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FUR SEAL INVESTIGATIONS, 1980

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by

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INTRODUCTION

The northern fur seal (Callorhinus ursinus) is harvested commercially by the United States on St. Paul Island of the Pribilof Islands, Alaska, and by the USSR on its Commander and Robben Islands. Japan and Canada, in return for abstention from pelagic sealing, share in these harvests under terms of the Interim Convention on the Conservation of North Pacific Fur Seals. Under this same Convention, all four countries cooperate in an international program of conservation and research on the species.

Three of the five Pribilof Islands, St. Paul (Figure 1), St. George (Figure 2), and Sea Lion Rock (Sivutch, Figure 1) have fur seal rookeries and hauling grounds. Walrus Island supports a breeding population of northern sea lions (Eumatopias jubatus) and Otter Island, a breeding population of harbor seals (Phoca sp). Two small northern fur seal rookeries are found off the coast of Santa Barbara, California (Figure 3), one at Adams Cove of San Miguel Island and another on nearby Castle Rock. Five other species of pinnipeds, on which some research is carried out by the National Marine Mammal Laboratory, also use Adams Cove, including the northern sea lion, harbor seal, Guadalupe fur seal (Arctocephalus townsendi), northern elephant seal (Mirounga angustirostris), and the California sea lion (Zalophus californianus).

Terms having special meanings in fur seal research are described in the glossary, as are English translations of names given to some of the rookeries by the Russians when they discovered the Pribilof Islands.

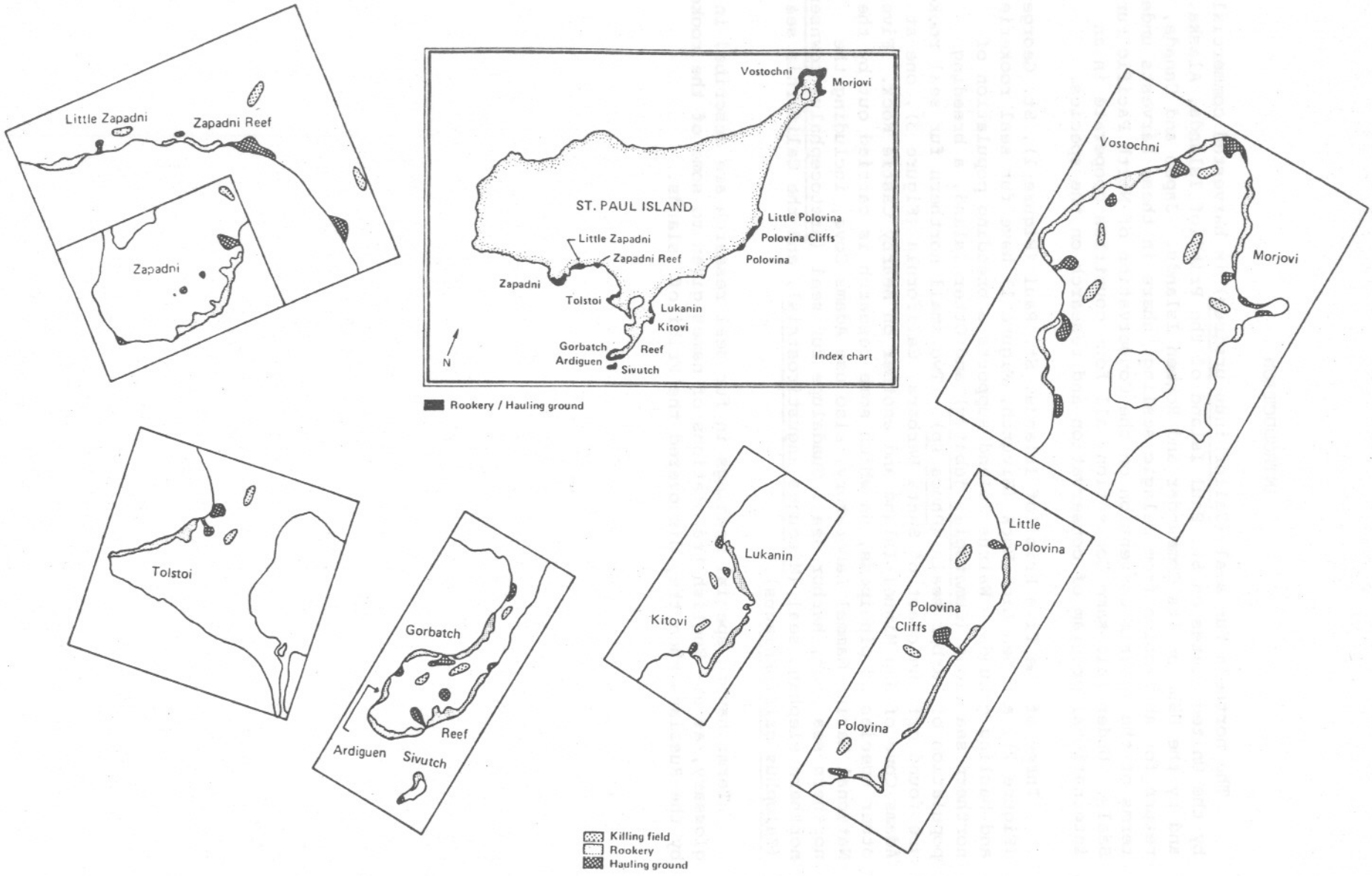

Figure 1.--Location of rookeries, hauling grounds and killing fields, St. Paul Island, Alaska

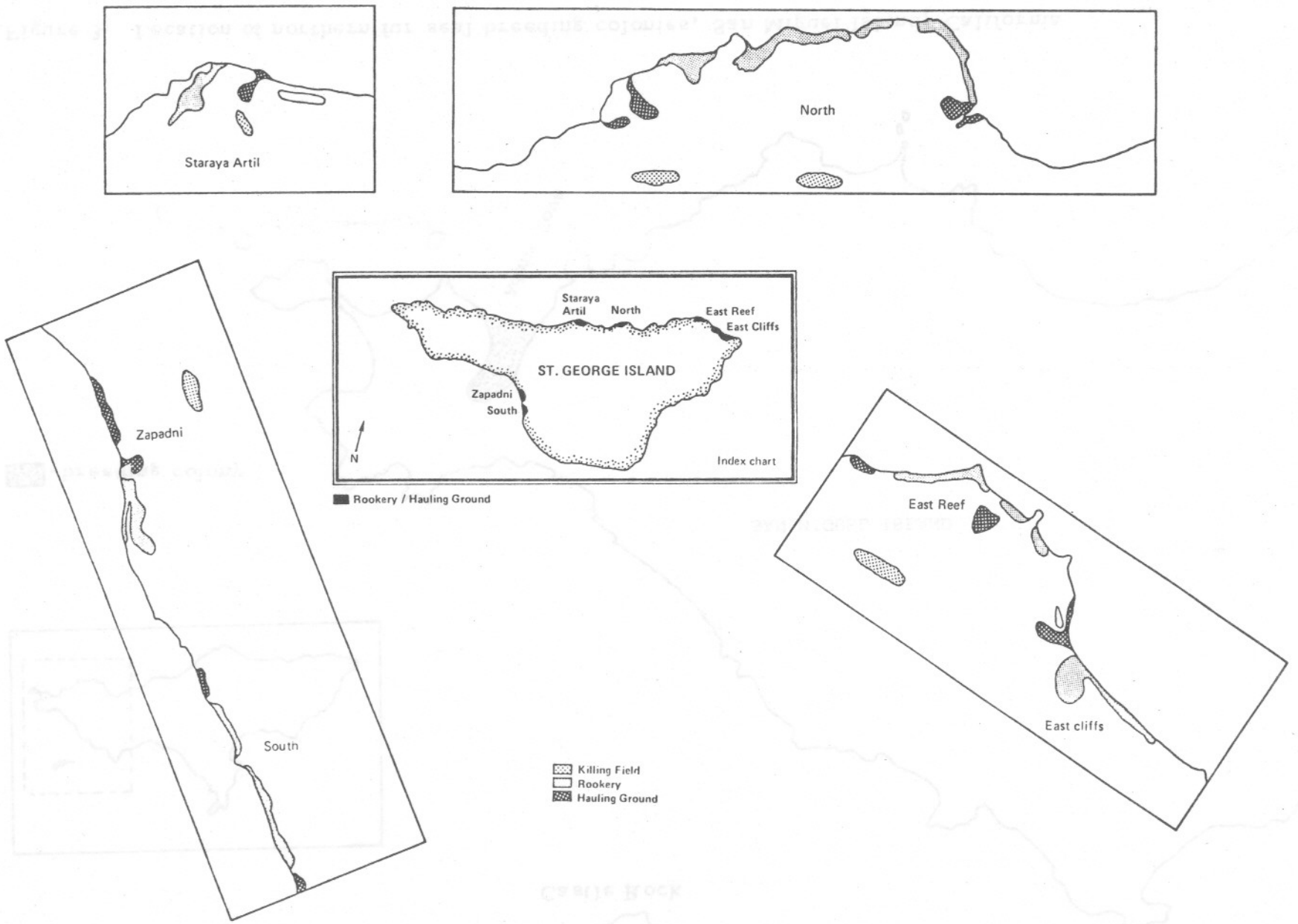

Figure 2.--Location of rookeries, hauling grounds and killing fields, St. George Island, Alaska.

Figure 3. Location of northern fur seal breeding colonies, San Miguel Island, California

Part I. POPULATION ASSESSMENT, PRIBILOF ISLANDS

The Interim Convention on the Conservation of North Pacific Fur Seals is a mandate requiring the United States, Canada, Japan, and the USSR collect specific kinds of information on fur seals. Thus, the United States contributes to the overall data base of the species by furnishing to the Fur Seal Commission, and for its own use in managing the Pribilof Islands fur seal resource , specific kinds of information on the fur seal herd. Included are population size, age and sex composition, estimates of natural mortality of the different age groups and recruitment of young to each age or sex class, and information on the number of fur seals harvested on the Pribilof Islands by sex and estimated age and on the number with tags or other marks. Additional data is collected by personnel of the Pribilof Islands Program[1/] with respect to the proportion of harvested seals entangled in debris from fishing gear and in other materials.

Population Parameters

Various elements of the herd monitored on the Pribilof Islands in 1980 included: 1) age and sex composition of seals harvested commercially on St. Paul Island and for food on St. George Island[2/]; 2) number of adult males in each of three classifications; 3) number of pups born on St. Paul Island; and 4) number of dead pups and older seals found on the rookeries, hauling grounds, and adjacent beaches.

Age and Sex Composition of Seals Harvested

Males.--There was a 25-day harvesting season on St. Paul Island in 1980 beginning 27 June and ending 1 August with no work on Saturdays, Sundays, and the 4 July holiday. Five complete "rounds" or circuits of the existing hauling grounds were made during the period, i.e., all available males were driven from each hauling ground five times during the season and subjected to the harvest. An upper limit of body length restricted the take of males to those 49 inches (124.5 cm) or less from tip of nose to tip of tail, and none were rejected because of bite wounds or other defects. However, all males longer than 49 inches were rejected and permitted to return to the sea as were all seals identified as females. The sealing crew left the village at 5:00 a.m., drove the animals from the hauling grounds beginning about 5:30 a.m., and began the harvest between 6:00 and 6:30 a.m.

Harvested animals were again sampled at the rate of 20% for right maxillary canine teeth for use in determining the age composition of males taken (Appendix A, Table A-1). The harvest of 3- and 4-year-old males in 1980 is shown in Figure 4, and the number of males taken by year class since

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1/ U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 1700 Westlake Av. N., Seattle, WA 98109.

2/ The skins of seals harvested for food on St. George Island in a given year are blubbered and kenched then combined with the commercial take the following year for sharing with Japan and Canada.

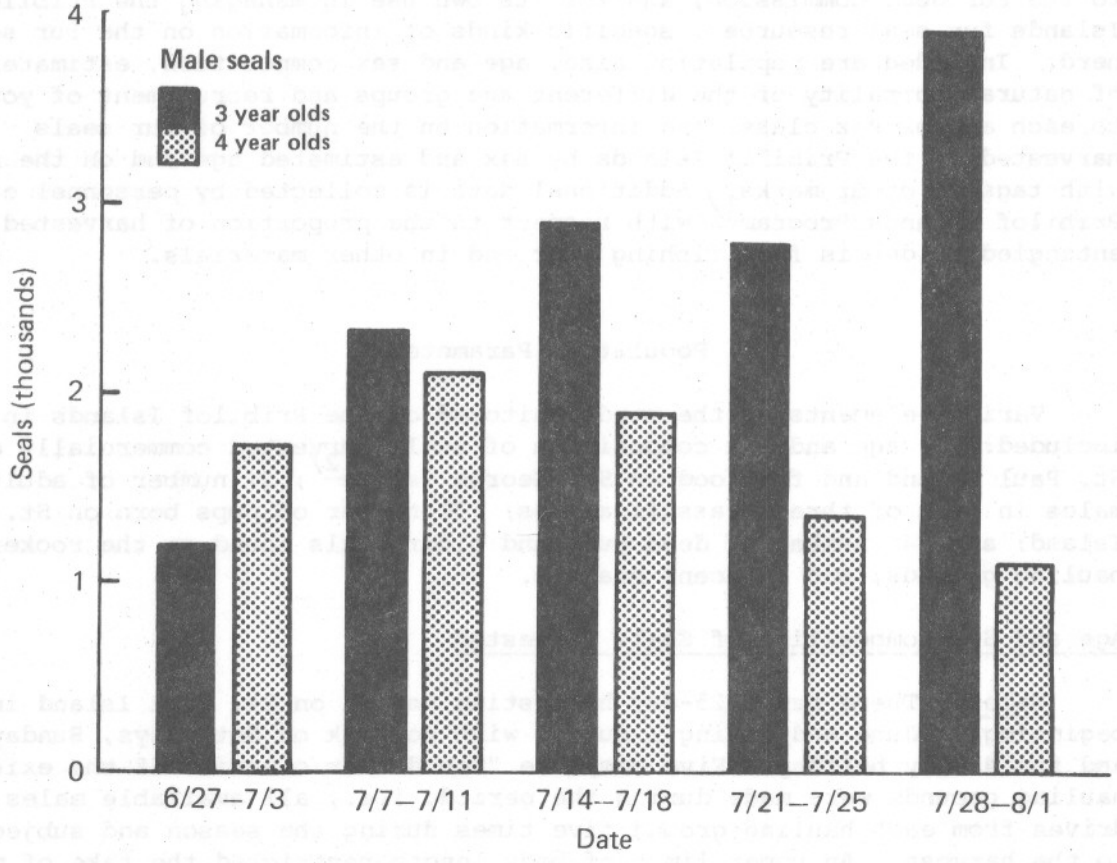

Figure 4.--Three-and four-year-old male northern fur seals harvested, St. Paul Island, Alaska, 27 June to 1 August 1980.

1966 are given in Figure 5 and Table 1. The age composition of males harvested on the Pribilof Islands since 1971 is shown in Table 2.

There was no harvest on Lukanin-Kitovi Rookeries 24 July 1980 because of an unusually warm morning following the harvest on Polovina Rookery. Had the driving and harvesting process been carried out, the animals there would have been subjected to overheating. Consequently, the harvest on these two rookeries a week later on 31 July was abnormally large.

Fur seals were taken for food on St. George Island again in 1980. This was the fifth such subsistence harvest on that island since the moratorium on the commercial harvest of fur seals began there in 1973. A total of 348 males were included (Appendix A, Table A-2), all from the eastern hauling ground of North Rookery.

Females.--In 1980, 49 females on St. Paul Island and 2 on St. George Island were mistaken for males and harvested[3/]. The ages of females taken on St. Paul Island were not determined.

Living Adult Male Seals Counted

The relative locations of the different classes of adult males (bulls) on a typical fur seal rookery-hauling ground complex are shown in Figure 6. Classes 2 and 3 defend territories which they establish on the rookery. Class 2 males do not have females, and those of Class 3 have one or more females or pups[4/]. Class 5 males are found on historical hauling grounds or are scattered along the inland fringes of the rookeries and adjacent beaches. Males of classes 2,3 and 5 are approximately age 7 years or older. In 1980, 7,940 adult males were counted on St. Paul Island in June and 9,738 in July. St. Paul Island hosts about 80 percent of the Pribilof Islands' fur seal population. St. George Island, with 20 percent of the population, had 2,775 adult males in June and 3,358 in July. These counts are given in detail in Appendix A, Tables A-3 to A-8.

Dead Seals Counted that were Older than Pups

In 1980, counts of dead adult northern fur seals on St. Paul Island during 25-28 August and 15-30 August on St. George Island totaled 219 and 79, respectively (Table 3). Wherever possible, canine teeth were collected from the animals as a basis for determining their ages.

Dead Pups Counted

Counts of dead northern fur seal pups in August on St. Paul and St. George Islands totaled 7,859 and 2,385, respectively. The number of pups

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3/ Young females through 4 years of age have black whiskers and are about the same size as 3-year-old males. As a result, some are inadvertently taken each year.

4/ Some territorial males have as few as 1 or 2 females. Should these females be absent during the counts, their pups are used as a basis for putting the adult male into Class 3 rather than Class 2.

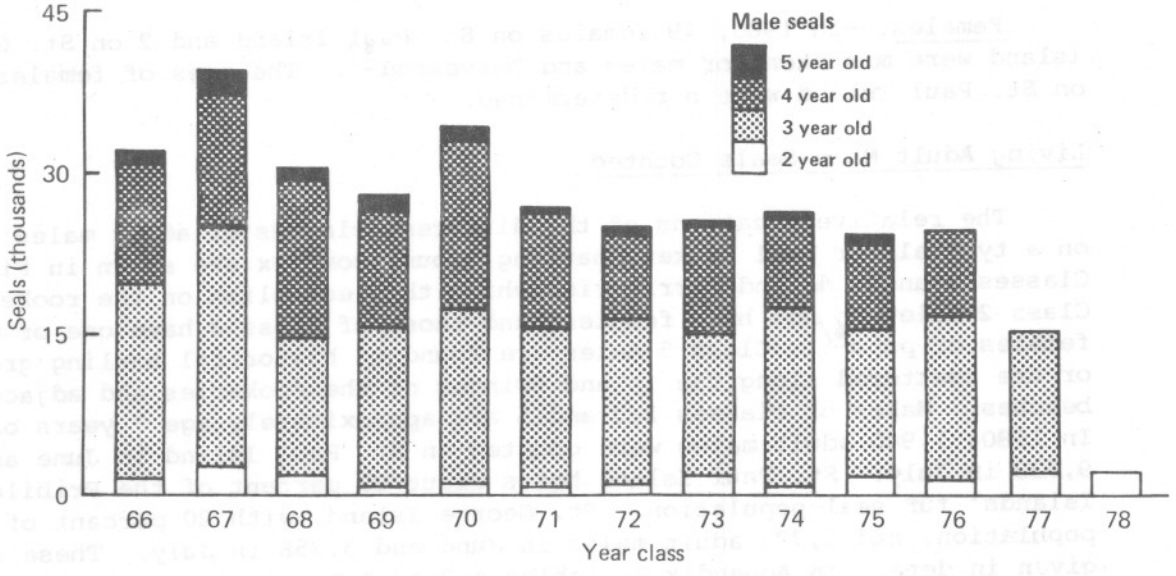


Figure 5.--Harvest of male northern fur seals, by year class, St. Paul Island, Alaska, 1966-78.

TABLE 1.--Harvest of male northern fur seals, by age group, St. Paul Island, Alaska, 1966-78 year classes[1/].

Year class	Age group 2	3	4	5	Total
1966	1,673	17,826	11,548	1,338	32,385
1967	2,640	22,176	12,503	2,185	39,504
1968	1,725	12,888	14,932	721	30,266
1969	323	15,024	10,800	1,631	27,778
1970	916	16,337	15,533	1,402	34,188
1971	577	14,652	10,768	722	26,719
1972	1,025	15,186	8,050	707	24,968
1973	1,642	13,397	9,421	598	25,058
1974	893	16,476	8,955	470	26,794
1975	1,783	13,752	7,918	725	24,178
1976[2/]	1,479	15,245	8,183	-	24,907
1977[2/]	2,051	13,157	-	-	15,208
1978[2/]	2,180	-	-	-	2,180
Total	18,907	186,116	118,611	10,499	334,133
Mean	1,454	15,510	10,783	1,050	29,184[3/]

1/ Includes only 2- to 5-year-old seals taken during the harvest of male seals. From 1956 through 1978 year classes, 137 one-year-olds and 1,321 six-year-olds were harvested. In addition, age was not determined for 4,919 males taken on St. Paul Island, Alaska.

2/ Incomplete returns.

3/ 1976, 1977, and 1978 year classes not included.

TABLE 2.--Age classification of male northern fur seals harvested, Pribilof Islands, Alaska, 1971-80.

Year of harvest	St. Paul Island						St. George Island[1/]					
	Age group					Total no. harvested	Age group					Total no. harvested
	2	3	4	5	6		2	3	4	5	6	
	Number											
1971	323	12,888	12,503	1,338	190	27,242	32	1,456	2,517	467	81	4,553
1972	916	15,024	14,932	2,185	53	33,110	57	1,442	2,125	559	21	4,204
1973	577	16,337	10,800	721	22	28,457	-	-	-	-	-	-
1974	1,025	14,652	15,533	1,631	135	32,976	-	-	-	-	-	-
1975	1,642	15,186	10,768	1,402	95	29,093	-	-	-	-	-	-
1976	893	13,397	8,050	722	19	23,081	-	-	-	-	-	-
1977	1,783	16,476	9,421	707	9	28,396	-	-	-	-	-	-
1978	1,479	13,752	8,955	598	45	24,829	-	-	-	-	-	-
1979	2,051	15,245	7,918	470	18	25,702	-	-	-	-	-	-
1980	2,180	13,157	8,183	725	33	24,278	-	-	-	-	-	-

1/ No commercial fur seal harvest on St. George Island, Alaska, 1973-80.

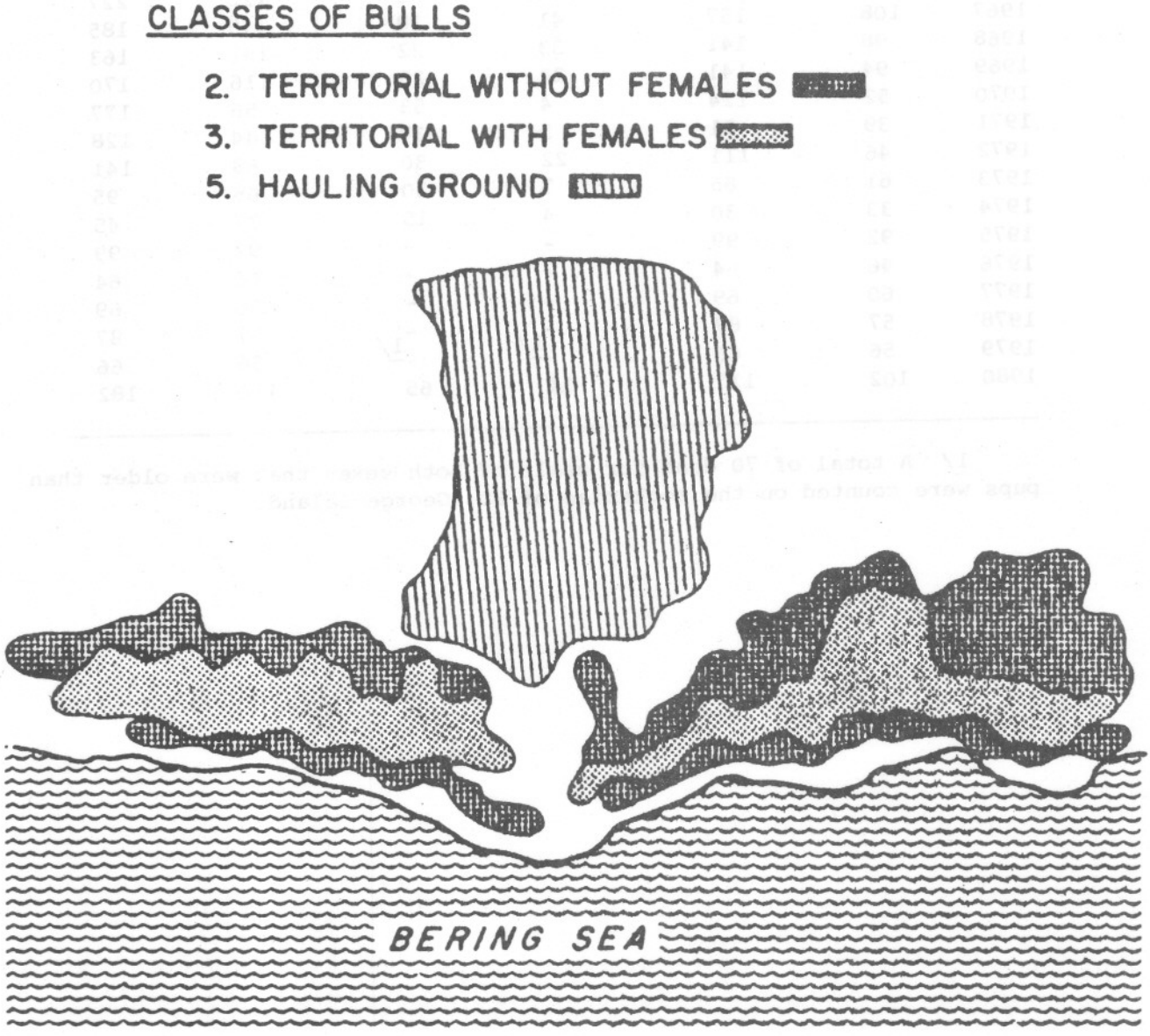


Figure 6. --General composition of a typical fur seal rookery.

TABLE 3.--Dead northern fur seals counted that were older than pups, Pribilof Islands, Alaska, 1965-80. A dash indicates no data.

Year	St. Paul Island		St. George Island		Total	
	Males	Females	Males	Females	Males	Females
	Number					
1965	158	-	-	-	158	-
1966	181	172	41	55	222	227
1967	108	157	41	28	149	185
1968	98	141	33	22	131	163
1969	94	141	22	29	116	170
1970	52	124	4	53	56	177
1971	39	91	5	37	44	128
1972	46	111	22	30	68	141
1973	61	65	7	30	68	95
1974	33	30	4	15	37	45
1975	92	99	-	-	92	99
1976	46	64	-	-	46	64
1977	60	69	-	-	60	69
1978	57	87	-	-	57	87
1979	56	66	-1/	-1/	56	66
1980	102	117	14	65	116	182

1/ A total of 70 dead fur seals of both sexes that were older than pups were counted on the rookeries of St. George Island.

found dead on St. Paul Island in 1980, as in 1978 and 1979, remained at an abruptly lower level not seen since 1924. Appendix A, Tables A-9 and A-10 list the number of dead pups counted on the Pribilof Islands in 1980 and since 1967, respectively.

Number of Pups Born

York and Kozloff (1979[5/]) demonstrated that a good estimate of the total number of pups alive at the time of sampling can be determined by multiplying the ratio of the numbers of live pups to harem males on sampled rookeries by the total number of harem males on all rookeries. Furthermore, since it is well known that the ratio estimate is biased (Cochran 1966), it was recommended that the jackknife estimate (Mosteller and Tukey 1977) be used instead of the raw ratio. Besides tending to be less biased, the jackknife method also contains a simple way to compute the variance of the estimate.

Therefore, the pup estimate for 1980 is based on data collected from four rookeries (Reef, Tolstoi, Morjovi and Little Polovina) using the same shearing-sampling method developed in the 1960's. A direct count of pups was made on Little Polovina Rookery.

Due to some apparent biases in the counts made by two inexperienced samplers, the estimate of live pups is based only on the counts of the most experienced sampler. Detailed data (count of sheared pups in each sample group of 25) from all three samplers will be analyzed later to determine if it is possible to construct good estimates of the bias of individual samplers. Estimates of bias, if produced, may be used to revise the estimate.

The shearing-sampling estimates for the sampled rookeries are taken from Table 4 and harem male (Class 3 adult male) counts from Appendix A, Table A-6. From these data, we compute the ratio of pups to harem males as shown for St. Paul Island in 1980 as demonstrated as follows.

Rookery	Estimate 1 *	Estimate 2 *	Mean	Harem male count	Ratio pups/harem male (using mean)
Reef	22,852	26,827	24,840	714	34.79
Tolstoi	23,206	23,222	23,214	681	34.08
Morjovi	17,351	15,705	16,528	376	43.96
Little Polovina	2,293	2,217	2,255	91	24.78
Totals	65,702	67,971	66,837	1,862	35.895

* Estimates 1 and 2 correspond to periods 1 and 2 of Table 4.

The total number of harem males on St. Paul Island (all rookeries) counted in 1980 is 5,490.

5/ A. E. York, and P. Kozloff, 1979. Estimation of numbers of fur seal pups born on St. Paul Island. Unpubl. manuscr., 25 p. Natl. Mar. Mamm. Lab., Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way N.E., Seattle, WA 98115.

TABLE 4.--Estimated number of northern fur seal pups in 1980 at times of shearing and birth on four rookeries of St. Paul Island, Alaska. Pups were sheared, 4-8 August; sampling periods 1 and 2 were 12 and 15 August, respectively. Live pups on Little Polovina Rookery were counted 14 August. Values in parentheses refer to the second point south of Sea Lion Neck. A dash indicates that data were not collected.

Item	Rookery			
	Morjovi	Little Polovina	Tolstoi	Reef
No. pups sheared	1,524(104)	380	2,852	2,994
No. 25-pup samples				
Period 1	39(6)	14	69	69
Period 2	34(5)	14	71	81
No. sheared pups counted				
Period 1	92(13)	58	212	226
Period 2	92(8)	60	218	226
Total no. pups counted[1/]				
Period 1	975(150)	350	1,725	1,725
Period 2	850(125)	350	1,775	2,025
Estimated no. pups alive[2/]				
Period 1 Sampling	16,151(1,200)	2,293	23,206	22,852
Period 2 Sampling	14,080(1,625)	2,217	23,222	26,827
Mean, both periods	15,116(1,412	2,255	23,214	24,840
No. pups counted				
Dead	455(53)	77	1,488	790
Live	- -	2,052	-	-
No. pups born				
Estimated[3/]	15,571(1,465)	2,332	24,702	25,630
Counted[4/]	- -	2,129	-	-

1/ Number of samples X 25 = total number of sheared and unsheared pups.

2/ Estimated from $\hat{N} = MC/R$ (M=no. pups sheared, C=total no. pups counted, and R=no. sheared pups counted).

3/ Sum of dead pups counted and mean estimate of pups alive at times of sampling.

4/ Sum of dead and live pups counted.

The jackknife estimate of the ratio of pups to harem males for the entire island, R, is computed in the description that follows.

First, let r be the ratio of pups to harem males for all sampled rookeries (35.895). We then define $\bar{r}(j)$ to be the ratio of pups to harem males for all rookeries except the j^{th} rookery. (For example

$$\bar{r}(1) = \frac{66,837 - 24,840}{1,862 - 714} = 36.58$$

for Reef Rookery).

For convenience we define

$$r^*(j) = 4\,r - 3\,(\bar{r}(j))$$

such that the jackknife estimate of the ratio $\hat{R}$ is

$$\hat{R} = (1/4) \sum_{j=1}^{4} r^*(j)$$

and an estimate of the variances of R is

$$\hat{\text{Var}}\ R = \frac{\Sigma\ r^*(j)^2 - 4R^2}{12} .$$

Thus we have the following:

Rookery	$\bar{r}(j)$	$r^*(j)$
Reef	36.58	33.83
Tolstoi	36.94	32.77
Morjovi	33.86	42.01
Little Polovina	36.47	34.18

$$\hat{R} = 35.695$$

$$\hat{\text{Var}}(R) = 4.522$$

$$\hat{\text{SE}}(R) = 2.126 .$$

An approximate 95% confidence interval for R is

$$\hat{R} \pm (2.776)\ \text{SE}\ (R) \text{ or } 35.695 \pm 5.90$$

producing an interval extending from 29.792 to 41,597.

Thus the jackknife point estimate of the total population on St. Paul Island is found by multiplying $\hat{R}$ by the count of males (5,490). The estimate for 1980 is 195,966 with an estimated 95% confidence interval 195,966 ± 32,391. As seen in the example above the usual estimate of the ratio is 35.895 with a variance of 6.388 (see Cochran (1966) for computational details). This produces a point estimate and 95% confidence interval of 197,064 ± 38,519.

For these data, the estimates are essentially identical. York and Kozloff (1979)[5/] found that the jackknife method was more accurate than the ordinary method and thus was generally preferred. Therefore, the total number of pups born on St. Paul Island is estimated as 195,966 plus the count of dead pups on all rookeries (7,859, Appendix A, Table A-9) or 203,825 pups.

Table 5 lists the number of pups born on the different rookeries of St. Paul Island, year classes 1963-70, 1972-76, and 1979-80.

Pup Weighing

During the 1980 field season, a preliminary study was conducted to determine if pups selected for shearing weighed less than those not selected. There was concern that such a difference might systematically bias the estimate of total number of live pups, since the smaller, possibly younger marked pups might remain on land and be available for resighting for a disproportionately longer time than the unmarked pups--making the observed marked-unmarked ratio too high and producing a downward bias in the Petersen estimate of numbers of pups born.

Methods.--During 3-8 August, a weighing crew followed the shearing crew through four rookeries on St. Paul Island. In most cases, the shearers separated successive pods of 10-200 pups and selected animals therefrom for shearing.

A systematic sample of sheared pups was taken, sexed, placed in nets and weighed from a small spring scale hanging from a tripod. When the shearers were finished with a particular group of pups, the weighing crew kept them together and systematically sampled the remaining unsheared pups. These pups were sexed and weighed in the same manner. On several sections of Reef Rookery where longitudinal pup growth studies were being conducted, the above procedure was suspended and only pups which had been marked at birth for the growth study were weighed.

Results.--Table 6 shows the number of pups sampled, their mean weights and standard deviations by sex, rookery and shearing category. Table 7 presents similar information for tagged animals in the longitudinal study. Figure 7 presents the information in Table 6 in graphic form.

Generally, sheared pups weigh less than unsheared pups. Figure 7 suggests that the weight difference between the sheared and unsheared pups is somewhat greater for males than for females. Furthermore, there is a fairly constant trend in weight differences among rookeries and this is approximately the same for both sheared and unsheared animals.

TABLE 5.--Estimated number of northern fur seal pups born on different rookeries of St. Paul Island, Alaska, year classes 1963-70, 1972-76, and 1979-80.[1] A dash indicates that data were not collected.

Rookery	Year														
	1963	1964	1965	1966	1967	1968	1969	1970	1972	1973	1974	1975	1976	1979	1980
Morjovi	19,648	19,580	18,083	20,852	-	18,222	16,213	16,512	18,481	-	-	23,049	-	15,741	17,036
Vostochni	39,757	45,409	38,422	51,619	-	37,471	35,457	37,139	43,683	-	-	44,615	51,796	40,239	-
Little Polovina	7,423	9,016	7,250	9,147	-	-	5,291	4,185	-	-	-	3,667	-	3,437	2,332
Polovina Cliffs	21,760	23,362	21,404	24,075	-	-	19,000	18,728	-	-	-	26,399	23,378	20,725	-
Polovina	5,437	5,928	6,467	5,982	-	-	3,954	4,183	-	-	-	4,773	-	4,409	-
Tolstoi	26,874	28,064	29,077	30,433	35,735	-	29,507	25,774	-	38,875	-	35,249	-	34,929	24,702
Zapadni	37,014	37,537	30,450	40,932	-	-	31,727	37,227	-	37,479	-	40,068	-	31,758	-
Little Zapadni	16,380	18,226	16,767	24,632	-	-	19,671	16,626	-	24,609	-	22,372	-	19,221	-
Zapadni Reef	6,918	6,940	5,982	5,393	-	5,239	4,751	4,499	-	8,388	-	7,731	8,028	7,890	-
Reef	38,688	41,685	36,696	38,480	33,466	27,901	28,460	27,128	-	-	35,061	29,398	-	30,059	25,630
Gorbatch	25,172	25,174	20,052	22,401	-	-	18,504	16,002	-	-	20,144	18,063	-	15,166	-
Ardiguen	DC[2]	2,917	3,139	2,936	-	-	3,691	3,181	-	-	3,459	2,916	-	2,725	-
Kitovi	11,681	14,567	13,563	14,430	-	-	11,524	13,392	-	-	-	13,752	-	13,865	-
Lukanin	5,746	5,517	6,416	7,619	-	-	5,120	5,909	-	-	-	6,209	-	5,768	-
Total	262,498	283,922	253,768	298,931			232,870	230,485				278,261		245,932	

1/ Estimates were not determined in 1971, 1977, and 1978.

2/ DC = Data for pups born combined with Gorbatch Rookery.

TABLE 6.--Numbers of pups weighed, their mean weights (kg.) and standard deviations by sex and shearing category for 4 rookeries, St. Paul Island, Alaska

Sex	Rookery		Sheared	Unsheared	Both
Males		Number	13	17	30
	Little	Mean wt.	7.52	7.56	7.54
	Polovina	s.d.	1.32	1.72	1.53
		Number	72	69	141
	Tolstoi	Mean wt.	7.07	7.94	7.50
		s.d.	1.37	1.62	1.55
		Number	74	103	177
	Morjovi	Mean wt.	7.52	8.08	7.84
		s.d.	1.46	1.55	1.53
		Number	92	105	197
	Reef	Mean wt.	8.32	8.42	8.37
		s.d.	1.82	1.80	1.81
		Number	251	294	545
	Combined	Mean wt.	7.68	8.14	7.93
	rookeries	s.d.	1.65	1.68	1.68
Females		Number	13	6	19
	Little	Mean wt.	6.94	8.31	7.37
	Polovina	s.d.	1.06	1.20	1.26
		Number	77	64	141
	Tolstoi	Mean wt.	6.79	6.74	6.76
		s.d.	1.31	1.16	1.24
		Number	75	98	173
	Morjovi	Mean wt.	7.11	7.29	7.21
		s.d.	1.46	1.31	1.37
		Number	69	68	137
	Reef	Mean wt.	7.10	7.48	7.29
		s.d.	1.39	1.68	1.51
		Number	234	236	470
	Combined	Mean wt.	6.99	7.22	7.11
	rookeries	s.d.	1.37	1.42	1.40
Both sexes and combined rookeries		Number	485	530	1015
		Mean wt.	7.35	7.73	7.55
		s.d.	1.56	1.63	1.61

TABLE 7.--Numbers of marked pups captured on Reef Rookery, their mean weights (kg.) and standard deviation by shearing category.

Sex	Type of work		Sheared	Unsheared	Both
Males	Tagged	Number	21	9	30
		Mean wt.	7.71	9.00	8.10
		s.d.	1.25	1.57	1.43
	Clipped or Bleached	Number	15	16	31
		Mean wt.	7.88	7.41	7.64
		s.d.	1.33	1.52	1.41
	Both marks	Number	36	25	61
		Mean wt.	7.78	7.98	7.87
		s.d.	1.27	1.71	1.99
Females	Tagged	Number	15	12	27
		Mean wt.	6.26	6.88	6.54
		s.d.	1.34	1.39	1.35
	Clipped or Bleached	Number	19	11	30
		Mean wt.	6.92	7.14	7.00
		s.d.	1.42	1.30	1.36
	Both marks	Number	34	23	57
		Mean wt.	6.63	7.00	6.78
		s.d.	1.40	1.35	1.37
Both sexes and combined marks		Number	70	48	118
		Mean wt.	7.22	7.51	7.34
		s.d.	1.45	1.61	1.51

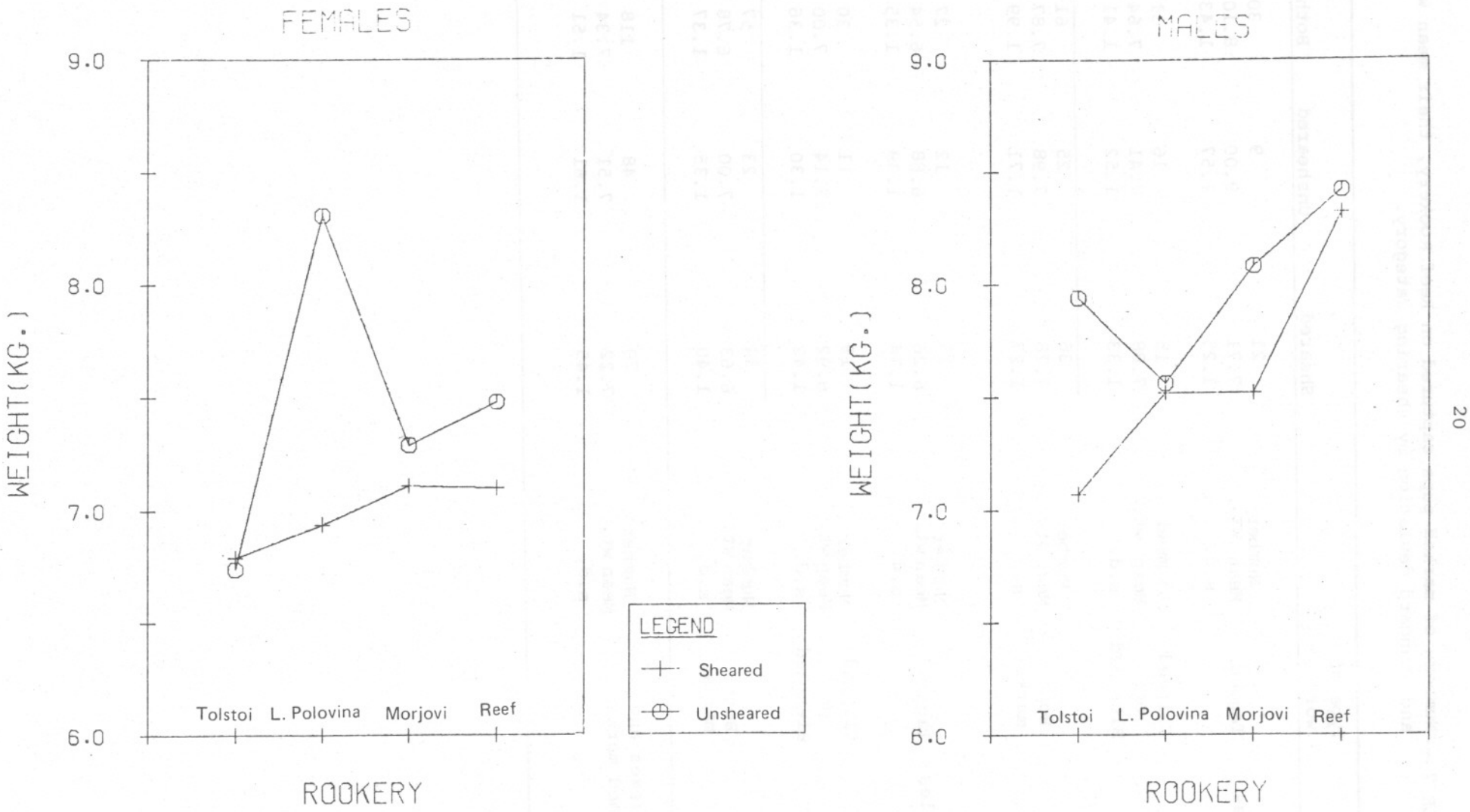
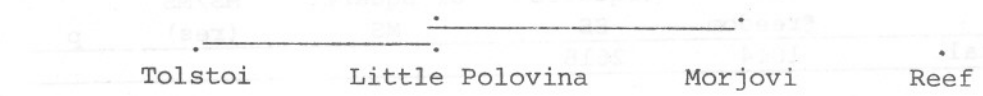


Figure 7.--Mean weights of sheared and unsheared northern fur seal pups of both sexes on 4 sampled rookeries of St. Paul Island, Alaska, August 1980.

An analysis of variance (see Table 8) indicated all main effects were highly significant, the three-way effect was much less significant, and the two-way effects were not significant. This was expected from the similar pattern seen in both graphs in Figure 7. A further analysis of the main effects indicated a significant difference ($p<.01$) between weights of male and female pups (both sheared and unsheared). Furthermore, rookery differences can be "sorted-out" using the Tukey-Q statistic ($p=.05$):



whereby weights of pups taken on rookeries connected by a solid line in the above diagram are not significantly different ($p=.05$), whereas those which are not connected are different.

Conclusions.--The experiment supports the results of previous weighing programs that male pups are significantly heavier than female pups and that there are major differences in pup weights between rookeries. In addition, sheared pups weigh less than unsheared pups. How this weight difference biases the shearing-sampling estimate of total number of pups born needs to be studied.

Marking

In 1980, 22 northern fur seals marked as pups by the Soviet Union on Bering and Medny Islands were recovered as 2-5 year olds in the United States harvest of male seals on St. Paul Island, Alaska (Appendix A, Table A-11.

Seals Entangled in Net Fragments and Other Materials

During the 1960's, increasing numbers of northern fur seals were returning to the Pribilof Islands entangled in net fragments and other debris. As a result, a study was started to collect data from these animals as they appeared in the United States harvest of male northern fur seals. Appendix A, Table A-12 lists, by year, the number of entangled northern fur seals that appeared in the harvest during 1967-80.

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Patrick Kozloff
Anne E. York

TABLE 8.--Analysis of variance of the three way model sex X shearing X rookery with pup weight as the dependent variable.

	Degrees of freedom	Sum of squares SS	Mean sum of squares MS	MS/MS (res)	p
Corrected total	1014	2618			
Main effects	5	280	56.00	24.36	<.001
Sex	1	171	171.00	74.38	<.001
Shearing	1	31	31.00	13.48	<.001
Rookeries	3	78	26.00	11.30	<.001
Two way effects	7	21	3.00	1.30	≃.60
Sex X Rookeries	3	15	5.00	2.18	≃.20
Shearing X Rookeries	3	2	.67	.29	≃.90
Sex X Shearing	1	4	4.00	1.74	≃.50
Three way effects	3	20			
Sex X Rookeries X Shearing	3	20	6.67	2.90	≃.03
Residual	999	2297	2.30		

Part II. BEHAVIOR AND BIOLOGY, PRIBILOF ISLANDS

In 1980 the monitoring of changes in herd size and composition at East Reef and Zapadni Rookeries continued on St. George Island as did the study of land/sea movements of tagged juvenile males begun in 1978. This year a new study on sex ratios and growth rates of pups was initiated at St. George and St. Paul Islands. Time-depth recorders were attached to six female and three juvenile male seals. A special study on estrus was conducted using captive seals. The latter two studies will be reported elsewhere, as will the newest results on the study of juvenile male movements.

Work Plan

Observations were made daily on East Reef and Zapadni Rookeries of St. George Island from 23 May to 12 August (approximately 500 worker hours) to collect data on herd size and composition. Daily searches for marked juvenile males were made at all hauling grounds on St. George Island from 23 May to 13 August (approximately 1,000 worker hours). Newborn pups were captured and weighed at Staraya Artil Rookery (St. George Island) from 22 June to 11 August (400 worker hours), and at Reef Rookery (St. Paul Island) from 21 June to 31 July (640 worker hours). Table 9 shows the age and sex classes, numbers, and locations of seals permanently marked in 1980.

Trends in Herd Size and Composition

The St. George Island herd has been changing consistently since the imposition of the harvest ban after the 1972 field season. Table 7 of the 1979 Report of Fur Seal Investigations[6/] showed yearly population trends at two sample rookeries on St. George Island (East Reef and Zapadni) from 1974 to 1979. This table showed that the adult males have been steadily increasing and that the females and pups have been declining. Island-wide counts of adult males and shearing-sampling estimates of pup numbers indicate that these changes are occurring at all rookeries, and that the data from East Reef and Zapadni Rookeries are representative.

In 1980, data were again collected on the sample rookeries. The number of adult males, females, and pups was counted daily at East Reef Rookery. The adult males and females were counted daily at Zapadni Rookery as well, but pups there were counted only once (in late July when rain drove the adult females off the rookery, leaving unattended pups). As in previous years the number of animals on shore peaked during the week ending 13 July. The results for 1980 are shown in Table 10 with comparable numbers from 1979, the proportion of the 1979 values that the 1980 results represent, and the mean annual change from 1974 to 1979 (from Table 7 of the 1979 Report of Fur Seal Investigations[6/].

6/ P. Kozloff (ed.). Fur seal investigations, 1979. NWAFC Processed rep. 80-4, 93 p. Natl. Mar. Mamm. Lab., Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way N.E., Seattle, WA., 98115.

TABLE 9.--Tags applied to northern fur seals for studies of behavior, Pribilof Islands, Alaska, 1980.

Type and color of tag	Tag number	Age-sex class	Number	Rookery[1/]
Monel, silver	X1851-X1894	Adult male	24	Zapadni
Plastic, white	537-540 542-544 546, 548-551 553, 1203-1208 1211	Adult female	20	East Reef
Monel, silver	IA2979-IA2980	Adult female	4	Stranded female[2/]
Plastic, blue	1001-1176	Male pup	176	Reef (St. Paul)
Plastic, yellow	908-1000 1003-1090 1101-1111	Male pup	192	Staraya Artil
	1001, 1002 1091-1100 1112-1225 1227-1527		427	East Reef
	1528-1912 1914-2099		570	Zapadni
	2100-2900		800	Staraya Artil
	2901-3200		300	Zapadni
Plastic, pink	501-646	Female pup	146	Reef (St. Paul)
Plastic, white	541, 545, 552 554, 555 1202, 1209, 1212	Female pup	8	East Reef
	910, 914 916-1132		222	Staraya Artil

1/ Tags were applied to seals on St. George Island unless otherwise specified.

2/ Tags applied following rehabiliation and prior to release of females stranded on the coast of Washington.

TABLE 10.--Trends in population size at East Reef and Zapadni Rookeries, St. George Island, Alaska, 1980.

	Numbers on shore 1980		Numbers on shore 1979		1980 as	Average trend,
	$\bar{x}$ [1]	S.D.	$\bar{x}$	S.D.	% of 1979	1974-1979
Zapadni Rookery						
Females	346	±32	470	±71	-26.4%	-19.4%
Pups	623	- [2]	738	- [2]	-15.6%	-15.9%
Males	85	± 1	73	± 1	+16.4%	+12.2%
East Reef Rookery						
Females	236	±23	235	± 6	+ 0.4%	-10.0%
Pups	350	±22	372	±35	- 5.9%	-11.3%
Males	42	± 2	41	± 2	+ 2.4%	+16.5%

[1] $\bar{x}$ = mean of daily counts during week ending 13 July.

[2] Not a mean; only one count was made, hence there is no S.D.

Table 10 shows that the increase in adult males continued at Zapadni Rookery at a rate comparable to the 1974-79 average. Table 10 also shows that females and pups continued to decline at rates equal to or perhaps greater than the 1974-79 average. However, the table shows that East Reef Rookery changed relatively little between 1979 and 1980, a finding that differs from the 1974-79 averages. Experimenter bias is not a factor here because the same researcher (J. Francis) collected the data from 1975 to the present. The absence of change between two successive years does not necessarily represent a trend. Nevertheless, these data are the first since 1974 that show any results other than a progressive decline in females and pups, and an increase in males. Additional data will confirm whether the herd is beginning to recover from the effects of the harvest ban, and to stabilize in size and sex composition.

Age Bias in the Shearing-Sampling Procedure

The shearing-sampling procedure used to estimate the number of pups born each year, assumes that a) a random sample of the pups born are sheared, and b) the samples of marked/unmarked pups are collected randomly. If either assumption is violated, an unreliable estimate of numbers born could result. Past behavioral studies suggest that pups move nonrandomly on the rookeries, with older animals wandering to the water first. If shearing occurred before the youngest pups entered the water, then a nonrandom sample of pups might be available for shearing, and a bias toward younger pups could result.

The existence of a bias by age was sought in 1980 by individually marking pups on the day of birth, and then finding a median age for pups that were subsequently captured by the shearing crew, and for those pups that escaped being sheared. Pups were marked daily from 22 June to 11 August at Staraya Artil Rookery (St. George Island), and from 21 June to 31 July at Reef Rookery (St. Paul Island). Newborn seals having a fresh, bloody placenta, or a pink umbilical stump (denoting 1 or 2 days of age) were captured from catwalks using a noose on a 4 m long pole. All unmarked newborns reachable with the pole were marked each day; none were excluded. Each pup was weighed, sexed, and given an individual identification mark (plastic tags, or bleached or clipped patterns in the pelage) and released. These pups were recaptured and reweighed at intervals. The growth rates determined from reweighing will be reported separately.

On 7 August a list was compiled of the marked animals that were captured by the shearing crew as it passed through Reef Rookery that day. A second list was compiled of pups known to have died, and a third list was made for animals assumed to have escaped capture by the shearing crew. The median age of captured and noncaptured animals as of 7 August was then calculated. A similar procedure was carried out at Staraya Artil Rookery except that a) no actual shearing took place, b) the captures were not made by the usual shearing crew, and c) the captures were made on 16 August. At both rookeries the marked pups were reweighed upon being captured by the shearing crew, and these weights were compared against their birth weights (see Pup Weighing in Part I of this report).

The median ages for captured and noncaptured pups appear in Table 11 by sex and rookery. The most important finding is that captured pups were significantly younger than noncaptured pups at both rookeries (Mann-Whitney test, .05 level). That is, there was an age bias in the pups that were sheared. The magnitude of this bias was about the same at the two rookeries (4 and 5 days at Reef and Staraya Artil Rookeries, respectively). Absolute ages at the time of capture cannot be compared because captures occurred later at Staraya Artil Rookery.

There appeared to be no bias by sex of pups. At Reef Rookery 30% of the marked females, and 27% of the marked male pups were captured, and at Staraya Artil comparable figures were 40% and 41%. The difference between rookeries may reflect the larger absolute size of Reef Rookery (fewer marked pups would be taken in each group of 100).

Given that there was no bias by sex, bias by age should be expected to occur within the same sex. That is, captured females should be significantly younger than noncaptured ones, and the same for males. This is the case for the Staraya Artil data; captured animals were significantly younger than noncaptured animals of the same sex (Mann-Whitney test, significant at .001 level). However, at Reef Rookery differences within sex were not significant at the .05 level (Mann-Whitney test). It is possible that the later capture date at Staraya Artil Rookery contributed to this difference between rookeries. If many pups suddenly enter the sea for the first time between 7 and 16 August, which is possible, then the age difference within sex of captured and noncaptured pups would be greater in pups with the later capture date.

Sex Ratio of Newborn Pups

The sex ratio at birth is usually estimated to be 51:49, males/females. However, it is not known whether males and females are born at the same or at different times of the season. In mass captures of adult females at Zapadni Rookery in 1975 and 1976, female offspring strongly predominated during the first week of the pupping season (n=<100 pups). However, evidence from gray seals and Weddell seals shows that early in the season males exceed females by 120/100, and that late in the season this ratio may shift to 80/100 (Trivers and Willard 1973). It is not known whether such a shift occurs in the northern fur seal. If so, then any management activity dependent on the ages of pups, such as shearing-sampling, might be affected.

Data on the sex ratio at birth were collected at Staraya Artil and Reef Rookeries during the study of age bias in shearing-sampling, reported above, and also at Staraya Artil from 19 June to 3 July 1979. The capture methods were described above. Catwalks afforded access to small groups of seals, and to the edges and centers of large groups. The only factor that determined whether a given pup would be sexed was the mother's tendency to select a birth site that was within pole's length of the catwalk, a tendency which we assume was equal among mothers of male and of female pups.

TABLE 11.--Age bias in the shearing-sampling procedure, Pribilof Islands, Alaska, 1980.

	Reef Rookery		Staraya Artil Rookery	
	Median Age [1]	N [2]	Median Age [1]	N [2]
Noncaptured females	33	124	40	122
Captured females	29	54	34	60
Noncaptured males	33	149	43	106
Captured males	29	56	37	49
Captured males & females	29	110	36	109
Noncaptured males & females	33	273	41	228

[1] Median age (in days) on the day of capture (7 August at Reef, 16 August at Staraya Artil Rookery).

[2] N = number of seals in sample.

For each of the three groups of data the daily results were grouped into blocks representing quarters of the season, and the quarterly results within each group were tested against each other by X^2. The quarters were of slightly dissimilar length because the dates of data collection were not identical. Because of the small daily sample size, the ratio of males/females often varied widely. For example, in a 7-day period at Reef Rookery, 55 pups of each sex were born, but the daily male/female numbers were as follows: 7/7, 17/13, 11/4, 2/12, 7/5, 7/8, and 4/6. Despite short-term runs of males or females, the numbers within quarters were similar; in all three groups of data the differences among quarters were not significant (Table 12; X^2 at .05 level). The two fourth quarter samples in Table 12 appeared to differ from the previous quarters of their respective groups, but this difference was not significant because of the relatively small sample sizes. Furthermore, these samples differed in opposite directions from each other (Staraya Artil Rookery toward females, Reef Rookery toward males). Given the absences of significant differences within groups, the groups were pooled so that conclusions about the sex ratio could be based on the largest possible sample. Table 12 shows that the overall sex ratio for 1,064 pups was 51:49 (males:females), and that no seasonal predominance of one sex over the other was evident.

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John M. Francis

TABLE 12.--Sex ratio at birth of northern fur seals, Pribilof Islands, Alaska, 1979 and 1980.

Quarter	Staraya Artil, 1979[1] Number ♂	♀	Ratio ♂:♀	Staraya Artil, 1980[2] Number ♂	♀	Ratio ♂:♀	Reef, 1980[3] Number ♂	♀	Ratio ♂:♀	Total Number ♂	♀	Ratio ♂:♀
1	68	66	51:49	60	65	48:52	61	55	53:47	189	186	50:50
2	63	46	48:42	69	72	49:51	64	66	49:51	196	184	52:48
3	-	-	-	51	59	46:54	54	51	51:49	105	110	49:51
4	-	-	-	13	23	36:64	36	22	62:38	49	45	52:48
Total	131	112		193	219		215	194		539	525	51:49

[1] 19 June - 3 July; 7 calendar days/quarter.

[2] 22 June - 4 August; 7 calendar days/quarter. Does not include 2 female pups born 10 and 11 August which were deleted to keep quarters similar in length.

[3] 21 June - 31 July; 9 calendar days/quarter.

PART III. VETERINARY MEDICAL SERVICES AND RESEARCH

Pathology -- St. Paul Island

From 13 July through 13 August, Mark C. Keyes and Assistant, Roseanne Lorenzana, collected or counted 87 dead fur seal pups from under catwalks on study areas at Reef and Northeast Point Rookeries of St. Paul Island as described by the Marine Mammal Biological Laboratory (1970).

Parasitology

Respiratory Mite Research

This work was carried out by Ke Chung Kim and his assistant, Peter Adler, Department of Entomology, Pennsylvania State University. They were assisted by Mark Keyes and Roseanne Lorenzana.

The objectives of the study were to 1) better understand the life history of both species of mites, specifically the rate of migration to and time of establishment in definitive host tissues, and 2) evaluate the severity of lesions caused by the presence of mites in the turbinates and lungs.

Methods and Procedures.--Large numbers of Orthohalarachne attenuata and O. diminuata were collected from 60 snouts of freshly killed subadult males collected from among those harvested commercially. Each snout was cut sagitally to expose the turbinates and left 4-5 hours at room temperature to induce the mite larvae to come to the surface. Five hundred larvae of each species were collected and kept refrigerated until they were used for artificial infestation of pups.

Ten pregnant female fur seals were captured and transported to a holding area (biology garage) in separate cages. All 10 females delivered pups within 4 days. Eight of the pups were artifically infested with known numbers of mite larvae. Infestation was facilitated by chemical restraint of the pups using ketamine hydrochloride and acepromazine. Mite larvae were transmitted to the pups' nostrils with a camel's hair brush.

Two infested pups were killed 1, 3, 6, and 11 days post-infestation. The latter two pups were fed artificial seal milk daily after the release of their mothers. All of the mother seals were released into the ocean 6 days post-infestation or sooner.

Entire respiratory tracts of each pup (from the nostrils to and including the lungs) were fixed in 10% buffered formalin. Some fresh materials, such as skins, were frozen for further procedures in the recovery of parasites.

Histopathology.--Microscopic examination of the respiratory tracts will proceed under contract in fiscal year 1981.

Filariid Worm Research

This research on the biology and transmission of Dipetalonema odendhali was carried out by Murray D. Dailey, Parasitologist with Marine Animal Research Associates, California State University at Long Beach, and Larry Shults, parasitological research technician from the University of Alaska.

The approaches to the problem in 1980 were to: 1) isolate a pregnant female prior to birth of her pup to facilitate the birth of the pup in captivity away from the rookery (development of the parasite in the pup in these circumstances would establish that transmission involved the mother, whereas a lack of this development when the mother had a heavy infection herself would incriminate some vector on the rookery); 2) collect potential vector organisms at the rookery where natural transmission among seals with high microfilaremias is taking place; and 3) carry out experimental feedings on infected blood with potential vectors and follow development of the parasite in those potential vectors.

Methods and Results.--Although several trapping methods were employed, it appeared that a sweep net on the end of a long pole, manipulated from a catwalk above the harems was the best method of catching flies, particularly those that swarm on seals with open wounds. After trying box traps and light traps, it became apparent that only a few species of flies occurred in high enough numbers to qualify as possible vectors. A rather large, brown, furry fly that apparently laps blood and serum from wounds was selected for experimental study. This fly was abundant on all the rookeries and is currently being identified by Raymond Gagne, Diptera Section of the U. S. National Museum in Washington, D.C.

Other potential vectors considered during the study included amphipods, mites, and lice. Three hundred amphipods were collected and 150 were teased apart under a dissecting micrscope to find naturally occurring parasites but none were found. The remaining 150 were divided into groups of 50 and placed in a gallon container of seawater and allowed to feed on placenta taken from infected female seals, and on blood with a high concentration of microfilaria, again with negative results. Mites in the respiratory tract were also examined with negative results, probably because they are mucus feeders and do not come into close enough contact with the blood. Adult lice were examined and, as in previous investigations by other workers, they were negative. One class of louse that has not been examined thoroughly is that class which overwinters on the potential mother seal and undergoes final development during parturition to infest the newborn pup. Future plans call for examining this special group or class of fur seal louse. Other adult lice examined were probably second generation lice that could not possibly carry microfilaria since the adult worm takes up to several

months to begin depositing microfilaria into the blood stream of the new host.

Approximately 50-100 flies were caught per day from 15 to 20 July by means of the sweep method at Reef Rookery. Flies feeding on wounds were swept from the heads and backs of resting seals. They were returned to the laboratory, cooled until inactive, then transferred to plastic quart jars in lots of 50. The jars were equipped with small feeding cups (rings of plastic tubing cut and glued to the bottom of the jar) for holding infected blood each day and were kept at 5° C during observation. Microfilaria were found active in the gut of the fly at 24 and 48 hours. No larvae were observed after that period; however, movement was seen in the fat bodies of the fly at 6 days, but it was not possible to confirm the presence of the parasite at the time due to poor resolution of the microscope available. The remaining flies were returned to California to continue the observation at the end of the 3-week period at St. Paul Island. In California they were maintained at the same temperature (5°C) on colored sugar water for 45 days. Dissections of flies at 2 day intervals during this period were all negative.

Discussion and Conclusions.--The fly infesting wounds could be a possible carrier but time is short for the worm to succeed in its larval development. It may pass directly to the wound, as the fly is feeding, through defecation. Direct transmission results, i.e., mother to pup, are still incomplete pending a study of blood samples from captive mother-pup pairs in the Canadian research program of Michael Bigg, Fisheries and Marine Service Environment Canada, Nanaimo, British Columbia. Amphipods, ticks, mites, and biting flies can be eliminated as possible vectors since they do not occur in great enough numbers, simultaneously on all the rookeries, to explain the high rate of infection of the herd (80% of harvested males). The exact age of pups when the parasite becomes patent (deposits microfilaria into the blood stream) awaits further investigation of silver pups in October-November, and certain age classes of captive fur seals in Seattle and at Nanaimo, British Columbia.

Studies of Infectious Diseases

This work has been carried out by the staff of the Naval Bioscience Laboratory, Naval Supply Center, Oakland, California, under the direction of Neyland A. Vedros and with the assistance of Mark Keyes.

Immunology

The most important aspect of the immunocompetence studies concerns the cellmediated immune system. If the pups do not have a very effective humoral (peripheral blood system) immune system as has been shown, then the cellular immune system must be functioning in the early weeks following birth. To determine the biological activity of T and B cells, peripheral

blood and splenic tissue must be obtained and processed in less than 24 hours. Attempts to carry out this research in the summer of 1980 failed. Peripheral lymphocytes did not survive and no splenic tissue from moribund pups was obtained. Further attempts to obtain this information are planned.

Microbiology

The initial phase of these studies concerned development of the most effective medium for isolation of bacteria and fungi from the northern fur seal. The number of dissimilar colonies obtained on various media incubated under various conditions was determined. The final nonselective and selective media chosen are shown in Table 13. By using these media the maximum number of microbes were isolated. These isolates are shown in Table 14. Anaerobes isolated to date from the intestinal tract are shown in Table 15. Many of these isolates do not fit any classification and are currently under study.

Northern fur seals of the Pribilof Islands harbor a variety of bacteria, some of which could become pathogenic under pelagic stress. There were many bacteremias (bacteria in the blood stream) noted; yet the animals were healthy. Knowledge of this tolerance of organisms in the blood stream may be of great importance to human medicine. One doctoral candidate is now examining this phenomenon.

Now that the most efficient media have been developed, any sick or moribund seals can be sampled with confidence, and future spread of an infectious disease agent through the herd can be accurately identified and followed serologically (similar to what was done with San Miguel Sea Lion Virus).

Pathology -- St. George Island

A third and final year of baseline data on causes of death in newborn fur seals was completed on St. George Island in 1979. An evaluation of the influence of a peak male population on pup mortality will begin there in 1985.

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Ke Chung Kim
Murray D. Dailey
Neylan A. Vedros

TABLE 13.--Optimum environment and medium for isolation of microbes from the northern fur seal, St. Paul Island, Alaska, 1975-1980.

Source of specimen	Medium of choice (in order of priority)	Incubation temp. (°C) ( ) air, CO_2, or anaerobic
Ear, nose, throat	1. TSASB-D	25 (air)
	2. BAP	25 (air)
	3. BHI	25 (air)
Blood, liver kidney, spleen	1. TSASB-D	37 (air)
	2. Biphasic blood bottle	37 (air)
	3. BAP	37 (air)
Rectum, intestine	1. TSASB-D	37 (CO_2)
	2. BAP	37 (CO_2)
	3. BHI	37 (CO_2)
selective		
Fastidious organisms (e.g. neisseria)	Choc. bl. agar	37 (CO_2)
Brucella	Brucella agar	37 (air)
Enteric pathogens (e.g. Salmonella)	1. Xylose-lysine-deoxycholate agar	37 (CO_2)
	2. Salmonella-shigella agar	" "
Leptospira	Fletchers medium	35 (air)
Mycobacteria	Lowenstein Jensen	37 (air)
Fungi	1. Mycosel	25 (air)
	2. Saboraud's	" "
Mycoplasma	PPLO media with inhibitor broth	37 (CO_2)

TABLE 14.--Bacterial isolates from the northern fur seal, St. Paul Island, Alaska, 1975-80.

Specimen	No. of animals	Males (2-4 years)	No. of animals	Pups (1-5 weeks)
Blood	28	Streptococcus spp. (4) Moraxella spp. (3) Escherichia coli (8) Proteus vulgaris (2) Staphylococcus Aureus (7) Corynebacterium spp. (2) Aerococcus spp. Lactobacillus subgenus Streptobacterium Klebsiella spp.	10	Streptococcus spp. (5) Staphylococcus aureus (3) Corynebacterium spp. (3) Proteus vulgaris Proteus spp.
Kidney	75	Micrococcus spp. Neisseria caviae Staphylococcus spp. (3) Corynebacterium spp. (4)	5	Micrococcus spp. Corynebacterium spp. Bacillus circulans
Liver	65	Bacillus spp. Corynebacterium spp. Staphylococcus spp. Micrococcus spp. (2) Acinetobacteria	5	Micrococcus spp. (2)
Spleen	19	Corynebacterium spp. (3) Citrobacter freundii Enterobacter sakazaki Lactobacillus spp. Moraxella spp. Proteus spp.	5	No isolations
Nose/throat	50	Corynebacterium spp. Moraxella spp. (3) Acinetobacter spp. Streptococcus spp. Neisseria cuniculi (14) Escherichia coli Bacillus spp. Proteus mirabilis atypical E. coli (2) Neisseria sicca	8	Proteus mirabilis
Rectal	22	Actinobacillus spp. Acinetobacter spp. Corynebacterium spp. Escherichia coli Moraxella spp. Neisseria spp. Staphylococcus spp. Enterococcus spp. Enterobacter hafnia Streptococcus spp. Pseudomonas fluorescens (3) Aeromonas punctata (2) Klebsiella spp. (2) Pseudomonas spp. (2) Acinetobacter coloaceticus Var. Anitratum	4	Escherichia coli Alcaligines spp. Alcaligines faecalis Acinetobacter calcoaceticus Moraxella spp.

TABLE 15.--Obligate anaerobe isolates from the large intestines of 74 northern fur seals, St. Paul Island, Alaska[1/].

ISOLATES	
Clostridium felsineum (1)	Bacteroides hypermegas (2)
Clostridium mangenotii (1)	Bacteroides spp. (5)
Clostridium scatologenes (1)	Propionibacterium spp. (2)
Clostridium novyi (2)	Propionibacterium acnes
Clostridium paraputrificum (2)	Eubacterium spp. (3)
Clostridium sordellii (3)	Eubacterium lentum (2)
Clostridium perfringens (1)	Fusobacterium spp. (3)
Clostridium spp. (17)	Bifidobacterium spp. (1)

[1/] Animals examined in 1976

PART IV. POPULATION GROWTH - SAN MIGUEL ISLAND (Adams Cove and Castle Rock)

Adams Cove

Since its discovery in 1968, the northern fur seal colony breeding at Adams Cove on the west end of San Miguel Island has been studied annually. During the 1980 field season, research activities at Adams Cove included ongoing population monitoring and pup tagging programs, observations of mortality, estimation of the total female population and the study of pup growth and development.

Population Information

Table 16 summarizes the more important population information for the Adams Cove colony obtained since 1969. In 1980, as in previous years, the adult males began establishing territories on the rookery when females begin arriving in mid-to-late May. The first pup was born on 24 May and the mean birth date was 29 June; 896 pups were born at the Adams Cove Rookery, an increase of 7% over the number born in 1979. Although this increase was not as great as that from 1978 to 1979 (31%) or from 1977 to 1978 (51%), the population continued to grow rapidly. These high rates of increase were most likely caused by recruitment of sexually mature females from within the population and the continued immigration of mature females from northern rookeries of the Pribilof, Commander and Robben Islands. Immigration of females from nearby Castle Rock to the Adams Cove colony has never been observed.

The number of territorial males increased from 18 in 1979 to 19 in 1980. A maximum count of 68 bachelor males was recorded on 5 August and represented a 36% increase over the maximum count of 50 in 1979. This increase was probably the result of recruitment of males born at Adams Cove after 1973 when the pup population began to increase markedly. Marked males from northern populations have never been observed at San Miguel Island.

Tagging Records and Program

Records have been kept of each tagged seal observed ashore in Adams Cove, starting in 1968 with the discovery of this colony. As stated earlier, some of these females had been tagged as pups on the Pribilof, Commander, and Robben Islands (Appendix A, Table A-13), and some have been tagged as adult females or pups at Adams Cove on 20 July 1968 (Appendix A, Table A-14). Records have also been kept of sightings of adult females tagged on San Miguel Island in 1975 (Appendix A, Table A-15). From 1976 to 1980, we resighted 44 (86%) of 50 females tagged in 1975; however, during any single season, only approximately 50% of these individuals were resighted.

The fur seal pup tagging program on San Miguel Island began in 1975. During subsequent years, the general trend has been for more resightings of tagged fur seals from each year class as they increase in age (Appendix A,

TABLE 16.--Summary of some observations of the northern fur seal colony in Adams Cove, San Miguel Island, California, 1969-80.

Observation	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
Season span												
Beginning date[1]	16 May	23 May	15 May	16 May	9 May	20 May	19 May	29 May	18 May	17 May	15 May	17 May
Ending date	1 Oct	20 Sept	6 Sept	7 Sept	15 Aug	9 Sept	6 Sept	14 Sept[2]	22 Sept[9]	9 Sept[3]	15 Sept	23 Sept
First male	16 May	29 May	24 May	16 May	26 May	20 May[3]	12 May	29 May[2]	18 May[9]	17 May[11]	21 May[13]	17 May[14]
First female	27 May	28 May	25 May	22 May	17 May[4]	20 May[3]	19 May	29 May[2]	18 May[9]	17 May[11]	16 May[13]	23 May
First birth	6 Jun	28 May	31 May	22 May	7 Jun[4]	27 May	27 May	29 May[5]	29 May[10]	30 May	28 May	24 May
Mean birth date	24 Jun	21 Jun	26 Jun	22 Jun	24 Jun	23 Jun	27 Jun	29 Jun	25 Jun[10]	24 Jun	29 Jun	29 June
Total births	28	33	45	70	68	220	329	417	421	635	834	896
Total pup deaths	2	14	15	21	17	52	46	91	64	77	72	103
Total females (maximum counted and date)[6]	175	179	274	310	394	551	563	495	681	584	702	665
	23 Aug	23 Aug	2 Sept	16 Aug	4 Aug	8 Sept	24 Aug	14 Jul	26 Aug	18 Aug	25 Aug	31 Aug.
Total large adult males	4	2	4	6	6	6	10[7]	7	7	13[7]	11	9
Total small adult males	4	4	6	7	5	6	6	5	3	12[12]	13[12]	10
Total bachelors[8]	4	5	6	10+	6	8	7	11	7+	19	50	68

1/ Beginning and ending dates of continuous observations.
2/ Four males, nine females present 29 May--arrived prior to 29 May.
3/ May have arrived earlier.
4/ One still birth occurred on 19 May.
5/ One pup present 29 May-born prior to 29 May.
6/ A few 2-, 3-, and 4-year-old males may have been included because they are about the same size as adult females.
7/ Includes two males who arrived in late August and were not territorial (probably from Castle Rock).
8/ Animals about 104-127 cm in body length, tip of nose to tip of tail.
9/ Three males and 2 females present 17 May--arrived prior to 18 May.
10/ Estimated from previous breeding season information.
11/ Two females present 17 May--arrived prior to 18 May.
12/ Includes six small adult males who were not territorial.
13/ Four females present 16 May--arrived prior to 16 May.
14/ Two males present 17 May--arrived prior to 16 May.

Table A-16). In 1980, from the portion of tagged fur seals in each year class, we resighted one female yearling (.25%), eight 2-year-olds (4%, two females and six males), sixteen 3-year-olds (16%, nine females and seven males), twelve 4-year-olds (14%, seven females and five males), and eighteen 5-year-olds (18%, seven females and eleven males). Similar age specific rates of return have been recorded in previous years for the population of Adams Cove and the Pribilof Islands.

On 4 October 1980, 200 fur seal pups were single tagged with modified monel cattle ear tags and checkmarked by removal of the cartilaginous extension of the second digit of the left hind flipper (Appendix A, Table A-17). Also, at Adams Cove, nine subadult male fur seals were tagged on 24 May 1980 (Appendix A, Table A-18), 20 fur seal pups were given double pink plastic tags[7/] on 5, 6, and 8 December 1980 and on 18 November 1979, 28 female fur seals were double tagged with white plastic tags and 2 were single tagged with orange rubber disc tags (Appendix A, Table A-19).

Mortality

In 1980, the mortality rate for fur seal pups was 11.5% of the total pup population. Forty nine percent of the 103 pup deaths recorded in 1980 probably resulted from heat prostration during or immediately following periods of abnormally hot weather[8/]. One pup was crushed and/or suffocated by falling earth embankments. Causes of death for the other pups were undetermined.

Two adult female fur seals were killed by crushing and/or suffocation from falling earth embankments. Although this has been a relatively common cause of pup mortality, this is the first observation of adult mortality caused by falling earth embankments. During warm weather, fur seals frequently seek shade at the base of ridges and cliffs which are composed of sandy topsoil. The base of these areas erode easily because of frequent animal activity and high winds and result in the formation of large overhanging ledges. These ledges eventually collapse and crush or smother the animals below.

Fur Seal Pup Study

The strictly observational nature of research on San Miguel Island was modified in 1980 to include a study of pup growth and development. The objectives of this study were to provide comparable data for the fur seal populations of San Miguel Island and the Pribilof Islands and to identify factors which may contribute to neonatal survival.

7/ Tags with numbers 649-658 were applied to male fur seal pups, except for 654 and 656, which were applied to female fur seal pups.

8/ High air and sand temperatures, solar radiation, and calm air combine to raise body temperatures and cause heat prostration.

The fur seal pups (n = 138) were taken from their mothers within 1 day of their birth using a 30 ft. (9.1 m) bamboo pole with a short noose at the end. Their sex was then determined and the animals were weighed to the nearest 0.25 kg., and measured from tip of snout to tip of tail (standard length) and assigned an identification number, which was either clipped into the fur or applied with bleach. Each pup was immediately returned to its mother following this procedure. Ninety four of these pups were recaptured at ages 42 and 52 days, weighed, measured, and tagged in the fore flipper with a plastic cattle ear tag[9/].

The fur seal pups in this study were divided into two groups: 1) those that were caught prior to the mean pupping date of 29 June (n = 76), and 2) those that were caught after the mean pupping date from 8 to 15 July (n = 62). Table 17 summarizes the information on pup weights collected from the Adams Cove population in 1980. Group and sex differences in pup weights at birth and at ages 42-52 days were statistically compared using the Mann-Whitney U Test (Table 18). There was no significant difference in the weights of male pups between groups 1 and 2, nor between female pups of groups 1 and 2, either at birth or at ages 42-52 days. Male pups of either group were, however, significantly heavier than female pups or either group, both at birth and at ages 42-52 days.

Group 2 pup weights, at birth and at ages 42 to 52 days, were compared to those of pups of similar ages born at approximately the same seasonal date on Zapadni Reef Rookery, St. Paul Island (Pribilof Islands, Alaska) in 1963 (Keyes 1963)[10/]. There were no significant differences in birth weights of male or female pups from the two locations; however, the weights of male pups from Adams Cove at ages 42-52 days were significantly heavier than those from Zapadni Reef Rookery. A test comparing the weights of female pups at this age could not be done due to an insufficiently small sample of animals from Zapadni Reef Rookery (Table 18).

Additional comparisons between these and other data currently being carried out will be presented in a separate manuscript later this year.

Female Population Estimates

Daily censuses of females on the rookery and resighting information of naturally marked females were used to generate a group of daily Lincoln/Petersen

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9/ Pink plastic roto tags with numbers 432-470 (except 451 and 456) were attached to the left front flippers of 37 male fur seal pups. Identical tags with numbers 427 and 430-491 (except 431, 445, 450, 474, 488, and 490) were attached to the right front flippers of 57 female fur seal pups.

10/ M. C. Keyes, 1963. Research in fur seal mortality; St. Paul Island, Alaska; 8 July-24 September 1963. Unpubl. manuscr., 80p. Natl. Mar. Mamm. Lab., Northwest and Alaska Fish. Cent., Natl. Mar. Fish. Serv., NOAA, 7600 Sand Point Way N.E., Seattle, WA 98115.

TABLE 17.--Mean weights of northern fur seal pups from Adams Cove, San Miguel Island, California 1980 (Group 1 and Group 2)[1/] and from Zapadni Reef Rookery, St. Paul Island, Pribilof Islands, Alaska 1963 (Keyes 1963 unpubl. manuscr. See footnote 10 in text).

Rookery	Group	$\bar{x}$ Weight at birth	$\bar{x}$ Weight @ age 42-52 days
Adams Cove	Group 1 males	5.30 kg (SD=.89;N=38)	9.54 kg (SD=1.38; N=27)
	Group 2 males	5.72 kg (SD=.74;N=25)	9.91 kg (SD=1.27; N=14)
	Group 1 & 2 males combined	5.46 kg (SD=.86;N=63)	9.66 kg (SD=1.34; N=41)
	Group 1 females	4.69 kg (SD=.85;N=38)	8.30 kg (SD=1.16; N=24)
	Group 2 females	4.93 kg (SD=.71;N=37)	8.28 kg (SD=1.14; N=29)
	Group 1 & 2 females combined	4.81 kg (SD=.79;N=75)	8.29 kg (SD=1.14; N=53)
Zapadni Reef	males (born 13 & 14 July 1963)	5.90 kg (SD=.89;N=17)	7.80 kg (SD=.89; N=12)
	females (born 13 & 14 July 1963)	5.06 kg (SD=.54;N=12)	(insufficient data)

1/ Group 1 pups; pups caught up to mean pup date (24 May to 29 June).
Group 2 pups; pups caught after mean pup date (8 July to 15 July).
(mean pup date occurred on 29 June 1980).

TABLE 18.--Table of Mann-Whitney U Test (Siegal 1956) results, comparing pup weights at birth and age 42-52 days for Adams Cove, San Miguel Island, California (Group 1 and Group 2)[1/] and for Zapadni Reef Rookery, St. Paul Island, Pribilof Islands, Alaska. (+ = Significant; - = Not significant; $P \leq .001$)

Age at birth	Result	Age 42-52 days	Result
Group 1 males vs. Group 2 males at birth	-	Group 1 males vs. Group 2 males	-
Group 1 females vs. Group 2 females at birth	-	Group 1 females vs. Group 2 females	-
Group 1 males vs. Group 1 females at birth	+	Group 1 males vs. Group 1 females	+
Group 2 males vs. Group 2 females at birth	+	Group 1 males vs. Group 2 females	+
Group 2 males vs. Zapadni Rookery males (born 13 & 14 July 1963)	-	Group 2 males vs. Zapadni Rookery males	+
Group 2 females vs. Zapadni Rookery females (born 13 & 14 July 1963)	-	Group 2 females vs. Zapadni Rookery females	(insufficient data)

[1/] Group 1 pups; pups caught up to mean pup date (24 May to 29 June).
Group 2 pups; pups caught after mean pup date (8 July to 15 July).
(mean pup date occurred on 29 June 1980)

estimates of the female population. Resighting information was used only from females with highly reliable marks so that all marked animals present on land were detected. Studies were conducted at those times when the highest numbers of females were expected to be ashore. The population was separated into parturient and nonparturient females so that the size of each group could be estimated to minimize bias which would be introduced by known differences in the onland portion of the two group's hauling cycles.

The Lincoln/Petersen estimator is of the form:

$$\hat{N} = \frac{n \cdot M}{X} \qquad \text{where,}$$

$\hat{N}$ = estimates of the population,

n = number of animals sampled,

M = total marked animals in population, and

X = number of resighted (recaptured) marked animals in sample.

We first estimate the number of parturient females ashore on any single day as

$$n_1 = \frac{N_1 X_1}{M_1} \qquad \text{where}$$

n_1 = estimate of the parturient females on land for a single day,

N_1 = total parturient females which is equal to the number of observed pups born,

X_1 = resighted marked parturient females, and

M_1 = total marked parturient females.

With the estimate of n_1 we can calculate the proportion of nonparturient females in the daily census and then estimate the nonparturient female population as follows:

$$N_2 = \frac{n_2 M_2}{X_2} \qquad \text{where}$$

n_2 = estimate on nonparturient females on land for a single day which is equal to n_1 subtracted from the total count of females for the same day,

N_2 = total nonparturient females,

X_2 = resighted marked nonparturient females, and

M_2 = total marked nonparturient females.

Total female population estimate = $N_1 + N_2$.

The data collected during this study was not corrected for those parturient females whose onland cycles might have changed because their pups died. The resighting studies were conducted during three sample periods: 1) 15-17 August, 2) 22-23 August, and 3) 8-9 September (Table 19). The means of daily estimates for the three study periods ranged from 2,343 to 2,490. The highest mean female pup estimate of 2,490 (896 parturient, 1,594 nonparturient) obtained during 22-23 August represents an increase of approximately 1,275 (106%) females over the highest estimate in 1976. The number of parturient females increased 115% between 1976 and 1980 while nonparturient females increased by 97%. The number of parturient females and the estimated total number of females (includes mature and immature females) was used to calculate a natality estimate of 36.1% for 1980, compared to 34.7% for the 1976 estimate.

Castle Rock

In 1972, a northern fur seal rookery was discovered on Castle Rock, a small island approximately 2 miles north of the west end of San Miguel Island. A summary of censusing information for Castle Rock is presented in Table 20 for 1972-80. These data have been obtained from afoot, from aerial photographs, and from offshore using a small skiff. In 1980, a count of 563 pups (525 live and 38 dead) was obtained during a census from afoot on 1 August, and represents a decrease in pup production of 90 animals from 1979 to 1980. Over the last few years, pup production on Castle Rock has fluctuated within a range of 521 (1976) to 653 (1979), suggesting a possible stabilization in the colony's growth compared to the continued rapid growth of the Adams Cove colony.

Twenty-seven breeding males were counted on Castle Rock from aerial photographs taken on 1 July 1980 (Table 20); the same number of territorial males was recorded in 1979.

On 3 October 1980, 100 fur seal pups were single tagged with modified cattle ear tags (Appendix A, Table A-20) and checkmarked by removing the cartilaginous extension of the 2nd digit of the left hind flipper.

One dead female fur seal was observed on Castle Rock during the count of pups on 1 August.

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George A. Antonelis, Jr.

TABLE 19.--Estimated number[1/] of female northern fur seals, Adams Cove, California, 1980

Sample period	Date	No. of seals
1	15 August	1,437
	16 August	2,797
	17 August	2,779
	Mean	2,338
2	22 August	2,367
	23 August	2,612
	Mean	2,490
3	8 September	2,311
	9 September	2,411
	Mean	2,361

[1/] Lincoln-Petersen estimates of parturient and nonparturient females using naturally marked females and daily censuses.

TABLE 20.--Summary of censuses of northern fur seals, Castle Rock, California, 1972-80[1/].

Fur seals	Numbers observed, methods and date of observation								
	1972	1973	1974	1975	1976	1977	1978	1979	1980
Females	223[a] 1 Aug.	345[a] 11 Jul.	301(+)[d]	396(+)[d]	526[c] 27 Jun.	617(+)[d]	533(+)[d]	653(+)[d]	563(+)[d]
Pups (total observed)[2/]	95[a] 1 Aug.	193[b] 28 Jul.	301(+)[b] 2 Aug.	396[b] 2 Aug.	521[b] 25 Jul.	617[b] 29 Jul.	533[b] 2 Aug.	653[b] 1 Aug.	563[b] 1 Aug.
Pups (dead observed)	- -	33[b] 28 Jul.	21[b] 2 Aug.	28[b] 2 Aug.	27[b] 25 Jul.	20[b] 29 Jul.	26[b] 2 Aug.	27[b] 1 Aug.	38[b] 1 Aug.
Reproductive large adult males[3/]	9[a] 1 Aug.	13[a] 11 Jul.	11[a] 2 Jul.	15[a] 1 Jul.	16[c] 27 Jun.	9(+)[a] 26 Jul.	20[a] 1 Jul.	27[a] 3 Jul.	27[a] 1 Jul.
Total large adult males	10[a] 1 Aug.	14[a] 11 Jul.	20[a] 2 Jul.	20[a] 1 Jul.	18[c] 27 Jun.	9(+)[a] 26 Jul.	25[a] 1 Jul.	32[a] 3 Jul.	32[a] 1 Jul.
Total small adult males	-	-	-	-	-	-	-	7[a] 3 Jul.	2[a] 1 Jul.

1/ Methods by which counts were obtained
a - Aerial photographs.
b - Land based counts from afoot.
c - Offshore counts from skiff.
d - Minimum estimate from pup count.

2/ Includes dead pup count.

3/ Territorial adult males with females.

PART V. PELAGIC ECOSYSTEM

A separate (and third) report on the analysis of pelagic data will be submitted to the North Pacific Fur Seal Commission at its twenty fourth meeting in April 1981. Major topics of discussion in this report will include distribution, migration and studies of the feeding habits of northern fur seals.

The NOAA ship MILLER FREEMAN[11/] was used to survey waters off southeastern Alaska, British Columbia, and Washington from 23 November to 8 December 1980 to increase our knowledge about the distribution of northern fur seals during early winter. Incidental sightings of other marine mammals were also recorded during this survey. Three scientists engaged in northern fur seal research observed northern fur seals and other marine mammals during this cruise.

The objectives of this cruise were to survey, enumerate, and monitor the arrival of fur seals and pups in the coastal offshore and nearshore waters of southeastern Alaska and to determine the maturity of sighted seals based on the color of their vibrissae. However, these objectives were not achieved since planned transect surveys (to be carried out seaward between 20 to 60 nmi from shore at intervals of 20 min of latitude) could not be completed because of severe storms. Instead, protected nearshore waters of southeastern Alaska were extensively surveyed for fur seals but none was seen. During the entire cruise, only one fur seal was seen, and that was on LaPerouse Bank 7 December off Vancouver Island, British Columbia, Canada. The color of its vibrissae was not determined.

A total of 471 marine mammals were sighted representing eight species during 94.3 hr of observation along survey lines totaling approximately 740 nmi.

Hiroshi Kajimura

11/ Registered length 66.0 m, 2,150 shp, cruising speed 14 kn.

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GLOSSARY

The following terms used in fur seal research and management on the Pribilof Islands have special meanings or are not readily found in standard dictionaries:

Bachelor Young male seals of ages 2-5 years.

Checkmark A notch, slit, hole, or other mark made on a seal flipper when a tag is applied to ensure recognition of an animal that has lost its tag.

Drive The act of surrounding and moving groups of seals on land from one location to another.

Escapement Seals that were not harvested because they were too old, too large, or were not available.

Hauling Ground An area, usually near a rookery, on which nonbreeding seals congregate. See Rookery.

Haul Out The act of seals moving from the sea to a rookery or hauling ground on shore.

Known-age Refers to a seal whose age is known because the animal bears an inscribed tag or other type of mark.

Male Seals, Adult Class 1 (Shoreline)--Full-grown males apparently with established territories spaced along the water's edge at intervals of 10-15 m. Most of these animals are wet or partly wet and some acquire harems of 1-4 females between 10 and 20 July. They would then be called harem males (Class 3). Shoreline or Class 1 males should not be confused with Class 2 animals. The latter definitely have territories, whereas the shoreline males appear to be attached to such sites but may not be in all cases.

Class 2 (Territorial without females)--Full-grown males that have no females but are actively defending territories. Most of these animals are located on the inland fringe of the rookery, some are between Class 1 (Shoreline) and Class 3 (Territorial with females) males, and an occasional Class 2 male may be completely surrounded by Class 3 males and their harems.

Class 3 (Territorial with females)--Full-grown males actively defending territories and one or more females. Most Class 3 males and their harems combine to form a compact mass of animals. Isolated individuals, usually with small harems, may be observed at each end of a rookery, on sand beaches, and in corridors leading to inland hauling grounds.

Class 4 (Back fringe)--Full- and partly-grown males on the inland fringe of the rookery. A few animals too young and too small to include in the count may be found here. Though some Class 4 males may appear to be holding territories, most will flee when approached or prodded with a pole.

Class 5 (Hauling ground)--The hauling grounds contain males from May to late July and a mixture of males and females from then on. The counts include males that obviously are adults and all others that have a mane and the body conformation of an adult. Males included in this count will be approximately age 7 and older.

Prior to 1966, Class 3 males were formerly called harem bulls, and Classes 1, 2, 4, and 5 were collectively called idle bulls. From 1966 through 1974, the adult male seals were classified into 5 groups (Classes 1, 2, 3, 4, and 5). Beginning in 1975, Classes 1 and 2 were combined and designated as Class 2, Class 3 remained the same, and Classes 4 and 5 were combined and designated as Class 5.

Marked Describes a seal that has been marked by removing the cartilaginous tip of a digit from a hind flipper, by attaching an inscribed metal tag to one or more of its flippers, by freeze marking or by hair-clipping and bleaching.

Mark Recoveries Includes the recoveries of seals marked by one of several methods. See Marked paragraph.

Rookery An area of which breeding seals congregate. See Hauling Ground.

Round The sequence in which hauling grounds are visited for the drive to harvest seals. A circuit or round of the hauling grounds is completed in 5 days and the procedure is repeated throughout the harvest of males.

The following are English translations of names given to some of the rookeries or hauling grounds by the Russians in the 1700's:

Russian	English
	St. Paul Island
Vostochni	From "Novoctoshni" meaning "place of recent growth"; applied to Northeast Point. Apparently, Northeast Point was at one time an island which has since been connected to St. Paul Island by drifting sand.
Morjovi	Walrus. Historically, walruses hauled out here in summer.
Polovina	Halfway (to Northeast Point from the village).
Kitovi	Of "KIT" or whale. When whaling fleets were active in the Bering Sea between 1849 and 1856, a large right whale killed by some ship's crew drifted ashore here.
Gorbatch	Humpback. Apparently refers to the "hump like" nature of the scoria slope above the rookery.
Tolstoi	Thick. In this case, thick headland on which the rookery is located.
Zapadni	West. Western part of the island.
Lukanin	So named after a Russian pioneer sailor who was said to have taken over 5,000 sea otters from St. Paul Island in 1787.
Zoltoi (hauling ground)	Golden.
	St. George Island
Staraya Artil	Old settlement or village. There once was a settlement or village adjacent to the rookery.
Zapadni	West. Western part of the island.
	Sea Lion Rock
Sivutch	Sea lion. These animals haul out but do not breed here.

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APPENDIX A

Tabulations of northern fur seal data collected on the Pribilof Islands, Alaska and on San Miguel Island, California and nearby Castle Rock in 1980.

APPENDIX A--continued

TABLE A-1.--Age classification of male northern fur seals harvested, St. Paul Island, Alaska, 27 June to 1 August 1980.

Date/Rookery[1/]	Males harvested	Tooth sample	Daily: Percent in each age group of sample					Daily: Estimated number harvested by age group					Total harvest to date	Cumulative: Estimated number harvested by age group					Cumulative: Percent harvested by age group				
			2	3	4	5	6	2	3	4	5	6		2	3	4	5	6	2	3	4	5	6
June 27 ZAP	299	75	0.0	33.3	57.4	8.0	1.3	0	99	172	24	4	299	0	99	172	24	4	0	33	58	8	1
30 TZR	167	39	2.6	25.6	61.5	10.3	0.0	4	43	103	17	0	466	4	142	275	41	4	1	30	59	9	1
July 1 NEP (east)	460	105	1.9	42.9	50.5	4.7	0.0	9	197	232	22	0	926	13	339	507	63	4	1	37	55	7	0
1 NEP (west)	155	31	0.0	32.3	64.5	3.2	0.0	0	50	100	5	0	1,081	13	389	607	68	4	1	36	56	6	1
2 POL	665	159	0.0	28.3	59.8	11.3	0.6	0	188	398	75	4	1,746	13	577	1,005	143	8	1	33	58	8	0
2 L-K	377	93	2.2	38.7	51.6	7.5	0.0	8	146	195	28	0	2,123	21	723	1,200	171	8	1	34	57	8	0
3 Reef	1,077	251	2.0	43.8	49.8	4.4	0.0	22	472	536	47	0	3,200	43	1,195	1,736	218	8	1	38	54	7	0
7 ZAP	944	225	1.8	48.9	46.2	3.1	0.0	17	462	436	29	0	4,144	60	1,657	2,172	247	8	2	40	52	6	0
8 TZR	237	51	0.0	35.3	60.8	3.9	0.0	0	84	144	9	0	4,381	60	1,741	2,316	256	8	1	40	53	6	0
9 NEP (east)	1,085	225	1.8	46.7	49.3	2.2	0.0	19	507	535	24	0	5,466	79	2,248	2,851	280	8	2	41	52	5	0
9 NEP (west)	456	100	1.0	54.0	43.0	2.0	0.0	5	246	196	9	0	5,922	84	2,494	3,047	289	8	1	42	52	5	0
10 POL	512	110	1.8	59.1	36.4	1.8	0.9	9	303	186	9	5	6,434	93	2,797	3,233	298	13	1	44	50	5	0
10 L-K	453	97	6.2	42.3	44.3	7.2	0.0	28	192	201	32	0	6,887	121	2,989	3,434	330	13	2	43	50	5	0
11 Reef	986	207	2.4	54.6	41.1	1.9	0.0	24	538	405	19	0	7,873	145	3,527	3,839	349	13	2	45	49	4	0
14 ZAP	1,144	248	7.3	57.3	31.8	3.2	0.4	83	656	364	37	4	9,017	228	4,183	4,203	386	17	3	46	47	4	0
15 TZR	353	56	1.8	48.2	44.6	5.4	0.0	6	170	158	19	0	9,370	234	4,353	4,361	405	17	3	46	47	4	0
16 NEP (east)	923	205	10.2	51.2	34.2	4.4	0.0	94	472	316	41	0	10,293	328	4,825	4,677	446	17	3	47	46	4	0
16 NEP (west)	353	77	6.5	49.3	41.6	2.6	0.0	23	174	147	9	0	10,646	351	4,999	4,824	455	17	3	47	46	4	0
17 POL	662	138	5.1	50.0	42.0	2.9	0.0	34	331	278	19	0	11,308	385	5,330	5,102	474	17	4	47	45	4	0
17 L-K	540	118	5.1	59.3	32.2	3.4	0.0	28	320	174	18	0	11,848	413	5,650	5,276	492	17	3	48	45	4	0
18 Reef	1,359	266	7.5	57.1	33.5	1.9	0.0	102	776	455	26	0	13,207	515	6,426	5,731	518	17	4	49	43	4	0
21 ZAP	918	121	8.3	60.3	31.4	0.0	0.0	76	554	288	0	0	14,125	591	6,980	6,019	518	17	4	49	43	4	0
22 TZR	797	109	11.9	52.3	30.3	5.5	0.0	95	417	241	44	0	14,922	686	7,397	6,260	562	17	5	49	42	4	0
23 NEP (east)	584	82	9.8	61.0	28.0	1.2	0.0	57	356	164	7	0	15,506	743	7,753	6,424	569	17	5	50	41	4	0
23 NEP (west)	460	65	16.9	46.2	36.9	0.0	0.0	78	212	170	0	0	15,966	821	7,965	6,594	569	17	5	50	41	4	0
24 POL	629	99	8.1	65.7	25.2	1.0	0.0	51	413	159	6	0	16,595	872	8,378	6,753	575	17	5	51	41	3	0
25 Reef	1,340	208	10.6	62.5	24.5	1.9	0.5	142	838	328	25	7	17,935	1,014	9,216	7,081	600	24	6	51	40	3	0
28 ZAP	979	213	18.8	62.4	18.8	0.0	0.0	184	611	184	0	0	18,914	1,198	9,827	7,265	600	24	6	52	39	3	0
29 TZR	161	36	0.0	44.4	55.6	0.0	0.0	0	71	90	0	0	19,075	1,198	9,898	7,355	600	24	6	52	39	3	0
30 NEP (east)	1,200	253	15.4	64.8	17.8	2.0	0.0	185	777	214	24	0	20,275	1,383	10,675	7,569	624	24	7	53	37	3	0
30 NEP (west)	271	58	10.3	62.1	22.4	5.2	0.0	28	168	61	14	0	20,546	1,411	10,843	7,630	638	24	7	53	37	3	0
31 POL	1,137	242	14.5	65.7	17.3	2.1	0.4	165	747	197	24	4	21,683	1,576	11,590	7,827	662	28	7	54	36	3	0
31 L-K	1,032	197	23.4	60.9	14.2	1.5	0.0	241	628	147	16	0	22,715	1,817	12,218	7,974	678	28	8	54	35	3	0
Aug. 1 Reef	1,563	336	23.2	60.1	13.4	3.0	0.3	363	939	209	47	5	24,278	2,180	13,157	8,183	725	33	9	54	34	3	0

1/ NEP (east) = East or Morjovi side of Northeast Point; NEP (west) = West or Vostochni side of Northeast Point; TZR = Tolstoi, Zapadni Reef, and Little Zapadni; POL = Polovina, Polovina Cliffs, and Little Polovina; ZAP = Zapadni; Reef = Reef, Gorbatch, and Ardiquen; L-K = Lukanin and Kitovi.

TABLE A-2.--Age classification of male northern fur seals taken, subsistence harvest, east hauling ground of North Rookery, St. George Island, Alaska, 8 July to 21 August, 1980.

Date	Males harvested	Tooth sample	Percent in each age group of sample			Estimated number harvested by age group		
			2	3	4	2	3	4
July 8	25	25	4.0	56.0	40.0	1	14	10
11	25	25	4.0	60.0	36.0	1	15	9
15	25	25	20.0	80.0	0.0	5	20	0
18	25	25	4.0	92.0	4.0	1	23	1
22	25	25	40.0	60.0	0.0	10	15	0
25	25	25	20.0	68.0	12.0	5	17	3
29	25	25	32.0	64.0	4.0	8	16	1
Aug. 1	25	25	8.0	76.0	16.0	2	19	4
5	25	25	60.0	40.0	0.0	15	10	0
7	25	25	72.0	28.0	0.0	18	7	0
12	24[1/]	24	58.0	42.0	0.0	14	10	0
15	25[2/]	25	92.0	8.0	0.0	23	2	0
19	24	24	79.0	21.0	0.0	19	5	0
21	25	25	20.0	80.0	0.0	5	20	0
Total	348					127	193	28

1/ Plus one 2-year-old female.

2/ Plus one 3-year-old female.

TABLE A-3. -- Adult male northern fur seals counted, by class[1/] and rookery section, St. Paul Island, Alaska, 20-23 June 1980 (A dash indicates no numbered sections).

Rookery and class of male	Section 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
	Number														
Lukanin															
2	38	39	-	-	-	-	-	-	-	-	-	-	-	-	77
3	13	12	-	-	-	-	-	-	-	-	-	-	-	-	25
5	77	7	-	-	-	-	-	-	-	-	-	-	-	-	84
Kitovi[2/]															
2	35 (13)	13	40	62	26	-	-	-	-	-	-	-	-	-	189
3	8 (7)	3	8	7	10	-	-	-	-	-	-	-	-	-	43
5	0 (1)	1	0	0	60	-	-	-	-	-	-	-	-	-	62
Reef															
2	61	82	74	52	45	52	66	49	47	42	18	-	-	-	588
3	14	12	21	14	17	16	1	17	13	12	4	-	-	-	141
5	9	5	5	0	149	0	30	33	0	18	4	-	-	-	253
Gorbatch															
2	79	58	40	19	38	61	-	-	-	-	-	-	-	-	295
3	22	21	18	4	9	31	-	-	-	-	-	-	-	-	105
5	50	1	1	125	0	4	-	-	-	-	-	-	-	-	181
Ardiguen															
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	37
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	20
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5
Morjovi[3/]															
2	35 (42)	50	52	53	50	62	-	-	-	-	-	-	-	-	344
3	16 (2)	18	13	28	15	15	-	-	-	-	-	-	-	-	107
5	98 (16)	5	42	0	0	160	-	-	-	-	-	-	-	-	321
Vostochni															
2	49	30	35	36	28	76	46	55	49	22	36	53	91	40	646
3	8	4	12	60	7	19	13	18	20	6	11	13	28	11	230
5	0	1	0	0	32	126	0	0	44	2	1	38	35	77	356

TABLE A-3. -- Adult male northern fur seals counted, by class[1/] and rookery section, St. Paul Island, Alaska, 20-23 June 1980 (A dash indicates no numbered sections) -- continued.

Rookery and class of male	Section														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	Number														
Little Polovina															
2	36	42	-	-	-	-	-	-	-	-	-	-	-	-	78
3	4	2	-	-	-	-	-	-	-	-	-	-	-	-	6
5	3	161	-	-	-	-	-	-	-	-	-	-	-	-	164
Polovina															
2	65	35	-	-	-	-	-	-	-	-	-	-	-	-	100
3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	3
5	162	0	-	-	-	-	-	-	-	-	-	-	-	-	162
Polovina Cliffs															
2	35	36	28	41	54	74	87	-	-	-	-	-	-	-	355
3	4	4	6	11	8	8	14	-	-	-	-	-	-	-	55
5	1	0	0	4	1	18	8	-	-	-	-	-	-	-	32
Tolstoi															
2	45	44	55	22	67	76	87	87	-	-	-	-	-	-	483
3	21	22	31	24	43	27	32	22	-	-	-	-	-	-	222
5	5	1	0	0	2	7	0	225	-	-	-	-	-	-	240
Zapadni Reef															
2	118	36	-	-	-	-	-	-	-	-	-	-	-	-	154
3	30	15	-	-	-	-	-	-	-	-	-	-	-	-	45
5	24	43	-	-	-	-	-	-	-	-	-	-	-	-	67
Little Zapadni															
2	16	35	55	82	36	56	-	-	-	-	-	-	-	-	280
3	11	22	24	33	32	25	-	-	-	-	-	-	-	-	147
5	7	2	0	6	3	133	-	-	-	-	-	-	-	-	151
Zapadni[4/]															
2	60 (0)	82	82	101	78	74	70	12	-	-	-	-	-	-	559
3	20 (0)	37	32	34	25	23	23	5	-	-	-	-	-	-	199
5	12 (91)	14	2	5	80	2	0	123	-	-	-	-	-	-	329

TABLE A-3. -- Adult male northern fur seals counted, by class[1/] and rookery section, St. Paul Island, Alaska, 20-23 June 1980 (A dash indicates no numbered sections) -- continued.

Rookery and class of male	Section														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	Number														

1/ Class 1 Shoreline - Full-grown males about age 10 and older without females but apparently with established territories at the high tide mark.
Class 2 Territorial without females - Full-grown males about age 10 and older without females but with established territories on the rookery.
Class 3 Territorial with females - Full-grown males about age 10 and older with females and established territories on the rookery.
Class 4 Back fringe - Full-grown and partly grown males about age 7 and older, without females and without territories, that are found along the inland fringe of the rookery.
Class 5 Hauling ground - Full-grown and partly grown males about age 7 and older, without females, that are found on traditional hauling grounds.
Class 3 males were formerly called harem bulls, and Classes 1, 2, 4, and 5 were collectively called idle bulls.
From 1966 through 1974, the adult male seals were classified into 5 groups (Classes 1, 2, 3, 4, and 5). Beginning in 1975, Classes 1 and 2 were combined and designated as Class 2, Class 3 remained the same, and Classes 4 and 5 were combined and designated as Class 5.
2/ Numbers in parentheses are the adult males counted in Kitovi Amphitheater.
3/ Numbers in parentheses are the adult males counted on the second point south of Sea Lion Neck.
4/ Numbers in parentheses are the adult males counted on Zapadni Point Reef.

TABLE A-4.--Adult male northern fur seals counted, by rookery, Pribilof Islands, Alaska, June 1980.

Island and rookery	Date	Class of adult male[1/] 2	3	5	Total
		----------Number----------			
St. Paul Island	June				
Lukanin	20	77	25	84	186
Kitovi	20	189	43	62	294
Reef	21	588	141	253	982
Gorbatch	21	295	105	181	581
Ardiguen	21	37	20	5	62
Morjovi	22	344	107	321	772
Vostochni	22	646	230	356	1,232
Little Polovina	20	78	6	164	248
Polovina	20	100	3	162	265
Polovina Cliffs	20	355	55	32	442
Tolstoi	23	483	222	240	945
Zapadni Reef	23	154	45	67	266
Little Zapadni	23	280	147	151	578
Zapadni	23	559	199	329	1,087
Island total		4,185	1,348	2,407	7,940
St. George Island	June				
Zapadni	20	222	24	144	390
South	20	180	70	42	292
North	21	569	120	328	1,017
East Reef	20	104	17	37	158
East Cliffs	20	215	79	176	470
Staraya Artil	21	277	24	147	448
Island total		1,567	334	874	2,775
Total both islands		5,752	1,682	3,281	10,715

1/ See Table A-3 or glossary for a description of the classes of adult male seals.

TABLE A-5.--Adult male northern fur seals counted, by class[1/] and rookery section, St. Paul Island, Alaska, 10-14 July 1980 (A dash indicates no numbered sections).

Rookery and class of male	Section														Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	
	Number														
Lukanin															
2	6	10	-	-	-	-	-	-	-	-	-	-	-	-	16
3	50	52	-	-	-	-	-	-	-	-	-	-	-	-	102
5	68	6	-	-	-	-	-	-	-	-	-	-	-	-	74
Kitovi[2/]															
2	7 (3)	2	13	14	9	-	-	-	-	-	-	-	-	-	48
3	46(28)	16	50	62	54	-	-	-	-	-	-	-	-	-	256
5	0 (1)	0	0	0	85	-	-	-	-	-	-	-	-	-	86
Reef															
2	25	37	49	19	25	17	32	23	15	9	7	-	-	-	258
3	87	99	90	61	61	72	48	61	56	57	22	-	-	-	714
5	0	16	0	7	69	0	82	50	0	50	10	-	-	-	284
Gorbatch															
2	13	11	11	1	10	9	-	-	-	-	-	-	-	-	55
3	111	74	60	25	54	73	-	-	-	-	-	-	-	-	397
5	82	4	0	175	13	2	-	-	-	-	-	-	-	-	276
Ardiguen															
2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	80
5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21
Morjovi[3/]															
2	18(16)	18	13	18	15	21	-	-	-	-	-	-	-	-	119
3	49(25)	61	51	65	64	61	-	-	-	-	-	-	-	-	376
5	130(19)	0	38	12	0	177	-	-	-	-	-	-	-	-	376

TABLE A-5.--Adult male northern fur seals counted, by class[1/] and rookery section, St. Paul Island, Alaska, 10-14 July 1980 (A dash indicates no numbered sections)--continued.

Rookery and class of male	Section 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
	Number														
Vostochni															
2	11	9	8	11	6	33	34	7	17	2	9	12	24	7	190
3	64	35	53	38	35	98	57	86	67	41	58	73	153	67	925
5	0	0	0	59	55	10	5	6	50	5	0	83	20	80	373
Little Polovina															
2	10	15	-	-	-	-	-	-	-	-	-	-	-	-	25
3	44	47	-	-	-	-	-	-	-	-	-	-	-	-	91
5	13	190	-	-	-	-	-	-	-	-	-	-	-	-	203
Polovina															
2	10	11	-	-	-	-	-	-	-	-	-	-	-	-	21
3	62	33	-	-	-	-	-	-	-	-	-	-	-	-	95
5	222	6	-	-	-	-	-	-	-	-	-	-	-	-	228
Polovina Cliffs															
2	6	9	8	9	20	33	35	-	-	-	-	-	-	-	120
3	51	39	45	67	84	106	132	-	-	-	-	-	-	-	524
5	16	2	2	2	4	2	1	-	-	-	-	-	-	-	29
Tolstoi															
2	12	11	18	12	24	23	27	18	-	-	-	-	-	-	145
3	77	68	74	68	114	120	77	83	-	-	-	-	-	-	681
5	2	2	1	1	39	0	10	200	-	-	-	-	-	-	255
Zapadni Reef															
2	49	14	-	-	-	-	-	-	-	-	-	-	-	-	63
3	101	54[4/]	-	-	-	-	-	-	-	-	-	-	-	-	155
5	0	81[4/]	-	-	-	-	-	-	-	-	-	-	-	-	81

TABLE A-5.--Adult male northern fur seals counted, by class[1/] and rookery section, St. Paul Island, Alaska, 10-14 July 1980 (A dash indicates no numbered sections)--continued.

Rookery and class of male	Section 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
	Number														
Little Zapadni															
2	4	15	21	19	7	22	-	-	-	-	-	-	-	-	88
3	25	57	93	101	60	90	-	-	-	-	-	-	-	-	426
5	0	0	0	0	0	198[5/]	-	-	-	-	-	-	-	-	198
Zapadni[6/]															
2	23 (0)	25	19	35	21	24	28	2	-	-	-	-	-	-	177
3	73 (0)	119	108	122	74	83	72	17	-	-	-	-	-	-	668
5	12(97)	4	3	6	67	10	0	234	-	-	-	-	-	-	433

1/ See Table A-3 or glossary for a description of the classes of adult male seals.
2/ Numbers in parentheses are the adult males counted in Kitovi Amphitheater.
3/ Numbers in parentheses are the adult males counted on the second point south of Sea Lion Neck.
4/ Includes adult males counted in section 1.
5/ Includes adult males counted in sections 1 through 5.
6/ Numbers in parentheses are the adult males counted on Zapadni Point Reef.

TABLE A-6.--Adult male northern fur seals counted, by rookery, Pribilof Islands, Alaska, July 1980.

Island and rookery	Date	Class of adult male[1/] 2	3	5	Total
		--------Number----------			
St. Paul Island	July				
Lukanin	11	16	102	74	192
Kitovi	11	48	256	86	390
Reef	13	258	714	284	1,256
Gorbatch	13	55	397	276	728
Ardiguen	13	6	80	21	107
Morjovi	12	119	376	376	871
Vostochni	12	190	925	373	1,488
Little Polovina	14	25	91	203	319
Polovina	14	21	95	228	344
Polovina Cliffs	14	120	524	29	673
Tolstoi	11	145	681	255	1,081
Zapadni Reef	10	63	155	81	299
Little Zapadni	10	88	426	198	712
Zapadni	10	177	668	433	1,278
Island total		1,331	5,490	2,917	9,738
St. George Island	July				
Zapadni	12	96	172	224	492
South	12	91	201	58	350
North	14	216	573	419	1,208
East Reef	15	48	123	60	231
East Cliffs	15	97	307	211	615
Staraya Artil	13	167	187	108	462
Island total		715	1,563	1,080	3,358
Total both islands		2,046	7,053	3,997	13,096

1/ See Table A-3 or glossary for a description of the classes of adult male seals.

TABLE A-7.--Adult male northern fur seals counted, by class,[1/] rookery, and year, St. Paul Island, Alaska, June 1966-80.

Rookery and class of male	Year														
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	Number														
Lukanin															
1	13	12	8	4	10	6	2	0	1	-	-	-	-	-	-
2	83	93	62	51	24	22	36	36	66	65	69	54	61	82	77
3	67	53	45	34	59	58	39	26	29	52	45	58	51	32	25
4	0	4	1	2	0	0	1	0	0	-	-	-	-	-	-
5	84	51	15	28	45	54	44	21	40	80	50	48	70	73	84
Total	247	213	131	119	138	140	122	83	136	197	164	160	182	187	186
Kitovi															
1	22	17	31	10	5	8	7	6	3	-	-	-	-	-	-
2	229	211	179	156	69	96	95	86	143	151	174	173	182	209	189
3	193	144	122	76	137	136	96	63	45	120	87	121	86	82	43
4	4	4	0	2	0	0	0	1	5	-	-	-	-	-	-
5	102	91	49	52	45	51	66	69	44	45	68	32	72	72	62
Total	550	467	381	296	256	291	264	225	240	316	329	326	340	363	294
Reef															
1	119	72	57	77	26	33	16	22	7	-	-	-	-	-	-
2	852	752	616	508	401	522	431	375	376	410	454	534	593	623	588
3	333	272	255	222	206	110	142	103	137	230	251	210	175	127	141
4	0	18	42	11	29	4	4	3	11	-	-	-	-	-	-
5	425	241	400	175	313	229	239	236	163	336	488	395	378	273	253
Total	1,729	1,355	1,370	993	975	898	832	739	694	976	1,193	1,139	1,146	1,023	982
Gorbatch															
1	78	43	32	31	16	8	14	11	11	-	-	-	-	-	-
2	441	407	341	250	205	193	205	183	199	228	228	241	274	297	295
3	180	159	128	146	128	136	88	76	83	147	144	135	122	86	105
4	62	25	25	23	13	5	1	2	12	-	-	-	-	-	-
5	362	236	242	202	155	213	109	120	106	254	272	284	331	217	181
Total	1,123	870	768	652	517	555	417	392	411	629	644	660	727	600	581

TABLE A-7.--Adult male northern fur seals counted, by class[1/], rookery, and year, St. Paul Island, Alaska, June 1966-80.--continued

Rookery and class of male	Year														
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	Number														
Ardiguen															
1	8	6	2	3	1	0	6	3	2	-	-	-	-	-	-
2	40	49	62	59	107	46	44	46	62	45	30	37	52	45	37
3	53	39	42	27	43	24	38	24	31	34	39	40	34	27	20
4	9	0	0	0	0	0	0	0	0	-	-	-	-	-	-
5	50	58	50	64	62	40	47	23	0	27	29	32	15	15	5
Total	160	152	156	153	213	110	135	96	95	106	97	109	101	87	62
Morjovi															
1	108	41	35	30	22	13	11	0	11	-	-	-	-	-	-
2	452	394	309	236	167	133	129	179	220	225	268	338	355	402	344
3	230	189	228	160	139	124	97	92	89	192	205	135	149	109	107
4	3	73	21	3	5	2	0	2	6	-	-	-	-	-	-
5	464	249	146	191	190	160	91	180	216	292	224	366	215	154	321
Total	1,257	946	739	620	523	432	328	453	542	699	697	839	719	665	772
Vostochni															
1	92	109	67	39	23	17	15	7	17	-	-	-	-	-	-
2	1,019	940	804	605	420	330	373	463	478	508	476	607	707	762	646
3	522	333	462	360	289	254	187	171	181	348	479	291	245	203	230
4	18	147	11	11	1	4	5	3	8	-	-	-	-	-	-
5	542	557	389	306	164	194	187	375	153	125	622	263	490	358	356
Total	2,193	2,086	1,733	1,321	897	799	767	1,019	837	981	1,577	1,161	1,442	1,323	1,232
Little Polovina															
1	12	7	12	5	0	2	4	0	2	-	-	-	-	-	-
2	162	143	107	83	59	88	46	62	75	88	72	78	84	77	78
3	73	51	71	28	43	14	24	14	15	31	34	34	28	12	6
4	29	27	14	11	0	4	1	5	3	-	-	-	-	-	-
5	254	150	75	38	50	17	6	53	52	108	127	101	171	165	164
Total	530	378	279	165	152	125	81	134	147	227	233	213	283	254	248

TABLE A-7.--Adult male northern fur seals counted, by class,[1/] rookery, and year, St. Paul Island, Alaska, June 1966-80.--continued

Rookery and class of male	Year														
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	Number														
Polovina															
1	75	27	8	15	3	4	3	3	1	-	-	-	-	-	-
2	168	150	89	89	44	51	35	40	50	54	55	67	90	84	100
3	65	43	68	25	31	4	13	8	19	42	40	26	26	19	3
4	0	25	1	1	2	0	0	7	1	-	-	-	-	-	-
5	253	185	177	43	61	80	41	80	64	170	189	184	197	161	162
Total	561	430	343	173	141	139	92	138	135	266	284	277	313	264	265
Polovina Cliffs															
1	48	38	52	33	15	7	19	2	8	-	-	-	-	-	-
2	494	408	315	295	192	245	186	200	249	262	291	441	350	380	355
3	202	192	256	105	150	49	70	85	75	193	159	140	200	68	55
4	5	68	16	3	7	4	3	3	6	-	-	-	-	-	-
5	81	47	74	65	58	101	67	107	71	97	100	114	71	53	32
Total	830	753	713	501	422	406	345	397	409	552	550	695	621	501	442
Tolstoi															
1	65	80	49	40	25	12	15	33	13	-	-	-	-	-	-
2	622	455	350	411	269	270	273	291	305	269	387	434	476	524	483
3	233	251	309	130	240	198	187	136	124	329	262	291	273	284	222
4	0	24	25	0	0	10	3	2	3	-	-	-	-	-	-
5	131	472	150	133	125	140	96	115	90	508	327	262	286	147	240
Total	1,051	1,282	883	714	659	630	574	577	535	1,106	976	987	1,035	955	945
Zapadni Reef															
1	13	13	3	3	1	7	0	0	1	-	-	-	-	-	-
2	142	125	72	67	43	63	59	57	79	78	117	107	136	160	154
3	65	52	75	46	43	41	33	27	26	64	43	55	44	38	45
4	0	13	3	1	0	0	3	0	2	-	-	-	-	-	-
5	146	64	59	4	28	38	24	56	34	113	84	63	62	66	67
Total	366	267	212	121	115	149	119	140	142	255	244	225	242	264	266

TABLE A-7.--Adult male northern fur seals counted, by class,[1/] rookery, and year, St. Paul Island, Alaska, June 1966-80.--continued

Rookery and class of male	Year														
	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
	Number														
Little Zapadni															
1	70	42	27	37	15	17	10	6	8	-	-	-	-	-	-
2	339	328	218	219	148	166	154	169	184	176	223	198	291	317	280
3	150	184	234	127	175	119	108	73	83	181	171	151	224	117	147
4	0	28	9	18	2	12	2	0	22	-	-	-	-	-	-
5	133	120	84	61	44	36	45	83	43	136	81	122	137	92	151
Total	692	702	572	462	384	350	319	331	340	493	475	471	652	526	578
Zapadni															
1	149	74	55	51	42	19	18	13	13	-	-	-	-	-	-
2	716	611	508	465	315	296	315	324	329	334	486	443	604	633	559
3	275	277	357	219	251	225	167	164	173	269	212	238	277	182	199
4	0	82	34	10	5	12	7	2	19	-	-	-	-	-	-
5	521	353	300	504	202	414	338	210	245	625	512	330	329	312	329
Total	1,661	1,397	1,254	1,249	815	966	845	713	779	1,228	1,210	1,011	1,210	1,127	1,087
Grand Total	12,950	11,298	9,534	7,539	6,207	5,990	5,240	5,437	5,442	8,031	8,673	8,273	9,013	8,139	7,940

[1/] See Table A-3 or glossary for a description of the classes of adult male seals.

TABLE A-8.--Harem and idle male northern fur seals counted in mid-July, Pribilof Islands, Alaska, 1971-80.

Year	St. Paul Island		St. George Island		Both islands	
	Harem	Idle	Harem	Idle	Harem	Idle
	Number					
1971	1/ 4,200	1/ 1,900	1,235	534	5,435	2,434
1972 2/	3,738	2,384	1,153	328	4,891	2,712
1973	3/ 4,906	3/ 2,550	875	375	5,781	2,925
1974	4/ 4,563	4/ 1,782	822	481	5,385	2,263
1975	5,018	3,535	877	1,427	5,895	4,962
1976	5,324	4,041	1,093	996	6,417	5,037
1977	6,457	3,845	1,610	899	8,067	4,744
1978	6,496	3,908	1,590	1,220	8,086	5,128
1979	6,242	4,457	1,716	1,942	7,958	6,399
1980	5,490	4,248	1,563	1,795	7,053	6,043

1/ Harem and idle males on St. Paul Island were counted on Reef, Vostochni, Polovina Cliffs, and Zapadni Reef Rookeries in 1971. Estimates of total number were based on these counts, the counts on all rookeries in June, and counts made on all rookeries in 1970.

2/ Values for St. Paul Island are extrapolated from July counts on Northeast Point Rookeries in 1972 and counts on Northeast Point Rookeries and total counts on St. Paul Island in 1970. Values for St. George Island are extrapolated from July counts on Zapadni and South Rookeries and counts on Zapadni and South Rookeries and the total counts on St. George Island in 1971.

3/ Total numbers of harem and idle males in July were extrapolated from counts of harem and idle males on all rookeries in June and from counts of harem and idle males on sample rookeries (Zapadni, Little Zapadni, Zapadni Reef, and Tolstoi) in July using the following procedure:

(a) Assume $\frac{\text{June (h+i)}}{\text{July (h+i)}} = \frac{\text{June (H+I)}}{\text{July (H+I)}}$, solve for July (H+I)

(b) Assume $\frac{\text{July (h)}}{\text{July (h+i)}} = \frac{\text{July (H)}}{\text{July (H+I)}}$, solve for July (H)

(c) Solve July (H+I) - July (H) = July (I);

where h, H = respective counts of harem males on sample rookeries and all rookeries;

i, I = respective counts of idle males on sample rookeries and all rookeries.

4/ Total numbers of harem and idle males in July were extrapolated from counts of harem and idle males on all rookeries in June and from counts of harem and idle males on sample rookeries (Reef, Gorbatch, and Ardiguen) in July using the same procedure applied in 1973 (see footnote 3).

TABLE A-9.--Dead northern fur seal pups counted, by rookery section, Pribilof Islands, Alaska, August 1980.

Island and rookery	Date	Section 1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
		Number														
St. Paul Island	August															
Morjovi	20 [1]	169	76	60	85	69	49	-	-	-	-	-	-	-	-	508
Vostochni	22	28	14	45	47	19	291	145	63	48	28	10	24	113	57	932
Little Polovina	19	44	33	-	-	-	-	-	-	-	-	-	-	-	-	77
Polovina Cliffs	19	151	47	80	81	75	70	123	-	-	-	-	-	-	-	627
Polovina	19	45	82	-	-	-	-	-	-	-	-	-	-	-	-	127
Ardiguen [2]	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	76
Gorbatch	18	243	141	142	22	97	54	-	-	-	-	-	-	-	-	699
Reef	18	72	64	86	85	98	154	63	61	51	39	17	-	-	-	790
Kitovi	20 [3]	67	5	63	48	73	-	-	-	-	-	-	-	-	-	256
Lukanin	20	106	100	-	-	-	-	-	-	-	-	-	-	-	-	206
Tolstoi	21	90	109	107	102	175	189	308	408	-	-	-	-	-	-	1,488
Little Zapadni	19	14	81	149	165	105	131	-	-	-	-	-	-	-	-	645
Zapadni Reef	19	114	129	-	-	-	-	-	-	-	-	-	-	-	-	243
Zapadni	21	60	134	152	395	161	114	145	24	-	-	-	-	-	-	1,185
Total																7,859
St. George Island [4]	August															
North	13,14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	949
Zapadni	15,19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	350
South	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	197
East Reef	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	121
East Cliffs	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	284
Staraya Artil	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	484
Total																2,385
Grand Total																10,244

1/ Includes 53 dead pups counted on point south of Sea Lion Neck.
2/ No numbered sections.
3/ Includes 18 dead pups counted in Kitovi Amphitheater.
4/ Dead pups were not counted by rookery section.

TABLE A-10.--Dead northern fur seal pups counted,[1/] by rookery, Pribilof Islands, Alaska, 1967-80.

Island and rookery	1967	1968	1969	1970	1971	1972	1973[2/]	1974[2/]	1975	1976	1977	1978	1979	1980
	Number													
St. Paul Island														
Morjovi	1,072	2,285	734	1,618	4,773	2,187	-	-	1,765	1,829	870	606	269	508
Vostochni	1,969	4,195	1,711	3,330	8,280	4,701	-	-	3,259	3,826	2,021	1,041	573	932
Little Polovina	233	509	200	337	1,207	372	-	-	252	316	103	90	28	77
Polovina Cliffs	825	1,616	836	1,636	5,445	1,566	-	-	1,529	1,862	733	761	433	627
Polovina	319	487	327	475	980	345	-	-	419	378	160	151	85	127
Ardiguen	90	118	112	75	373	161	-	111	142	212	112	15	31	76
Gorbatch	874	1,446	823	974	2,405	1,332	-	1,188	1,025	1,341	860	475	260	699
Reef	2,008	3,064	1,365	2,221	4,103	1,686	-	1,580	1,837	2,055	1,233	593	651	790
Kitovi	522	755	652	679	1,854	559	-	-	787	846	331	203	171	256
Lukanin	240	597	460	401	1,224	494	-	-	505	385	250	197	132	206
Tolstoi	2,251	3,315	2,778	3,580	5,147	3,540	3,613	-	4,141	4,241	3,291	1,488	1,645	1,488
Little Zapadni	1,098	1,781	798	1,386	3,223	1,686	1,783	-	1,204	1,977	1,133	674	637	645
Zapadni Reef	380	685	177	308	673	505	661	-	508	638	427	129	161	243
Zapadni	2,195	4,445	2,306	3,561	6,752	3,515	3,851	-	3,252	3,770	2,559	1,650	1,368	1,185
Counted total	14,076	25,298	13,279	20,581	46,439	22,649	9,908	2,879	20,625	23,676	14,083	8,073	6,444	7,859
Estimated oversight 5%	704	1,265	664	1,029	2,322	1,132	495	144	1,031	1,184	704	404	322	393
Total	14,780	26,563	13,943	21,610	48,761	23,781	10,403	3,023	21,656	24,860	14,787	8,477	6,766	8,252
St. George Island														
North	971	1,567	444	866	1,862	1,032	1,153	545	1,230	791	408	1,068	774	949
Zapadni	578	1,197	260	636	1,058	464	450	474	814	653	190	404	463	547
East	201	824	187	522	638	372	506	334	536	391	200	456	389	405
Staraya Artil	770	1,055	640	1,243	1,662	616	552	[3/] -	709	454	410	590	565	484
Counted total	2,520	4,643	1,531	3,267	5,220	2,484	2,661	1,353	3,289	2,289	1,208	2,518	2,191	2,385
Estimated oversight 5%	126	232	76	163	261	124	133	68	165	114	60	126	110	119
Total	2,646	4,875	1,607	3,430	5,481	2,608	2,794	1,421	3,454	2,403	1,268	2,644	2,301	2,504
Pribilof Islands counted total	16,596	29,941	14,810	23,848	51,659	25,133	12,569	4,232	23,914	25,965	15,291	10,591	8,635	10,244
Estimated oversight 5%	830	1,497	740	1,192	2,583	1,256	628	212	1,196	1,298	764	530	432	512
Total	17,426	31,438	15,550	25,040	54,242	26,389	13,197	4,444	25,110	27,263	16,055	11,121	9,067	10,756

1/ The dead pups are counted after 15 August each year; most mortality has occurred by that date.

2/ The dead pups were counted only on selected rookeries on St. Paul Island.

3/ Dead pups were not counted.

TABLE A-11.--Soviet tags recovered in the United States harvest of male northern fur seals, St. Paul Island, Alaska, 27 June to 1 August 1980.

Date	Tag number	Age (years)	Sex	Island of tagging	Rookery of recovery
22 July	XB-969	2	M	Bering	Tolstoi-Zapadni Reef
30 July	XB-1010	2	M	Bering	Northeast Point
18 July	XB-5744	2	M	Bering	Reef
24 July	XM-1913	2	M	Medny	Polovina
25 July	XM-8242	2	M	Medny	Reef
31 July	TB-2511	3	M	Bering	Polovina
9 July	TB-5123	3	M	Bering	Northeast Point
31 July	TB-6143	3	M	Bering	Polovina
9 July	TM-243	3	M	Medny	Northeast Point
30 July	TM-507	3	M	Medny	Northeast Point
21 July	TM-571	3	M	Medny	Zapadni
1 August	TM-933	3	M	Medny	Reef
30 June	TM-2991	3	M	Medny	Tolstoi-Zapadni Reef
18 July	TM-4348	3	M	Medny	Reef
21 July	TM-5211	3	M	Medny	Zapadni
9 July	TM-6450	3	M	Medny	Northeast Point
27 June	TM-6873	3	M	Medny	Zapadni
24 July	TM-7964	3	M	Medny	Polovina
30 July	OB-3644	4	M	Bering	Northeast Point
9 July	OM-9288	4	M	Medny	Northeast Point
17 July	OM-9940	4	M	Medny	Polovina
1 August	OM-119	5	M	Medny	Reef

TABLE A-12.--Northern fur seals entangled in fishing debris and other materials, United States commercial harvest of northern fur seals, St. Paul Island, Alaska, 1967-80.

Year	Number of seals harvested[1/]	Number of entangled seals observed on killing field[1/]	Percentage of harvest
1967	50,229	75	0.15
1968	46,893	75	0.16
1969	32,817	67	0.20
1970	36,307	101	0.28
1971	27,338	113	0.41
1972	33,173	139	0.42
1973	28,482	135	0.47
1974	33,027	197	0.60
1975	29,148	211	0.72
1976	23,096	102	0.44
1977	28,444	99	0.35
1978	24,885	114	0.46
1979	25,762	110	0.43
1980	24,327	119	0.49

[1/] Includes both sexes.

TABLE A-13.--Northern fur seals tagged as pups on the Pribilof Islands (St. Paul and St. George), Commander Islands (Bering and Medny), and Robben Island, and dates first observed on San Miguel Island, California. 1968-80.

Tag number	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Sex	Island of origin	Date tagged
E-2818	21 July	--	11 Aug.	22 July.	29 June	6 July	--	4 Aug.	17 July	--	--	--	--	F	Bering	1960
T-19022	--	--	--	29 Oct.	23 July	--	--	--	--	--	--	1 Sept.	--	F	Medny	1965
N-41314	21 July	--	--	--	24 Aug.	--	--	--	22 July	--	19 Aug.	2 Sept.	--	F	St. Paul	1961
N-16387	--	25 July	14 July	23 June	27 July	--	--	9 Aug.	--	--	--	--	--	F	St. Paul	1961
N-19851	--	12 Sept.	12 Aug.[1]	24 July	29 June	21 July	--	--	--	--	--	--	--	F	St. Paul	1961
N-25437	--	25 July	2 Aug.	9 July	26 July	4 Aug.	--	--	--	--	--	--	29 June	F	St. Paul	1961
M-53901	--	31 July	23 July	14 June	--	--	--	--	--	--	--	--	--	F	St. Paul	1960
O-26056	--	25 July	18 July	29 July	3 Sept.[2]	22 July	--	28 July	29 July	--	17 July	24 May	--	F	St. Paul	1962
R-8179	--	1 Oct.	--	--	--	--	--	--	--	--	--	--	--	F	St. Paul	1965
J-4937	--	18 Aug.[3]	14 Aug.	14 June	24 Aug.	--	--	--	--	--	--	--	--	F	St. George	1957
N-29437	--	--	20 July	--	--	--	--	--	--	--	--	--	--	F	St. Paul	1961
N-48079	--	--	11 Aug.	--	--	--	--	--	--	30 July	--	8 Aug.	--	F	St. Paul	1961
N-2114	--	--	--	14 June	31 July	4 Aug.	--	27 July	24 July	--	--	--	--	F	St. George	1961
N-31432	--	--	--	7 July	12 July	3 July	--	26 Aug.	--	--	--	--	--	F	St. Paul	1961
Q-20975	--	--	--	10 July	--	--	--	--	--	--	--	--	--	F	St. Paul	1964
R-8844	--	--	--	8 Aug.	27 Aug.	19 July	--	27 July	18 July	--	--	10 Aug.	--	F	St. Paul	1965
T-24	--	--	--	7 Aug.	12 July	25 July	--	--	--	--	--	--	--	F	St. George	1967
T-9697	--	--	--	19 Aug.	2 Aug.	--	--	11 Aug.	7 Sept.	--	--	--	--	F	St. Paul	1967
T-12129	--	--	--	25 Aug.	26 July	21 July	--	--	--	--	--	--	--	F	St. Paul	1967
U-6971	--	--	--	21 Aug.	26 July	10 July	--	31 July	2 Aug.	--	17 July	8 Aug.	5 July	F	St. Paul	1968
O-48131	--	--	--	--	3 Sept.	--	--	--	--	--	--	--	--	F	St. Paul	1962
T-6003	--	--	--	--	5 Sept.	10 July	12 Aug.	--	--	--	--	24 Aug.	--	F	Robben	1965
T-8572	--	--	--	--	23 July	23 July	--	--	--	21 Aug.	--	--	--	F	St. Paul	1967
Y-7104	--	--	--	--	30 Aug.	13 July	10 June	3 July	11 July	6 Aug.	--	--	4 July	F	Robben	1966
BB-1364	--	--	--	--	7 Sept.	--	9 Aug.	--	--	8 Sept.	8 July	11 Aug.	20 July	F	Bering	1969
AM-8302	--	--	--	--	--	--	14 Aug.	28 July	18 July	--	--	11 Aug.	--	F	Medny	1968
U-6974/	--	--	--	--	--	--	5 July	--	--	7 Sept.	--	--	--	F	St. George	1968
U-5791	--	--	--	--	--	--	1 Sept.	--	--	--	--	--	--	F	St. George	1968
CM-3667	--	--	--	--	--	--	--	3 July	--	--	--	--	8 Sept	F	Medny	1970
ET-593	--	--	--	--	--	--	--	17 July	--	--	--	--	--	F	Robben	1971
H-2314	--	--	--	--	--	--	--	20 Aug.	--	--	--	--	--	F	Robben	1963

TABLE A-13.--Northern fur seals tagged as pups on the Pribilof Islands (St. Paul and St. George), Commander Islands (Bering and Medny), and Robben Island, and dates first observed on San Miguel Island, California, 1968-80.--continued.

Tag number	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	Sex	Island of origin	Date tagged
T-19022	--	--	--	--	--	--	--	20 Aug.	--	--	--	--	--	F	Medny	1965
DT-TINRO 5/	--	--	--	--	--	--	--	14 Aug.	21 July	--	--	--	--	F	--	--
I-36983 6/	--	--	--	--	--	--	--	--	5 Sept.	--	--	--	--	F	St. Paul	1956
ET-9564	--	--	--	--	--	--	--	--	--	--	--	6 Aug.	18 July	F	Medny	1971
KT-1230	--	--	--	--	--	--	--	--	--	--	--	--	14 Sept	F	Robben	1973

1/ Tag number N-19851 recorded as N-15851 in 1970.

2/ Tag number O-26056 also recorded on Castle Rock, 8 September 1972.

3/ Tag number J-4937 recorded as J-4939 in 1969.

4/ Female identified by #U6971 may be the same individual.

5/ A double-tagged female. TINRO was read but the numbers could not be seen with the scope.

6/ Last number on tag unreadable.

TABLE A-14.--Northern fur seals tagged on San Miguel Island, California in 1968 and the dates first resighted in each season, 1969-80[1/].

Tag number	Tag placement	Date observed 1969	Date observed 1970	Date observed 1971	Date observed 1972	Date observed 1973	Date observed 1974	Date observed 1975	Date observed 1976	Date observed 1977	Date observed 1978	Date observed 1979	Date observed 1980
UC-3789	R	--	--	24 July	23 July	31 July	--	--	--	--	--	--	--
-3793	R	--	21 July	13 July	11 July	--	--	--	--	12 Aug.	1 Sept.	--	--
-3926	L			9 July			--	--	--	--	--	--	--
-3927	R	31 July	23 July		26 July	21 July							
-3931[2/]	R	--	--	--	--	--	--	--	--	--	19 Aug.	--	--
-3932	R	16 Aug.	29 July	2 July		--	27 July	8 Aug.	10 July	18 Aug.	18 Aug.	1 Sept.	--
-3933	L				13 July								
-3934[2/]	L	--	--	--	--	--	--	--	29 Aug.	--	--	--	--
-3936	L	--	--				28 July	--				--	--
-3937	R			24 July	31 July	22 July			10 July	18 Aug.	21 July		
-3938	L	31 July	10 Aug.	8 June		--	--	--	--	--	--	--	--
-3939	R	31 July			29 June								
-3940	L	31 July	29 July	--	--	--	--	--	--	--	--	--	--
-3941	R												
-3942	R	31 July	17 July	22 July	14 July	--	--	20 Aug.	29 July	18 Aug.	15 Aug.	11 Aug.	3 Aug
-3943	L												
-3944	R		17 July			18 July					15 Aug.	9 Aug.	18 July
-3945	L	14 Aug.		14 June	27 June		15 July	9 July	14 July	12 Aug.			18 July
-3951	L	--	21 July	22 July	12 July	--	--	--	--	--	--	--	--
-3953[3/]	R												
-3955	R	25 July	31 July	2 July	15 July	--	--	--	--	--	--	--	--
-3956	L												
-3957[4/]	R	7 Aug.	--	--	--	--	--	--	--	--	--	--	--
-3959	R	25 July	--	--	--	--	--	--	--	--	--	--	--
-3961[2/]	R	12 Sept.	--	--	--	--	--	--	--	--	--	--	--
-3964	L		2 Aug.	21 July	12 July	1 Aug.	--	--		--	30 Aug.	--	--
-3965	R	12 Aug.							2 Aug.				

TABLE A-14.--Northern fur seals tagged on San Miguel Island, California in 1968 and the dates first resighted in each season, 1969-80[1/]--continued.

Tag number	Tag placement	Date observed 1969	Date observed 1970	Date observed 1971	Date observed 1972	Date observed 1973	Date observed 1974	Date observed 1975	Date observed 1976	Date observed 1977	Date observed 1978	Date observed 1979	Date observed 1980
UC-3968	R	--	18 July	6 July	--	--	--	--	--	--	--	--	--
-3971	L												
-3972	L		16 Aug.	22 July		--	--	--	--	--	--	--	--
-3973	R	31 July			5 Aug.								30 June
-3974	L	--	--	--	--		15 July	8 Aug.		22 Aug.			17 June
-3975	R					5 Aug.			4 Aug.		8 July	15 Aug.	--
-3976	R		--	--	--	--	--	11 Aug.	--	--	--	--	--
-3977	L	31 July											
-3978[2/]	L	--	22 July	--	--	--	--	--	--	--	--	--	--
-3980	R	--	31 July		30 Aug.	--	15 July	--		--	--	--	--
-3984	L			9 July					18 July				
-3981	R		9 July	5 July	11 July		--	--	--	--	--	--	--
-3982	L	31 July				4 Aug.							
-3985	L	31 July	--		--	--	--	--	--	--	--	--	--
-3986	R			17 July									
-3987	L	--		6 July	14 July	2 Aug.	--	--	--	--	--	--	--
-3988	R		10 Aug.										
-3989	L			5 July		11 June	10 Aug.	7 Aug.	--	--	--	--	--
-3990	R	10 Aug.	8 July		27 June								
-3991	R	7 Aug.	20 July				--		--			--	
-3992	L			27 July	12 July	4 Aug.		28 July		21 Aug.	25 July		19 July
-3993	R	16 Aug.		4 July	--	--			10 July	--	25 July	16 Aug.	--
-3994	L		17 Aug.				27 July	17 July					
-3995	R	--		--	11 Aug.	--		17 July	--	--	--	--	--
-3996	L		21 July				28 July						
-3997	L	--	--		--		--		6 Sept.	--	--	16 Aug.	--
-3998	R			21 July		4 July		10 July					

TABLE A-14.--Northern fur seals tagged on San Miguel Island, California in 1968 and the dates first resighted in each season, 1969-80[1/]--continued.

Tag number	Tag placement	Date observed 1969	Date observed 1970	Date observed 1971	Date observed 1972	Date observed 1973	Date observed 1974	Date observed 1975	Date observed 1976	Date observed 1977	Date observed 1978	Date observed 1979	Date observed 1980
UC-3999	R	--	--		--	--	13 Aug.	--	--	--	--	--	--
-4000	L			3 Aug.									

1/ A total of 36 pups (3751-3800 and 3958-3963 series and 3983) and 33 adult females (all other 3900-4000 series) were tagged on 20 July 1968.

2/ Female was double tagged, but the other tag number has never been resighted.

3/ Tag loss confirmed by observation of tag scar.

4/ Left flipper injured, not tagged.

TABLE A- 15.--Adult female northern fur seals double tagged (the two tag numbers within the lines represent one seal) at Adams Cove, San Miguel Island, California on 9 October 1975 and the dates first resighted, 1976-80[17]

Tag number	Date of first resighting				
	1976	1977	1978	1979	1980
SMI 201	23 Aug		13 July	12 July	22 June
202		-			
203		21 Sept	2 Sept	-	-
204	-				
205					26 July
206	-	-	-	-	
207					
208	-	-	-	-	-
209					
210	-	-	-	-	-
211	12 Aug	-	-	16 Aug	
212					29 June
213					
214	-	-	-	7 Aug	19 July
215	17 July	8 Sept	-	-	-
216					
217	12 July	4 Sept	19 Aug	3 Aug	9 June
218					
219	11 July	-	30 Aug	9 Aug	16 July
220					
221					
222	-	-	22 Aug	-	13 July
223	-	4 Sept	22 July	-	-
224					
225	Tag lost in sand of Arroyo west of Mallo Roses, Adams Cove				
226	11 July	18 Aug	-	14 July	8 Sept
227					
228	25 Aug	-	27 Aug	16 Aug	14 July
229					
230					
231	-	-	-	-	-
232	-	18 Aug	18 Aug	-	4 Aug
233					
234	-	-	-	-	-
235					
236	22 Aug	-	18 Aug	-	25 July
237					
238	2 Aug	6 Aug	25 July	6 Aug	8 Sept
239					
240	-	-	-	6 July	-
241					
242	-	12 Aug	-	-	-
243					
244	12 July	18 Aug	12 July	8 July	-
245					

TABLE A-15.--Adult female northern fur seals double tagged (the two tag numbers within the lines represent one seal) at Adams Cove, San Miguel Island, California on 9 October 1975 and the dates first resighted, 1976-80[1/] - (continued).

Tag number	Date of first resighting				
	1976	1977	1978	1979	1980
SMI 246	-	20 Aug	9 Aug	-	-
247					
248	11 July	-	-	6 Aug	-
249					
250	-	20 Aug	-	5 Aug	-
251					
252	-	19 Aug	-	-	-
253					
254					
255	-	-	16 Aug	1 Sept	-
256					
257	-	-	-	-	-
258					
259	-	-	20 Aug	-	-
260					
261	-	-	-	23 Aug	13 July
262	-	10 July	10 July	-	-
263					
264	10 July	18 Aug	22 July	11 June	5 Aug
265					
266	26 July	12 Aug	9 Aug	-	10 Aug
267					
268	29 July	-	-	-	10 Aug
269					
270	29 July	12 Aug	-	-	18 July
271					
272	23 July	20 Aug	18 Aug	-	17 July
273					
274	5 Sept	-	10 July	1 Sept	-
275					
276	21 Aug	3 Sept	16 Aug	-	-
277	T a g	d e s t r o y e d			
278					
279	5 Aug	-	17 July	30 July	-
280					
281	23 July	4 Sept	22 July	-	-
282					
283	24 July	12 Aug	20 July	-	7 Aug
284					
285	25 Aug	-	20 July	16 Aug	-
286					
287	-	-	-	-	-
288					
289	-	30 July	-	15 Aug	-
290					

TABLE A-15.--Adult female northern fur seals double tagged (the two tag numbers within the lines represent one seal) at Adams Cove, San Miguel Island, California on 9 October 1975 and the dates first resighted, 1976-80[1/] - (continued).

Tag number	Date of first resighting				
	1976	1977	1978	1979	1980
SMI 291	-	-	-	23 Aug	10 Aug
292					
293	10 Aug	-	-	-	-
294					
295	22 July	-	30 Aug	-	17 July
296					
297	29 Aug	-	1 Sept	18 Aug	10 July
298					
299	8 Aug	30 July	28 Aug	9 Aug	4 Aug
300					
301	21 Aug	-	20 Aug	24 Aug	23 June
302					

1/ Fifty adult females were tagged.

TABLE A-16.--Northern fur seals tagged as pups at Adams Cove, San Miguel Island, California, and the date first observed in subsequent years at Adams Cove.

Tag number	Year tagged	Sex	Date of first resighting			
			1977	1978	1979	1980
SMI-4	1975	F	-	31 Aug	6 Aug	21 Aug
-5	-do-	F	-	-	11 Aug[2]	-
-11	-do-	M	-	-	7 July	24 May
-15	-do-	M	-	18 Aug	28 May	-
-16	-do-	F	-	-	1 Aug[2]	17 July[2]
-17	-do-	M	-	-	16 June	-
-20	-do-	M[1]	-	22 Aug	12 June	22 June[2,3,4]
-21	-do-	M	-	9 Aug	-	-
-22	-do-	M	-	9 Aug	23 June	8 Aug
-24	-do-	M	-	9 Aug	24 May	13 July
-32	-do-	M	-	-	9 June	11 June
-40	-do-	M	-	-	9 July	-
-41	-do	F	18 Aug	-	-	-
-42	-do-	M	-	-	5 May	28 June
-44	-do-	F	-	21 Aug	-	-
-46	-do-	M	-	29 Aug	-	15 July
-52	-do-	F	-	31 Aug	-	-
-54	-do-	F	-	-	-	1 Aug
-55	-do-	F	-	13 Aug	16 Aug	-
-58	-do-	F	-	-	24 Aug	-
-61	-do-	F	-	22 Aug	15 Aug	19 July
-63	-do-	M	-	-	2 June	-
-65	-do	M	-	-	-	25 July
-70	-do-	F	-	19 Aug	-	26 June
-72	-do-	F	-	1 Sept	-	-
-73	-do-	M	-	29 July	2 Aug	30 June
-75	-do-	F	2 Sept	17 Aug	27 May	10 July
-83	-do-	F	-	-	5 Aug	14 Aug
-85	-do-	F	-	6 Sept	-	-
-86	-do-	M	-	17 July	18 June	-
-89	-do-	M	-	-	9 Aug	18 July
-90	-do-	F	-	9 Sept	4 Sept	-
-99	-do-	F	-	-	8 Aug	-
-304	-do-	M	-	1 Sept	-	26 June
-312	1976	F	-	-	8 Aug	3 Aug
-313	-do	M[1]	-	16 Sept	5 June	24 May
-315	-do	F	-	-	-	14 June
-322	-do-	F	-	-	-	10 Aug
-325	-do	M[5]	-	-	-	24 May
-328	-do-	F	-	-	-	3 Aug
-330	-do	M	-	-	23 July	22 June[2,4]
-334	-do-	F	-	-	3 Sept	11 July
-344	-do-	F	-	-	-	7 Aug

TABLE A-16.--Northern fur seals tagged as pups at Adams Cove, San Miguel Island, California, and the date first observed in subsequent years at Adams Cove. --continued.

Tag number	Year tagged	Sex	Date of first resighting			
			1977	1978	1979	1980
-351	-do-	M	-	-	-	21 July
-368	-do-	F	-	-	-	17 Aug
-377	-do-	M	-	-	-	11 June
-615	-do-	F	-	-	28 Aug	-
-678	1977	F	-	-	-	23 Aug
-904	-do-	F	-	-	3 Sept	-
-908	-do-	F	-	-	-	31 July
-912	-do-	F	-	-	-	19 July
-921	-do-	F	-	-	-	21 July
-926	-do-	F	-	-	-	10 Aug
-927	-do-	M	-	-	-	31 July
-928	-do-	F	-	-	-	3 Sept
-931	-do-	M	-	-	-	7 Aug
-946	-do-	M	-	-	-	10 July
-956	-do-	M	-	-	5 July	9 June
-961	-do-	F	-	-	15 Aug	7 Aug
-962	-do-	F	-	-	-	23 Aug
-973	-do-	M 1/	-	-	-	26 July
-977	-do-	M	-	-	-	15 July
-997	-do-	F	-	-	3 Aug	30 July
-999	-do-	M	-	-	-	3 Aug
-1189	1978	F	-	-	-	4 Oct
-1200	-do-	M	-	-	-	10 Aug
-1206	-do	M	-	-	-	26 July
-1217	-do-	M	-	-	-	3 Aug
-1228	-do-	F	-	-	-	8 Sept
-1261	-do-	M	-	-	-	26 July
-1263	-do-	M	-	-	-	16 Aug
-1284	-do-	M	-	-	-	10 Aug
-1368	1979	F	-	-	-	9 Sept

1/ Mistakenly identified as a male and tagged on the right flipper.
2/ Observed nursing a pup of the year.
3/ Tag recorded as being floppy and/or reversed in flipper at least once.
4/ Pup was used in growth study.
5/ Sex previously listed as unknown.

TABLE A-17.--Northern fur seal pups tagged at Adams Cove, San Miguel Island, California, 4 October 1980

Tag number[1/]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)	Checkmark	Remarks
SMI 1930	L	F	13.0	83	LHD-2	
1931	L	F	11.0	85	LHD-2	
1932	R	M	13.5	87	LHD-2	
1933	R	M	14.5	86	LHD-2	
1934	L	F	13.0	84	LHD-2	
1935	L	F	9.5	79	LHD-2	
1936	L	F	11.5	77	LHD-2	
1937	L	F	11.5	82	LHD-2	
1938	L	F	9.5	77	LHD-2	Roto tag #430-R
1939	R	M	13.0	83	LHD-2	
1940	L	F	8.0	79	LHD-2	
1941	L	F	11.0	83	LHD-2	
1942	R	M	14.5	87	LHD-2	
1943	L	F	9.5	81	LHD-2	Roto tag #439-R
1944	L	F	13.5	83	LHD-2	
1945	L	F	10.0	78	LHD-2	
1946	L	F	10.5	79	LHD-2	
1947	R	M	13.5	87	LHD-2	
1949	L	F	11.5	81	LHD-2	
1950	R	M	13.0	85	LHD-2	
1951	R	M	15.0	79	LHD-2	
1952	L	F	10.0	85	LHD-2	Roto tag #473-R
1954	R	M	10.0	81	LHD-2	
1955	R	M	16.0	87	LHD-2	Roto tag #470-L
1956	L	F	8.5	78	LHD-2	
1957	L	F	12.0	78	LHD-2	
1958	R	M	14.5	85	LHD-2	
1960	L	F	9.0	74	LHD-2	
1961	L	F	11.0	79	LHD-2	
1962	L	F	7.5	77	LHD-2	
1963	L	F	7.5	82	LHD-2	
1964	L	F	11.0	82	LHD-2	
1965	L	F	9.5	78	LHD-2	
1966	R	M	9.5	78	LHD-2	
1967	L	F	9.0	77	LHD-2	
1968	L	F	11.5	82	LHD-2	
1969	L	F	10.0	76	LHD-2	
1971	R	M	15.5	82	LHD-2	Roto tag #435-L
1973	R	M	11.5	74	LHD-2	
1974	R	M	13.0	82	LHD-2	
1975	R	M	8.5	77	LHD-2	
1976	R	M	11.0	79	LHD-2	
1977	L	F	10.0	76	LHD-2	Roto tag #469-R
1979	R	M	19.0	89	LHD-2	
1980	R	M	17.5	87	LHD-2	
1982	R	M	15.0	88	LHD-2	Roto tag #477-L

TABLE A-17.--Northern fur seal pups tagged at Adams Cove, San Miguel Island, California, 4 October 1980-continued

Tag number[1/]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)	Checkmark	Remarks
SMI 1983	L	F	14.0	79	LHD-2	
1984	L	F	12.0	78	LHD-2	
1987	L	F	12.0	82	LHD-2	Roto tag #454-R
1988	L	F	10.5	81	LHD-2	Roto tag #459-R
1989	L	F	12.0	76	LHD-2	
1990	L	F	11.5	83	LHD-2	
1992	R	M	9.5	80	LHD-2	
1993	R	M	16.0	89	LHD-2	
1994	R	M	14.5	87	LHD-2	
1995	L	F	12.0	82	LHD-2	Roto tag #436-R
1996	L	F	8.5	77	LHD-2	
1997	L	F	9.5	82	LHD-2	
1998	L	F	12.5	80	LHD-2	
2000	L	F	9.5	78	LHD-2	
2001	R	M	16.0	87	LHD-2	
2002	R	M	14.5	88	LHD-2	
2004	L	F	10.0	73	LHD-2	
2005	R	M	13.5	85	LHD-2	Roto tag #473-L
2006	R	M	13.5	87	LHD-2	Roto tag #483-L
2007	R	M	15.0	83	LHD-2	
2008	L	F	13.0	85	LHD-2	
2009	L	F	12.0	85	LHD-2	
2010	R	M	14.0	81	LHD-2	
2011	R	M	13.0	85	LHD-2	
2012	L	F	11.0	83	LHD-2	
2013	L	F	10.0	78	LHD-2	
2014	L	F	8.5	73	LHD-2	
2015	R	M	15.5	83	LHD-2	
2017	R	M	11.0	81	LHD-2	
2018	L	F	11.0	78	LHD-2	
2019	L	F	10.5	81	LHD-2	
2020	R	M	15.0	83	LHD-2	
2021	L	F	11.0	74	LHD-2	
2022	L	F	9.5	83	LHD-2	Roto tag #471-R
2023	L	F	11.5	85	LHD-2	
2024	L	F	12.5	84	LHD-2	
2025	R	M	10.5	78	LHD-2	
2026	L	F	8.0	76	LHD-2	
2027	R	M	11.0	85	LHD-2	
2028	R	M	12.0	80	LHD-2	Roto tag #474-L
2029	L	F	13.5	82	LHD-2	
2030	R	M	11.5	88	LHD-2	
2031	L	F	9.5	80	LHD-2	
2032	R	M	8.5	78	LHD-2	
2033	L	F	10.5	80	LHD-2	

TABLE A-17.--Northern fur seal pups tagged at Adams Cove, San Miguel Island, California, 4 October 1980-continued

Tag number[1/]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)	Checkmark	Remarks
SMI 2034	L	F	8.5	78	LHD-2	
2035	R	M	14.0	82	LHD-2	
2036	R	M	13.5	84	LHD-2	Roto tag #459-L
2037	R	M	16.0	83	LHD-2	
2039	L	F	10.5	85	LHD-2	
2040	L	F	10.0	78	LHD-2	
2041	R	M	10.0	76	LHD-2	
2042	L	F	14.0	80	LHD-2	
2043	L	F	8.0	79	LHD-2	
2044	L	F	14.0	83	LHD-2	
2045	L	F	12.0	80	LHD-2	
2046	L	F	9.0	79	LHD-2	
2047	R	M	13.0	84	LHD-2	
2048	L	F	11.0	81	LHD-2	Roto tag #477-R
2049	L	F	12.5	79	LHD-2	
2050	L	F	10.0	76	LHD-2	
2051	L	F	9.0	77	LHD-2	
2052	R	M	14.5	83	LHD-2	Roto tag #436-L
2053	L	F	11.0	80	LHD-2	
2054	R	M	12.5	79	LHD-2	
2055	L	F	13.5	86	LHD-2	
2056	L	F	11.0	84	LHD-2	
2057	R	M	14.5	86	LHD-2	
2058	L	F	10.5	81	LHD-2	
2059	R	M	10.0	77	LHD-2	
2060	L	F	11.0	78	LHD-2	
2061	R	M	16.0	88	LHD-2	
2062	L	F	10.5	74	LHD-2	
2063	R	M	14.0	86	LHD-2	
2064	L	F	10.0	82	LHD-2	Roto tag #455-R
2065	L	F	11.5	79	LHD-2	
2066	R	M	12.0	84	LHD-2	
2067	R	M	14.0	85	LHD-2	
2068	L	F	11.5	79	LHD-2	
2069	L	F	14.0	83	LHD-2	
2070	L	F	9.5	80	LHD-2	Roto tag #442-R
2071	R	M	14.5	88	LHD-2	
2072	L	F	12.0	86	LHD-2	Roto tag #488-R
2073	L	F	13.0	83	LHD-2	
2074	L	F	6.5	78	LHD-2	Roto tag #441-R
2075	L	F	9.5	77	LHD-2	
2076	R	M	12.5	89	LHD-2	
2077	L	F	9.5	81	LHD-2	
2078	L	F	10.0	81	LHD-2	
2079	L	F	11.5	83	LHD-2	
2080	R	M	11.5	78	LHD-2	
2081	L	F	12.0	81	LHD-2	

TABLE A-17.--Northern fur seal pups tagged at Adams Cove, San Miguel Island, California, 4 October 1980-continued

Tag number[1/]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)	Checkmark	Remarks
SMI 2082	L	F	10.5	80	LHD-2	
2083	L	F	15.5	83	LHD-2	
2084	L	F	12.5	79	LHD-2	
2085	R	M	14.0	90	LHD-2	
2086	R	M	11.0	84	LHD-2	
2087	L	F	11.5	79	LHD-2	
2088	R	M	9.0	77	LHD-2	
2089	L	F	12.5	85	LHD-2	Roto tag #485-R
2090	L	F	10.5	81	LHD-2	
2091	L	F	11.5	86	LHD-2	
2092	R	M	14.5	85	LHD-2	
2093	R	M	12.0	84	LHD-2	
2094	L	F	11.5	86	LHD-2	
2095	R	M	12.5	87	LHD-2	
2096	R	M	11.0	80	LHD-2	Roto tag #457-L
2097	R	M	10.0	80	LHD-2	
2098	R	M	14.0	84	LHD-2	
2099	L	F	12.0	82	LHD-2	
2100	L	F	10.5	80	LHD-2	
2101	L	F	9.5	79	LHD-2	
2102	L	F	10.5	80	LHD-2	
2103	L	F	10.0	79	LHD-2	
2104	L	F	10.0	79	LHD-2	Roto tag #476-R
2105	L	F	11.5	84	LHD-2	
2106	R	M	13.5	88	LHD-2	
2107	L	F	14.0	87	LHD-2	
2108	R	M	11.5	82	LHD-2	
2109	L	F	9.0	80	LHD-2	
2110	R	M	10.5	82	LHD-2	Roto tag #449-L
2111	L	F	11.0	86	LHD-2	
2112	L	F	9.5	77	LHD-2	
2113	R	M	12.5	87	LHD-2	
2114	L	F	12.5	82	LHD-2	
2115	L	F	13.0	87	LHD-2	
2116	L	F	10.0	76	LHD-2	
2118	R	M	12.0	86	LHD-2	
2119	L	F	12.0	79	LHD-2	
2120	R	M	14.0	87	LHD-2	
2121	L	F	10.0	83	LHD-2	
2122	L	F	8.5	78	LHD-2	
2123	L	F	10.0	83	LHD-2	
2124	R	M	13.5	89	LHD-2	
2126	R	M	13.5	86	LHD-2	
2127	L	F	12.0	86	LHD-2	
2128	E	M	13.0	82	LHD-2	
2129	R	M	11.0	81	LHD-2	
2130	L	F	13.5	87	LHD-2	

TABLE A-17.--Northern fur seal pups tagged at Adams Cove, San Miguel Island, California, 4 October 1980-continued

Tag number 1/	Flipper tagged	Sex	Weight (kg.)	Length (cm.)	Checkmark	Remarks
SMI 2131	L	F	12.0	86	LHD-2	
2132	L	F	14.0	83	LHD-2	
2133	R	M	14.0	86	LHD-2	
2134	R	M	12.0	90	LHD-2	
2135	R	M	17.5	88	LHD-2	
2137	R	M	13.5	79	LHD-2	
2138	L	F	13.0	87	LHD-2	
2141	R	M	15.5	80	LHD-2	
2142	L	F	10.5	92	LHD-2	Roto tag #446-R
2143	R	M	11.0	79	LHD-2	Roto tag #455-L
2144	L	F	9.0	78	LHD-2	Roto tag #427-R
2145	R	M	11.5	83	LHD-2	Roto tag #453-L
2146	R	M	12.5	84	LHD-2	
2149	R	M	8.5	77	LHD-2	
2150	L	F	12.5	84	LHD-2	

1/ Tags destroyed: SMI 1948, 1953, 1959, 1970, 1972, 1978, 1981, 1985, 1986, 1991, 1999, 2003, 2016, 2038, 2117, 2125, 2136, 2139, 2140, 2147, and 2148.

TABLE A-18.--Bachelor male fur seals double tagged at Adams Cove, San Miquel Island, California (24 May 1980).

Tag Numbers		
Plastic (pink) tags applied to left foreflipper[1/]	Monel steel tags applied to right foreflipper[1/]	Estimated fur seal weight (Kg)
#420	SMI 651	45-60
421	SMI 653	45-60
423	SMI 655	25-35
424	SMI 657	25-35
425	SMI 658	25-35
426	SMI 659	25-35
427	SMI 661	25-35
428	SMI 664	25-35
492	SMI 665	25-35

[1/] Tags destroyed: Plastic pink #422; Monel steel #'s SMI 652, 654, 656, 660, 662 and 663.

TABLE A-19.--Adult female northern fur seals restrained, tagged[1], blood sampled and swabbed for bacterial and viral cultures at Adams Cove, San Miguel Island, California, 18 November 1979.

Tag number		Vibrassae	Samples[2]					Remarks
			Bacteria	Blood		Virus		
Right flipper	Left flipper	Color	Ames	CB	Heprin	Rectum	Nasal	
401	402	white	+	+	+	+	+	
404	403	mixed	+	+	+	+	+	
405	406	white	+	+	+	+	+	RFS & tag seen
407	408	white	+	+	+	+	+	
SMI 224	SMI 223, 0007[3]	white	+	+	+	+	+	SMI tags applied in 1975, 0007 applied during this study
410	409	white	+	-	+	+	+	
411	412	white	+	-	+	+	+	
413	414	mixed	+	-	+	+	+	
416	415	white	+	-	+	+	+	
417	419	white	+	-	+	+	+	Tag 418 destroyed
420	421	white	+	-	+	+	+	
422	423	white	+	-	+	+	+	
424	425	white	+	-	+	+	+	
426	427	white	+	-	+	+	+	
428	430	white	+	-	+	+	+	Tage 429 destroyed
431	432	white	+	-	+	+	+	
433	434	white	+	-	+	+	+	
435	437	white	+	-	+	+	+	Tag 436 destroyed Healed flipper lesion
438	439	white	+	-	+	+	+	Healed flipper lesion
440	441	white	+	-	+	+	+	Flipper lesion; Sample right rear
442	443	mixed	+	-	+	+	+	
445	444	mixed	-	-	+	+	+	
447	446	white	-	-	+	+	+	
448	449	white	-	-	+	+	+	

TABLE A-19.--Adult female northern fur seals restrained, tagged[1], blood sampled and swabbed for bacterial and viral cultures at Adams Cove, San Miguel Island, California, 18 November 1979.--continued

Tag number			Samples[2]					
Right flipper	Left flipper	Vibrassae Color	Bacteria Ames	Blood CB	Blood Heprin	Virus Rectum	Virus Nasal	Remarks
450	451	white	-	-	+	+	+	
452	453	white	-	-	+	+	+	
454	455	white	-	-	+	+	+	
456	457	white	-	-	+	+	+	
458	459	white	-	-	+	+	+	
0008[3]	SMI 908	black	-	-	+	+	+	blood labeled 460, SMI tag applied in 1977, 0008 applied during this study
460	461	white	-	-	-	-	-	nursing 19 Nov.

[1] Plastic (white) Roto cattle ear tags.

[2] Plus (+) = sample taken; minus (-) = no sample taken.

[3] Rubber (orange) Alflex disc type cattle ear tag.

TABLE A-20.--Northern fur seal pups tagged on Castle Rock, San Miguel Island, California, 3 October 1980.

Tag number[1]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)[2]	Checkmark	Remarks
SMI 1812	R	M	11.5	-	LHD-2	
1813	R	M	9.5	-	LHD-2	
1814	R	M	13.2	-	LHD-2	
1815	L	F	11.0	-	LHD-2	
1816	R	M	11.5	-	LHD-2	
1817	R	M	10.0	-	LHD-2	
1818	R	M	14.0	-	LHD-2	
1819	L	F	9.0	-	LHD-2	
1820	R	M	12.0	-	LHD-2	
1821	L	F	13.0	-	LHD-2	
1822	L	F	10.0	-	LHD-2	
1823	L	F	9.5	-	LHD-2	
1824	R	M	11.5	-	LHD-2	
1826	L	F	11.5	-	LHD-2	
1828	L	F	11.0	-	LHD-2	
1829	L	F	11.0	-	LHD-2	
1831	R	M	12.5	-	LHD-2	
1832	R	M	9.5	-	LHD-2	
1833	L	F	12.5	-	LHD-2	
1834	L	F	10.5	-	LHD-2	
1836	L	F	9.0	-	LHD-2	
1838	R	M	10.0	-	LHD-2	
1839	L	F	11.5	-	LHD-2	
1840	L	F	12.0	-	LHD-2	
1842	L	F	9.5	-	LHD-2	
1843	L	F	10.0	-	LHD-2	
1844	L	F	13.5	-	LHD-2	
1846	L	F	8.5	-	LHD-2	
1849	L	F	10.0	-	LHD-2	
1850	R	M	15.0	-	LHD-2	
1852	R	M	9.5	-	LHD-2	
1853	L	F	10.0	-	LHD-2	
1854	L	F	11.5	-	LHD-2	
1855	L	F	9.5	-	LHD-2	
1856	R	M	14.5	-	LHD-2	
1857	L	F	13.0	-	LHD-2	
1858	R	M	12.0	-	LHD-2	
1859	R	M	14.0	-	LHD-2	
1860	R	M	9.0	-	LHD-2	
1861	R	M	14.0	-	LHD-2	
1862	L	F	11.0	-	LHD-2	
1863	R	M	13.0	-	LHD-2	
1864	L	F	11.0	-	LHD-2	
1865	R	M	14.0	-	LHD-2	
1866	L	F	7.5	72	LHD-2	
1867	R	M	12.5	-	LHD-2	
1869	L	F	14.5	-	LHD-2	

TABLE A-20.--Northern fur seal pups tagged on Castle Rock, San Miguel Island, California, 3 October 1980-continued.

Tag number[1/]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)[2/]	Checkmark	Remarks
SMI 1870	R	M	12.5	80	LHD-2	
1871	R	M	12.5	83	LHD-2	
1872	R	M	14.5	84	LHD-2	
1873	R	M	9.5	78	LHD-2	
1875	L	F	10.0	77	LHD-2	
1876	L	F	12.0	81	LHD-2	
1879	L	F	12.0	80	LHD-2	
1882	R	M	15.0	88	LHD-2	
1883	L	F	9.5	76	LHD-2	
1884	R	M	14.0	84	LHD-2	
1885	R	M	12.0	78	LHD-2	
1886	R	M	11.5	81	LHD-2	
1888	L	F	11.0	79	LHD-2	
1889	R	M	11.0	80	LHD-2	
1890	R	M	15.0	84	LHD-2	
1891	R	M	11.5	88	LHD-2	
1892	R	M	12.0	86	LHD-2	
1894	R	M	15.0	88	LHD-2	
1895	L	F	11.5	81	LHD-2	
1896	L	F	11.0	82	LHD-2	
1897	L	F	10.5	79	LHD-2	
1898	L	F	12.0	82	LHD-2	
1899	R	M	12.0	84	LHD-2	
1900	L	F	10.5	77	LHD-2	
1901	L	F	11.5	79	LHD-2	
1902	R	M	12.0	83	LHD-2	
1903	R	M	10.0	79	LHD-2	
1904	L	F	12.0	79	LHD-2	
1905	L	F	12.0	77	LHD-2	
1906	R	M	12.5	-	LHD-2	
1907	R	M	13.0	-	LHD-2	
1908	R	M	11.0	-	LHD-2	
1909	L	F	10.0	-	LHD-2	
1910	L	F	10.5	-	LHD-2	
1911	L	F	12.5	-	LHD-2	
1912	R	M	14.5	-	LHD-2	
1913	R	M	14.5	-	LHD-2	
1914	L	F	14.0	-	LHD-2	
1915	R	M	12.0	-	LHD-2	
1916	L	F	10.5	-	LHD-2	
1917	L	F	13.5	-	LHD-2	
1918	L	F	13.5	-	LHD-2	
1919	L	F	6.0	-	LHD-2	
1920	L	F	10.0	-	LHD-2	
1921	R	M	10.0	-	LHD-2	
1922	R	M	13.5	-	LHD-2	

TABLE A-20.--Northern fur seal pups tagged on Castle Rock, San Miguel Island, California, 3 October 1980-continued

Tag number[1/]	Flipper tagged	Sex	Weight (kg.)	Length (cm.)[2/]	Checkmark	Remarks
SMI 1923	R	M	12.0	-	LHD-2	
1924	L	F	8.5	-	LHD-2	
1925	L	F	11.5	-	LHD-2	
1926	L	F	11.0	-	LHD-2	
1927	L	F	11.0	-	LHD-2	
1928	R	M	12.5	-	LHD-2	
1929	R	M	11.5	-	LHD-2	

1/ Tags destroyed: SMI 1811, 1825, 1827, 1830, 1835, 1837, 1841, 1845, 1847, 1848, 1851, 1868, 1874, 1877, 1878, 1880, 1881, 1887, and 1893.

2/ Only 33 pups were measured.

APPENDIX B

Persons engaged in northern fur seal research in 1980
National Marine Mammal Laboratory (NMML)
Michael F. Tillman, Director
Robert V. Miller, Deputy Director
Charles W. Fowler, Director, Fur Seal Program

Name	Affiliation	Assignment
Scientific Staff		
Permanent		
Alton Y. Roppel	NMML	Population Assessment
Patrick Kozloff	NMML	Population Assessment
Robert H. Lander	NMML	Population Assessment
Roger L. Gentry	NMML	Behavior and Biology
Robert L. DeLong	NMML	Behavior and Biology
George A. Antonelis, Jr.	NMML	Behavior and Biology
Mark C. Keyes	NMML	Veterinary Medical Services
Hiroshi Kajimura	NMML	Pelagic Ecosystem
Temporary		
John M. Francis	NMML	Behavior and Biology
James R. Hartley	NMML	Behavior and Biology
Ronald J. Ryel	NMML	Behavior and Biology
Edward C. Jameyson	NMML	Behavior and Biology
Anne E. York	NMML	Population Dynamics
M. Robert Kochergin	NMML	Population Assessment
Alfey L. Hanson	NMML	Population Assessment
Igor V. Melovidov	NMML	Population Assessment
M. Darlene Melovidov	NMML	Population Assessment
Myron A. Melovidov	NMML	Population Assessment
Christopher J. Melovidov	NMML	Population Assessment
Anthony Philemonoff	NMML	Population Assessment
Andrew R. Lestenkof	NMML	Population Assessment
Rosanne Lorenza	NMML, Univ. of Calif., Berkeley	Veterinary Medical Services
Lavrenty Stepetin	Pribilof Isl. Prog.	Population Assessment
Cooperators[1]		
Robert Arenberger	Natl. Park Service[2]	Pup Tagging Project
Gary Davis	Natl. Park Service	Pup Tagging Project
Gary Robertson	Natl. Park Service	Pup Tagging Project
Daphne Smith	Natl. Park Service	Behavior and Biology
Jeffery Foster	MARC[3], Seattle, WA	Pup Tagging Project
Mark Fugil	MARC, Seattle, WA	Pup Tagging Project
Patrick Gearin	Univ. of Washington	Behavior and Biology
Steven Jefferies	Wash. Dept. of Game	Pup Tagging Project

APPENDIX B.--continued.

Name	Affiliation	Assignment
Cooperators, cont.		
John Calambokidis	Cascadia Research Collective	Behavior and Biology
Sara Madsen	Cascadia Research Collective	Behavior and Biology
Terry Brown	Cascadia Research Collective	Behavior and Biology
Carolyn Heath	Cascadia Research Collective	Behavior and Biology
Henry Bray	Naval Bioscience Lab.	Microbiology & Immunology
John Erpilla	Naval Bioscience Lab.	Microbiology & Immunology
Ke Chung Kim	Penn. State Univ.	Respiratory Mite Biology
Peter Adler	Penn. State Univ.	Respiratory Mite Biology
Murray D. Dailey	Marine Animal Research Assoc.	Subcutaneous Worm Biology
Larry Shults	Marine Animal Research Assoc.	Subcutaneous Worm Biology
Visiting Scientists		
Bernard Easterday	Univ. of Wisconsin	Human Virus in Marine Birds
Sandy McGregor	Univ. of Wisconsin	Human Virus in Marine Birds
Robert Olsen	Univ. of Wisconsin	Human Virus in Marine Birds

1/ Financed wholly or in part by the National Marine Mammal Laboratory or other Federal agency.

2/ The National Park Service manages San Miguel Island for the Department of Navy and frequently assists in wildlife management activities when needed.

3/ Marine Animal Resource Center.