6	688
4	F	90	N.D.	9.1	0.11	42.9	386	N.D.	10.40	0.22	54.4	763
5	F	130	2.08	12.3	1.96	44.6	134	7.26	5.82	0.64	27.4	147
6	F	145	4.91	11.1	11.80	46.0	294	18.29	5.43	1.09	39.2	412
7	F	125	1.56	22.2	4.57	55.8	243	5.96	5.60	0.36	31.6	274
8	F	152	11.59	4.2	1.40	50.4	601	26.34	5.45	0.81	45.6	733
9	F	97	N.D.	18.9	0.45	39.9	117	1.93	4.74	0.15	26.0	85
10	F	135	2.08	7.8	1.05	40.6	59	7.52	5.86	0.48	28.2	207
11	F	137	1.64	13.1	0.64	56.9	310	5.71	7.09	0.44	32.7	236
12	M	145	4.28	5.0	4.44	49.3	281	9.93	4.62	0.80	41.2	444
13	F	110	1.12	16.3	3.00	50.8	176	7.53	5.47	0.32	34.4	252
14	M	130	1.71	11.7	2.67	44.5	144	4.30	5.11	0.52	27.3	173
15	M	110	N.D.	7.6	0.89	39.5	78	3.32	5.68	0.49	28.8	194
Mean		129	3.81	13.1	2.86	47.1	240	9.71	6.33	0.55	35.2	343
SD		19	3.30	5.9	3.11	5.6	139	7.88	1.69	0.26	8.3	219
Range		(90–152)	(1.12–11.59)	(4.2–23.8)	(0.11–11.8)	(39.5–56.9)	(59–601)	(1.93–26.34)	(4.62–10.40)	(0.15–1.09)	(26.0–54.4)	(85–763)

^a Not defined.TONYAMA
et al, 1986

CORRELATION OF THE HEAVY METAL LEVELS WITH BODY LENGTH AND WITH THE METALLOTHIONEIN LEVEL IN THE HARBOR SEAL^a

Parameter	Liver				Kidney				Metallo- thionein
	Cd	Cu	I-Hg	Zn	Cd	Cu	I-Hg	Zn	
Body length 255	0.592	-0.149	0.457	0.406	0.534 ^b	-0.120	0.793 ^d	0.005	0.106
	0.724 ^b	-0.216	0.645 ^c	0.425	0.688 ^c	-0.077	0.851 ^d	0.077	0.267
	0.592	-0.314	0.399	0.359	0.534 ^b	0.418	0.770 ^c	0.576 ^b	0.580 ^b
	0.724 ^b	-0.358	0.449	0.385	0.688 ^c	0.413	0.823 ^d	0.592 ^b	0.690 ^b
Metallothionein	0.859 ^d	-0.183	0.057	0.495	0.944 ^d	0.364	0.269	0.966 ^d	1.000
	0.638 ^b	-0.090	0.055	0.633 ^b	0.907 ^d	0.368	0.383	0.952 ^d	1.000
	0.859 ^d	-0.137	0.138	0.591 ^b	0.944 ^d	0.018	0.571 ^b	0.961 ^d	1.000
	0.683 ^b	-0.054	0.318	0.735 ^c	0.907 ^d	0.144	0.683 ^c	0.952 ^d	1.000

^a Figures in the first and third lines and those in the second and fourth lines of each parameter (i.e., body length and metallothionein) denote the correlation coefficient between two given factors with and without logarithmic transformation, respectively. Those in the third and fourth lines were calculated with the omission of the values of the smallest seal (ID 4 in Table 1.). For the calculation of the correlation coefficient of Cd with body length and metallothionein, specimens under the detection limit of Cd were omitted ($n = 11$ and 14 in the liver and the kidney, respectively).

^b Statistically significant at $P < 0.05$.

^c Statistically significant at $P < 0.01$.

^d Statistically significant at $P < 0.001$.

Total number of Steller Sea Lions reported killed in British Columbia on rookeries and non-rookeries during 1912 to 1968. Number of pups included in parentheses.

Year	Rookery							Non-rookeries	Total
	Triangle Island	Sartine Island	Beresford Island	Virgin Rocks	Pearl Rocks	Cape St. James	N. Danger Rocks		
1912								2000	2000
1913			500 (+)	22 (15)	105 (81)				627 (96)
1914				750					750 ^a
1915			2290+(800+)	----- 1556+ -----				242	4088+(800+) ^{ab}
1922					220 (0)				220 (0)
1923				1760 (649)	125 (5)				1885 (654)
1924				2236 (903)	470(312)				2706 (1215)
1925				2587(1067)	240(102)				2827 (1169)
1926				1442 (565)	514(146)				1956 (711)
1927				1493 (635)	170 (40)				1663 (675)
1928				1007 (375)	32 (2)			103	1142 (377)
1929				1217 (522)	126 (7)			16	1359 (529)
1930				1008 (568)	60 (24)				1068 (592)
1931				1286 (523)	71 (12)				1357 (535)
1932				----- 1128 -----					1128
1933				813 (212)	110 (1)				923 (213)
1934				614 (125)	172 (0)				786 (125)
1935				602 (110)	21 (0)				623 (110)
1936			3529 (1043)	167 (73)	111 (2)			60	3867 (1118)
1937			2061 (428)	157 (62)	24 (0)			343	2585 (490)
1938		867(513)	1207 (535)	25 (4)	29 (2)		122	1002	3252 (1054)
1939			821 (815)	139 (34)	13 (0)			272	1245 (449)
1940							75 (0)	59	134 (0)
1941								111	111
1942								208	208
1943								45	45
1944								97	97
1945								293	293
1946								304	304
1947						12		263	275
1948								113	113
1949	26	26	35			50		227	364
1950		----- 1878(220) -----						232	2110 (220)
1951								231	231
1952						50 (0)		202	252 (0)
1953	95 (0)							216	311 (0)
1954		33 (0)				35 (0)	6	106	180 (6)
1955								176	176
1956		165(117)						134	299 (117)
1957								521	521
1958	25	6	6				377(158)	689	1103 (158)
1959	1107(471)	64 (0)	1077 (401)			352(145)	111 (33)	677	3388 (1050)
1960	111 (0)	14 (0)	59 (0)			1438 (0)	121 (62)	310	2053 (62)
1961	35 (0)	38 (5)	35 (0)			543 (0)		165	816 (5)
1962	23 (0)		49 (0)			480 (0)	193 (80)	638	1383 (80)
1963	117 (0)	24	117 (0)			150 (0)	66 (1)	563	1037 (1)
1964	139 (0)	157 (0)	324 (50)			254 (23)		103	977 (73)
1965		----- 309(246) -----				169(110)			478 (356)
1966	43 (0)	25 (0)	64 (0)			44 (0)		51	227 (0)
1967							15	55	70
1968								15	15

^aUp to 75% may have been pups.

^b1063+ were killed on the Virgin Rocks, and hundreds were killed on Pearl Rocks.

Summary of harbor seal harvests on Tugidak Island, Alaska, 1964-1972.

Year	Pup harvest	Total harvest
1964	4,000	5,500
1965	4,100	4,300
1966	2,200	2,275
1967	700	750
1968	800	800
1969	900	900
1970	1,160	1,160
1971	1,100	1,100
1972	1,100	1,100
Totals	16,060	17,885

p,p'-DDE (ug/kg)	
SAMPLE	p,p'-DDE
CALIFORNIA SEA LION	1400
NORTHERN ELEPHANT SEALS	1300
NORTHERN FUR SEALS	510
AUSTRALIAN SEA LIONS	37
ANTARCTIC FUR SEALS	12

Geometric mean levels of DDE, DDT, and the ratio of DDT/DDE ($\times 100$) in male California sea-lion blubber, with a range of one SD in parentheses. Residue values are expressed as mg kg^{-1} wet wt.

1970*			1988-1992		
DDE	DDT	DDT/DDE	DDE	DDT	DDT/DDE
740 (370-1500) $n=12$	17 (8.8-34)	0.023	5.0 (2.5-10) $n=7$	0.16 (0.07-0.35)	0.032

*1970 data were originally reported as arithmetic means (Le Boeuf & Bonnell, 1971).

Estimates of incidental mortality for California sea lions in gillnet fisheries and estimates of fishing effort for each fishery (Julian 1993, 1994, pers. comm. Jan. 1995, Brown and Jeffries 1993).

BARLOW
et al, 1995b

Year	Region	Fishery	Estimate		Est. Mortality rate		
			Kill	S.E.	Kill/ drift	Kill/ day	S.E.
1994 ¹	CA TOTAL	Set net	109 ¹	N.A. ²		0.003	N.A.
	California	Drift	4 ¹	N.A.		0.070	N.A.
1993	Southern CA ³	Set net	354	53.3		0.114	0.017
	Ventura, CA ⁴		937	90.2		0.443	0.043
	Channel Is.,		614	216.1		2.000	0.704
	Central CA ⁵		80	23.5		0.295	0.087
	CA TOTAL		1984	241.3		0.342	0.041
	California	Drift	89	34.3		0.002	0.006
1992	Southern CA	Set net	1164	131.0		0.397	0.448
	Ventura, CA		1242	265.2		0.677	0.145
	Channel Is.,		1164	131.0		0.397	0.045
	Central CA		51	16.1		0.233	0.073
	CA TOTAL		3255	848.9		0.595	0.155
	California	Drift	68	23.0		0.002	0.005
	Columbia R. ⁶	Drift	28		0.004		

¹Through the third quarter

²Not Available

³South of 33° 50'N (excluding Channel Islands)

⁴North of 33° 50'N to 34° 30'N (excluding Channel Islands)

Incidental mortality of marine mammal stocks in selected fisheries which interact substantially with stocks which have total incidental mortality > PBR (potential biological removal level). Mortality is the estimate of annual mortality in that fishery reported in the stock assessments. Estimates are generally from observer program data. LB stands for logbook data which documents unquantified mortality in that fishery. ST stands for stranding data which indicates mortality in that fishery. AN stands for species or stock. Mortality in brackets is for a category of pooled stocks; such stocks are shown sequentially in the table. M/PPBR is the ratio of the mortality estimate to the calculated PBR, which is also shown.

Fishery / Stock	Status	Mortality	M/PPBR	PBR
New England multispecies sink gillnet fishery (observer program 1990-93)				
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	1875	4.65	403
Atlantic white-sided dolphin, W. North Atlantic	Strategic	102	0.82	125
Harbor seal, W. North Atlantic		476	0.28	1729
Minkie whale, Canadian east coast		2.5	0.12	21
Gray seal, NW North Atlantic		4.5	0.04	122
Atlantic pelagic drift gillnet for swordfish/tuna/shark (observer program 1989-93)				
Common dolphin, W. North Atlantic	Strategic	424	13.25	32
Cuvier's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Trout's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Gervais' beaked whale, W. North Atlantic	Strategic	[34]	-	-
Blinville's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Sowerby's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Sperm whale, W. North Atlantic	Strategic	1.6	4	0.4
Atlantic spotted dolphin, W. North Atlantic	Strategic	1.6	3.2	0.5
Pantropical spotted dolphin, W. North Atlantic	Strategic	[22.6]	2.31	9.8
Pilot whale, long-finned, W. North Atlantic	Strategic	[22.6]	-	-
Pilot whale, short-finned, W. North Atlantic	Strategic	[61]	2.18	28
Stripped dolphin, W. North Atlantic	Strategic	[61]	-	-
Risso's dolphin, W. North Atlantic	Strategic	53	0.58	92
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	59	0.53	111
Stripped dolphin, W. North Atlantic	Strategic	27	0.37	73
Humpback whale, W. North Atlantic	Strategic	1	0.1	9.7
Atlantic white-sided dolphin, W. North Atlantic	Strategic	3.1	0.02	125
Spinner dolphin, W. North Atlantic	Strategic	1.4	-	-
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	1	0	403
Atlantic pelagic drift gillnet for swordfish/tuna/shark (observer program 1989-93)				
Common dolphin, W. North Atlantic	Strategic	424	13.25	32
Cuvier's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Trout's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Gervais' beaked whale, W. North Atlantic	Strategic	[34]	-	-
Blinville's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Sowerby's beaked whale, W. North Atlantic	Strategic	[34]	-	-
Sperm whale, W. North Atlantic	Strategic	1.6	4	0.4
Atlantic spotted dolphin, W. North Atlantic	Strategic	1.6	3.2	0.5
Pantropical spotted dolphin, W. North Atlantic	Strategic	[22.6]	2.31	9.8
Pilot whale, long-finned, W. North Atlantic	Strategic	[22.6]	-	-
Pilot whale, short-finned, W. North Atlantic	Strategic	[61]	2.18	28
Stripped dolphin, W. North Atlantic	Strategic	[61]	-	-
Risso's dolphin, W. North Atlantic	Strategic	53	0.58	92
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	59	0.53	111
Stripped dolphin, W. North Atlantic	Strategic	27	0.37	73
Humpback whale, W. North Atlantic	Strategic	1	0.1	9.7
Atlantic white-sided dolphin, W. North Atlantic	Strategic	3.1	0.02	125
Spinner dolphin, W. North Atlantic	Strategic	1.4	-	-
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	1	0	403
Atlantic pelagic drift gillnet for swordfish/tuna/shark (observer program 1992-93)				
Atlantic spotted dolphin, W. North Atlantic	Strategic	[8]	0.82	9.8
Pantropical spotted dolphin, W. North Atlantic	Strategic	[8]	-	-
Pilot whale, long-finned, W. North Atlantic	Strategic	[11]	0.39	28
Pilot whale, short-finned, W. North Atlantic	Strategic	[11]	-	-
Risso's dolphin, W. North Atlantic	Strategic	6.5	0.06	111
U.S. Atlantic coastal gillnet fishery (stranding data 1988-93)				
Bonnetose dolphin, W. North Atlantic, coastal	Strategic	21, ST	0.84	25
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	ST	-	403
Humpback whale, W. North Atlantic	Strategic	ST	-	9.7
Gulf of Mexico pelagic longline fishery for swordfish/tuna/billfish (observer program 1992-93)				
Risso's dolphin, N. Gulf of Mexico		19	0.86	22
Fishery / Stock				
Dwarf sperm whale, W. North Atlantic	Strategic	LB	-	-
Pymy sperm whale, W. North Atlantic	Strategic	LB	-	-
Atlantic mid-water trawl fisheries (for mackerel and squid, logbook data 1990-92, analogy to foreign fish)				
Pilot whale, long-finned, W. North Atlantic	Strategic	LB	-	28
Atlantic white-sided dolphin, W. North Atlantic	Strategic	LB	-	125
Common dolphin, W. North Atlantic	Strategic	AN	-	32
Bonnetose dolphin, W. North Atlantic, offshore	Strategic	AN	-	92
Risso's dolphin, W. North Atlantic	Strategic	AN	-	111
New England groundfish multispecies trawl fishery (observer program 1989-93)				
Pilot whale, long-finned, W. North Atlantic	Strategic	37	1.32	28
Stripped dolphin, W. North Atlantic	Strategic	36	0.49	73
Atlantic white-sided dolphin, W. North Atlantic	Strategic	22	0.18	125
Bonnetose dolphin, W. North Atlantic, offshore	Strategic	18	0.2	92
Atlantic pair trawl fishery for swordfish/tuna/shark (observer program 1991-93)				
Common dolphin, W. North Atlantic	Strategic	24	0.75	32
Bonnetose dolphin, W. North Atlantic, offshore	Strategic	57	0.62	92
Risso's dolphin, W. North Atlantic	Strategic	2.7	0.02	111
Pilot whale, long-finned, W. North Atlantic	Strategic	LB	-	28
Atlantic pelagic longline fishery for swordfish/tuna/billfish (observer program 1992-93)				
Atlantic spotted dolphin, W. North Atlantic	Strategic	[8]	0.82	9.8
Pantropical spotted dolphin, W. North Atlantic	Strategic	[8]	-	-
Pilot whale, long-finned, W. North Atlantic	Strategic	[11]	0.39	28
Pilot whale, short-finned, W. North Atlantic	Strategic	[11]	-	-
Risso's dolphin, W. North Atlantic	Strategic	6.5	0.06	111
U.S. Atlantic coastal gillnet fishery (stranding data 1988-93)				
Bonnetose dolphin, W. North Atlantic, coastal	Strategic	21, ST	0.84	25
Harbor porpoise, Gulf of Maine/Bay of Fundy	Strategic	ST	-	403
Humpback whale, W. North Atlantic	Strategic	ST	-	9.7
Gulf of Mexico pelagic longline fishery for swordfish/tuna/billfish (observer program 1992-93)				
Risso's dolphin, N. Gulf of Mexico		19	0.86	22
Fishery / Stock				
Pilot whale, short-finned, N. G. Mex	Strategic	0.3	0.16	1.9
Atlantic spotted dolphin, N. Gulf of Mexico	Strategic	[1.5]	0.07	23
Pantropical spotted dolphin, N. Gulf of Mexico	Strategic	[1.5]	0.01	265
Bonnetose dolphin, G. Mex., Cont. Shelf	Strategic	[2.8]	0.06	45
Edge/Slope	Strategic	[2.8]	0.01	452
Bonnetose dolphin, G. Mex., Outer Cont. Shelf	Strategic	[2.8]	0.01	452
Gulf of Mexico coastal fisheries (stranding data 1988-93, uncertain fisheries source)				
Bonnetose dolphin, G. Mex., Bays, Sounds, and Estuaries	Strategic	[30] ST	-	39.7
Bonnetose dolphin, G. Mex., western coastal	Strategic	[13] ST	-	29
Bonnetose dolphin, G. Mex., northern coastal	Strategic	[10] ST	-	35
Bonnetose dolphin, G. Mex., eastern coastal	Strategic	[8] ST	-	90
California drift gillnet fishery for swordfish/shark (observer program 1991-93)				
Sperm whale, CA/OR/WA	Strategic	17	1	1
Mesopodion beaked whale, CA/OR/WA	Strategic	7.7	5.5	1.4
Cuvier's beaked whale, CA/OR/WA	Strategic	24	2.7	8.9
Baird's beaked whale, CA/OR/WA	Strategic	0.5	2.5	0.2
Pymy sperm whale, CA/OR/WA	Strategic	5.7	1.2	4.8
Humpback whale, CA/OR/WA-Mexico	Strategic	0.5	1	0.5
Pilot whale, short-finned, CA/OR/WA	Strategic	36	-	-
Bonnetose dolphin, CA/OR/WA offshore	Strategic	7.7	0.43	18
Common dolphin, long-beaked, California	Strategic	17	0.30	56
Northern right whale dolphin, CA/OR/WA	Strategic	46	0.30	151
Minkie whale, CA/OR/WA	Strategic	0.5	0.19	2.6
Common dolphin, short-beaked, CA/OR/WA	Strategic	310	0.17	1792
Risso's dolphin, CA/OR/WA	Strategic	39	0.17	224
Dall's porpoise, CA/OR/WA	Strategic	36	0.06	589
Northern elephant seal, California	Strategic	102	0.06	1743
Pacific white-sided dolphin, CA/OR/WA	Strategic	28	0.03	629
California sea lion, U.S.	Strategic	64	0.02	5052