

ALASKA FUR SEAL INVESTIGATIONS
PRIBILOF ISLANDS, ALASKA, SUMMER OF 1953

Ford Wilke

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Collaborators and visiting scientists.--The adequacy of the laboratory on St. Paul Island for use by the regular workers concurrently with visiting scientists has been discussed in earlier reports. In 1953 we increased the worktable and seating space in order to accommodate more compatibly the parasitology group and those working on general biological problems. Also, better lights were installed by the island management. Conditions were generally improved although we look forward to use of the new laboratory when completed.

Mr. Robert W. Rand, the biologist of the Guano Island Administration, Union of South Africa, responsible for biological work with South African fur seals, spent June, July, and most of August on the Pribilof Islands. Although Mr. Rand was interested in all phases of fur seal biology, management, and processing, he participated very diligently in the study of reproduction in female seals. His experience with a similar study of South African fur seals was extremely helpful in planning and collecting the data for the 1952 study. It is planned that Mr. Rand will be joint author of any publication which may result from this research.

An ornithological party consisting of Roger T. Peterson (Glen Echo, Md.), James Fisher (London, England), and James Cottrell (Cambridge, Mass.), visited the Pribilofs to examine the sea bird colonies. Mr. Fisher was most keen to see the fulmars, a species on which he is the world expert.

GROWTH AND MEASUREMENTS

Tagged 4-year-old males.--Thirty tagged 4-year-old male seals were weighed and measured on the killing field. This group of seals was selected for size by the clubbers, hence they are not representative of the full

size range of 4-year males. They do show the mean size of 4-year animals taken in the commercial kill under present size limits.

Table 1.—Weight and length of 4-year males.

No.	Age years	Tag series	Weight		Total length	
			Mean lbs.	Range lbs.	Mean inches	Range inches
30	4	CS	72.8	56 - 91	46.8	44.9 - 51.2

In 1953 the average weight of 26, 4-year-old tagged males taken without regard for commercial size limits was 78.2 pounds and their average length was 49.5 inches. The average weight of selected males was 93 percent as large as that of the unselected males and their length was 94.5 percent as great as the length of unselected males. This comparison suggests that kills made within present size limits of 41 to 45 or 46 inches draw on over 90 percent of the 4-year-old males. If, as has been proposed, the escapement of males is larger than needed for procreation, this escapement probably occurs throughout the 3- and 4-year-old class rather than being concentrated among the larger animals.

Size and growth.--Because of the predominance of old animals the females arriving early are surprisingly large and heavy. It is also true, as has been suggested by earlier studies, that the larger individuals of a given age tend to arrive first. This is illustrated for the younger age groups in the following table in which females carrying young are not included.

Table 2.--Mean weight, pounds, of early and late arriving female seals.

Age	First 25 seals collected	Last 25 seals collected	Percent difference
4	62.9 ^{1/}	55.2 ^{1/}	13.9
5	71.9	62.1	15.8
6	77.7	70.8	9.7
7	78.6	71.2	10.4

At the age when sexual maturity is first reached the females have attained from 62 to 71 percent of their ultimate weight and 88 to 91 percent of their ultimate length. A gradual and rather uniform growth occurs until sometime after the 10th year. The rate of growth lessens, although not markedly, between the sixth and seventh year (Table 2, fig. 1).

Table 3.--Weight and length of females from rookeries.

Age	No.	Weight		Total length	
		Mean lbs.	Range lbs.	Mean cm.	Range cm.
3	17	50.8	40 - 60	107.8	97 - 119
4	34	58.3	40 - 77	117.4	105 - 129
5	75	67.6	42 - 104	122.4	110 - 138
6	84	76.2	56 - 105	126.4	114 - 137
7	54	75.5	60 - 109	136.6	121 - 135
8	43	82.0	53 - 109	129.8	118 - 140
9	43	85.7	61 - 119	132.1	116 - 141
10	36	90.7	61 - 118	132.5	122 - 140
10+	186	94.6	61 - 138	133.9	121 - 145

^{1/} Only 34 animals in total are in this age class.

Figure 1.--Brand and tag applied to seal pup in 1941 -
now 12-year-old cow. From Northeast Point,
St. Paul Island, Alaska, July 1953.

Figure 2.--Measuring cow seals at Polovina Rookery,
St. Paul Island, Alaska, July 1953.

Figure 3.--Weighing cow seals at Polovina Rookery,
St. Paul Island, Alaska, July 1953.

Figure 4.--Seal enclosure constructed at Northeast Point,
St. Paul Island, Alaska, for hookworm
investigation (May 1953).

III. Marking.

A. Paint marking.

Fifty bulls were marked with yellow traffic paint at Reef Rookery on 5 June as a test of the paint's lasting quality for such a purpose. For the first week the painted bulls were easily detected and up to a month they were recognizable. The number that could be found decreased to about one-half. Two were found dead along with several that had not been marked. After a month the paint marks are worn and dirty. They would need renewing for successful observation.

B. Tagging pups.

Ten thousand pups were tagged on the posterior edge of the left frontflipper. One-half to three-fourths of an inch of the tip of the same flipper was sliced off to aid in identifying animals which had lost their tags.

The tags used are type 19M of the National Band and Tag Company, Newport, Kentucky. They are identical with cattle ear tags but are made of monel metal instead of plated steel. The F series was applied in 1953. By accident, 400 G series tags were also attached before the error was corrected.

The excessive wear which occurred in the B series tags applied in 1948 has not given trouble in the series used in 1949. Thus far, the 1952 tags appear to be normally resistant to wear. At least some of the monel tags applied in 1941 are still in excellent condition (Figure 1.).

Table 4.--Fur Seal Pup Tagging, Series F - 1953.

Date	Rookery	Tag numbers	Number tagged	Number tags spoiled	Pups killed
31 August	Northeast Point	1 - 2300	2300	0	1
1 September	Polovina	2301 - 3500	1200	1	0
1 September	Little Zapadni and Zapadni Reef	3501 - 4400	900	5	0
2 September	Zapadni	4401 - 5500	1100	1	0
2 September	Tolstoi	3501 - 6700	1200	3	3
3 September	Reef	6701 - 9300	2600 ^{1/}	2	2
4 September	Lukanin-Kitovi	9301 - 10,000	$\frac{7800}{10,000}$	$\frac{0}{12}$	$\frac{0}{6}$
		Less 12 spoiled =	9,888		

The tagging crew theoretically consisted of:

- 2 taggers
- 2 tag feeders
- 2 head holders
- 2 flipper trimmers
- 2 pod watchers
- 4 carriers

Since one or two of the crew were sometimes absent the crew often functioned with fewer than the 14 men indicated. Both biologists worked steadily as part of the crew throughout the tagging. The smoothness of the

^{1/} Plus 400 G series accidentally used.

operation could have been much improved by assignment of a man capable of acting as foreman. This lack was much more important than the absence of a man.

IV. Mortality.

A. Dead pup study area.

The total number of dead pups counted on the Northeast Point dead pup study area in 1953 was 325. In 1951 the total number counted was 430. In spite of the decreased death rate on this area, the overall mortality on St. Paul Island increased by 9 percent. This suggests that caution must be used in selecting sample areas that will be used to indicate pup mortality for the entire island.

B. Dead pup counts.

Dead pups were counted on all rookeries of both St. Paul and St. George Island. The method used was identical with that reported for 1951. Attempts will be made in next few years to develop a reliable system of sample count areas which will make it unnecessary to cover every rookery exhaustively as is now done.

The 79,212 dead seal pups counted on St. Paul Island, together with the five percent allowance for animals which had washed out to sea or were otherwise lost, represent a nine percent increase over the 1951 count (Table 5). Counts of dead pups on St. George which totaled about 8700 were well under the estimated loss of 14,600 pups given in earlier reports (Table 6). Mortality at this stage is 17 percent of the total number born (530,000) as estimated from tag recoveries. It is not yet possible to estimate the influence of hookworm mortality on the commercial kill. The take has fluctuated around 65,000 regardless of the varied

Table 5.--St. Paul Island Dead Pup Counts.

Rookery	Number - 1951	Number - 1953
✓ Ardiguen	242	189 ✓
✓ Gorbach	3,559	3,679 ✓
✓ Kitovi	1,517	1,695 ✓
Little Polovina	2,208	2,211 ✓
Little Zapadni	2,804	2,446 ✓
Lukanin	712	1,086 ✓
Morjovi	3,592	3,764 ✓
Polovina	6,402	5,036 ✓
Polovina Cliffs	5,580	5,451 ✓
✓ Reef	11,007	13,661 ✓
Sivutch	-----	-----
✓ Tolstoi	6,033	6,154 ✓
Vostochni	18,450	19,503 ✓
Zapadni	8,204	12,221 ✓
Zapadni Reef	<u>353</u>	<u>1,116</u>
ACTUAL TOTAL	70,663	79,212 ✓
Add 5 percent	<u>3,533</u>	<u>3,961</u>
Estimated total	74,196	83,173
Percent increase	9.01	

78212
 C.A.
 8 Oct 58

Table 6.--St. George Island Dead Pup Counts

Rookery	Number - 1953
North Rookery	3,197
Staraya Artil	3,353
East Rookery	846
Zapadni	1,018
South	<u>254</u>
TOTAL	8,668
Add 5 percent	<u>43</u>
	8,711

factors influencing it. The total mortality when the seals arrive on the hauling grounds as 3-year-olds is estimated to be about 75 percent. Thus, 58 percent of the loss up to age 3 was due to other factors. The relative influence of these factors such as storms at sea, predators, and other diseases cannot even be estimated. Losses from hookworm infection probably has not played too important a part in the overall population picture up to the present. Nevertheless, the steady upward trend is worthy of concern. How long will it continue and what will be its eventual effect on the commercial kill?

C. Hookworm investigation.

The hookworm investigation of 1953 carried out by Dr. O. Wilford Olsen is the subject of a complete report, "Report on the third summer of investigations on hookworms, Uncinaria lucasi Stiles 1901, and hookworm disease of fur seals, Callorhinus ursinus Linn., on the Pribilof Islands, Alaska, from May 21 to September 17, 1953." In 1951 and 1952 it was

established that hookworm infection is restricted to fur seal pups. An additional important fact in the life history of Uncinaria, that had been suspected, was verified in 1953 when it was determined that the larvae lived overwinter in the rookery soil. It was found that a natural decline in the number of larvae in the soil took place throughout the summer. In the late summer and early fall newly hatched larvae from eggs deposited by infected pups bring up the soil population once more. The pups appear to become immune in the fall but the larvae remain in the soil to infect pups the following season.

Life history information is sufficiently complete to allow research emphasis in future years to be put on means of destroying the hookworm larvae in the soil by chemicals or other means.

Why hasn't St. P. been mentioned?

V. Population.

A. Tag recoveries.

In 1953, the policy of killing only those tagged animals falling within the regular size limits for the commercial kill was continued. This practice has been adopted as standard procedure. There is no evidence that the presence of tags has created bias by causing tagged seals to be killed out of proportion to the untagged animals.

Total tag recoveries for St. Paul Island were:

B tags (5 years old).....	11	+ 3
CS tags (4 years old).....	580	+ 14
D tags (2 years old).....	5	

17 St. Geo

Because no tags were applied in 1950, 3-year-old tagged seals were not part of the 1953 kill. This age class usually furnishes the greatest number of tagged animals.

On St. George Island, 14 tagged 4-year-olds and three tagged 5-year-olds were recovered.

B. Tooth ridge counts.

The usual random sample of canine teeth was collected from the commercial kill. A daily sample of 25 teeth was taken as in the past. It was decided later in 1953 that the sample should be increased for large daily kills so that it contained a minimum of two percent of the kill.

The representation of ages in the tooth samples is as follows:

2 years old	- 2.54 percent	1404
3 years old	- 74.64 percent	41,266
4 years old	- 22.63 percent	12511
5 years old	- .19 percent	105

ST. PAUL MALE KILL 5520
 ST. GEORGE 289
 8496
 2576
 22
 11,383

C. Dead pup counts.

Dead pup counts are mentioned only because they serve a dual purpose. They are a measure of hookworm caused and other mortality, and, also, because of the numbers involved, are an important part of the estimate of the number of pups born as derived from tag recoveries.

VI. Reproduction.

A. Hauling ground cows.

Because of the apparently stable fur seal population and the high natural mortality operating to keep it stable, the following questions have arisen in the minds of those responsible for fur seal management:

1. Are fur seals being utilized as fully as they might be?
2. Can the kill of young males be increased without reducing the productivity of the females?

Many lines of inquiry can be followed in approaching this problem. In 1951 a study of the testes of 12 seal bulls showed that with the possible

exception of one thin, worn animal taken late in the season, they were all actively producing sperm. The small amount of data collected do not show that sterility is at all common. An obvious and essential approach is to determine whether or not the pregnancy level is presently satisfactory. If not, it would be unwise to reduce the likelihood of successful impregnation still farther by killing additional males. In pelagic collections taken in waters off North America and in waters off Japan, the pregnancy rate among seals largely of Asiatic origin was higher than for the sample mostly of Pribilof origin. The most striking difference existed in the 4- and 5-year age classes. This difference may actually exist or it may be the result of chance affecting the unequal samples. In 1953 a survey of the pregnancy rate among rookery females was made to determine if the lower pregnancy rate found in the North American pelagic sample also prevailed on the breeding islands.

The pregnancy rate referred to in the following discussion is that resulting from impregnation in 1952 and in parturition or abortion in 1953.

From 15 June to 4 September, 607 females were taken in a random manner from various rookeries (Appendix table A). Five hundred seventy-three have been classified into age groups by reading the growth ridges on the canine teeth. The collections were made each day from a small rookery area and usually from one to three harems. The area was changed somewhat each time a rookery was revisited. Dragging cows from the rookery throughout the season when the bulls are most active in defending their territory and their harems is difficult and hazardous. Bulls do not necessarily lose interest in a dead cow. They frequently attempted to

copulate with a dead animal and occasionally succeeded in making a penetration. Therefore, as a practical consideration the number of entrances into the rookeries was held to a minimum.

Seals were killed by shooting in the head or at the base of the skull with a .22 caliber long-rifle hollowpoint cartridge. After being removed from the rookery they were dragged into a row on a grassy expanse or hauled by pickup truck to such a place. There they were tagged, weighed, measured, and skinned. The genital tract and skull were removed and tagged. Weights were taken with a steelyard and tripod. Measurements were made on a fish type measuring board adapted for seals (Figs. 2 and 3). Skinning was done by the usual bar and clamp method used on the Pribilofs. When only two men were available, one served as the barman holding the seal and the pickup truck driven by the second man furnished the power to pull off the skin.

Examination of the genital tract and cleaning the teeth for aging was done in the laboratory. A collection of skulls was retained as an incidental result of the project.

Age composition of harem.--The most striking feature of the age composition of harems from mid-June to mid-July was the large relative number of mature females 10 years old or older (Table 7). Four-year-olds first began to appear regularly in the collections on 8 July but the first 3-year-old female was not taken until 29 July. During August and early September all age classes were well represented. The 5-, 6-, and 7-year classes were mildly predominant during this period.

Further illustration of the increasingly strong influence of the homing instinct as the seals grow older is shown in Table 8. This gives the median date of the collection of rookery females of various ages and

ranges from 7 July for the 10+ age class to 23 and 24 August for 3- and 4-year-olds.

Generalizing it can be safely stated that the older and to a certain extent the larger female seals arrive first on the rookeries. It is probable that the need to give birth to their pup brings them to the islands with greater urgency than is the case with small, young animals. Giving birth early, they are also bred early (about 6 days after parturition) but because of delayed implantation it is not known how much, if any, this accelerates the birth of the pup the following season.

Table 7.--Age composition of rookery females by date.

Date	No.	Age								
		3	4	5	6	7	8	9	10	10+
		<u>Percent</u>								
15-17	25	--	--	8	8	4	--	--	12	68
18-22	37	--	3	--	19	8	5	5	3	57
23-27	36	--	--	6	8	3	3	8	14	58
28- 2	49	--	--	8	10	14	10	10	4	44
3-7	40	--	--	5	15	7.5	7.5	15	13	37
8-12	13	--	8	23	38	8	8	--	--	15
13-17	43	--	4.6	4.6	11.6	7	11.6	11.6	7	42
18-22	50	--	6	18	16	14	12	2	6	26
23-27	--	--	--	--	--	--	--	--	--	--
28- 1	51	2	2	35	24	7.8	7.8	7.8	6	7.8
3- 7	42	10	7	14	12	14	12	7	5	19
22-26	136	5	9	14	13	11	4	10	6	28
4	<u>49</u>	10	23	17	14	6	10	2	2	16

~~27 63 153 189~~

Table 8.--Median date of collection of rookery females by age.

Age	No.	Date
3	17	23 August
4	34	24 August
5	75	31 July
6	84	29 "
7	54	30 "
8	43	21 "
9	43	20 "
10	36	16 "
10+	186	7 "

Pregnancy.--From mid-June until early August pregnant seals carrying a full-term fetus and others with a recent blastocyst are present. Because of the technical difficulty of finding all of the microscopic blastocysts, the proportion of pregnant seals is determined from the number pregnant or post-partum from impregnation in 1952.

Earlier samples of female seals have demonstrated what is verified by the present collection, that less than one-third of the 4-year-old seals are pregnant, about three-fourths are pregnant in their fifth year, and they reach the mature breeding potential in the sixth year (Table 9, Fig. 5). Some decline in reproductive effectiveness is evident in seals over 10 years old but until the age of senescence is reached a remarkably high rate of pregnancy is maintained (Table 10, Fig. 6). Unfortunately, a collection of female

FIGURE 5.--REPRODUCTIVE CONDITION OF FEMALE FUR SEALS

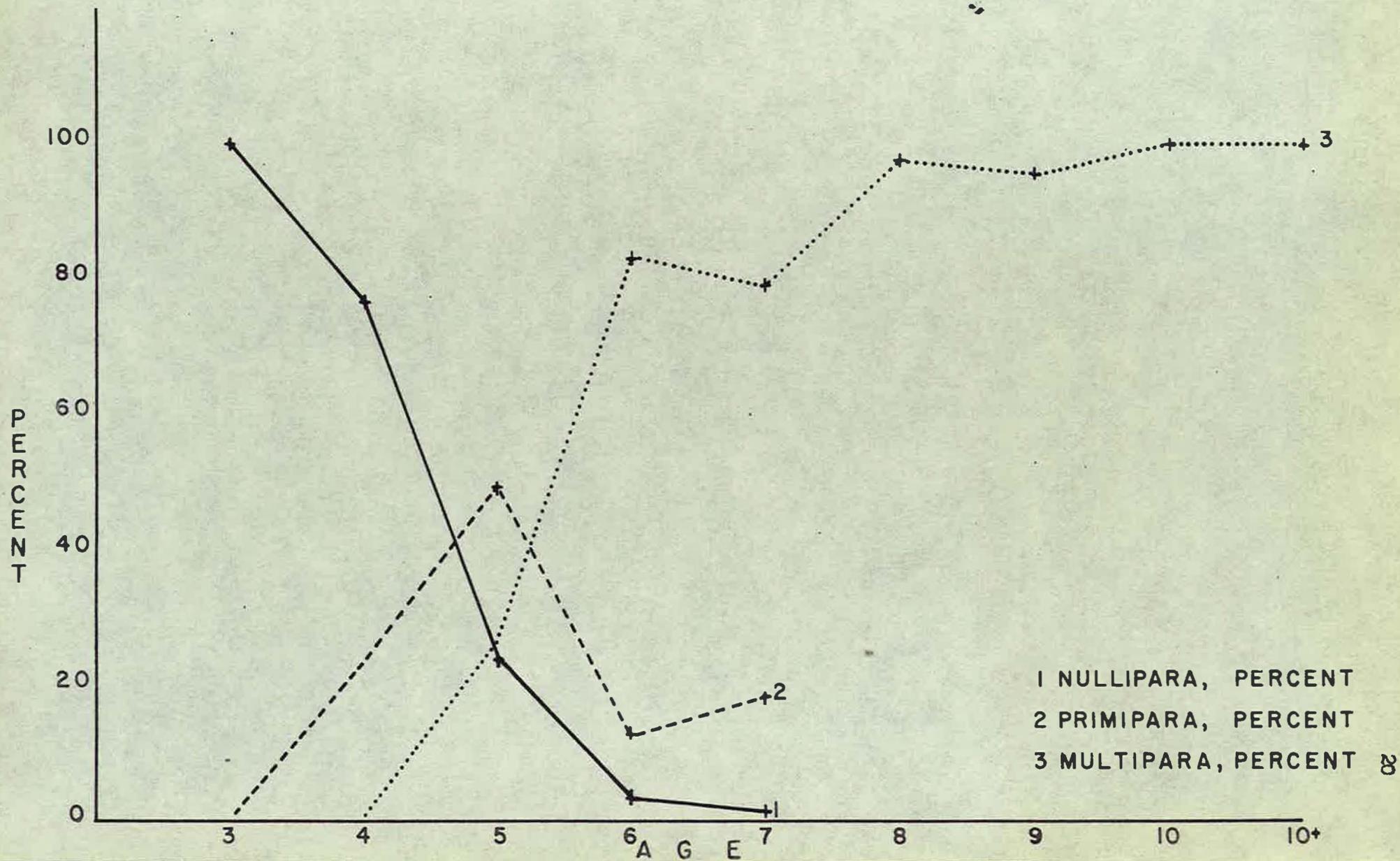


Table 9.--Reproductive condition of female fur seals at various ages.

Age	No.	Nullipara		Primipara		Multipara	
		No.	Percent	No.	Percent	No.	Percent
<u>From hauling grounds</u>							
3	5	5	100.0	----	----	----	----
4	27	25	92.6	2	7.4	----	----
5	81	18	22.5	57	71.3	5	6.3
6	31	3	11.1	16	53.3	11	36.6
7	8	----	----	----	----	8	100.0
8	3	----	----	----	----	3	100.0
9	----	----	----	----	----	----	----
10	1	----	----	----	----	1	100.0
10+	8	----	----	----	----	8	100.0
<u>From rookeries</u>							
3	17	17	100.0	----	----	----	----
4	34	26	76.5	8	23.5	----	----
5	75	18	24.0	37	49.3	20	26.7
6	84	3	3.6	11	13.1	70	83.3
7	54	1	1.9	10	18.5	43	79.6
8	43	----	----	1	2.3	42	97.7
9	43	----	----	2	4.7	41	95.3
10	36	----	----	----	----	36	100.0
10+	165	----	----	----	----	168	100.0

551

65

69

417

11.8%!!

165

FIGURE 6.—PERCENT OF PREGNANCY

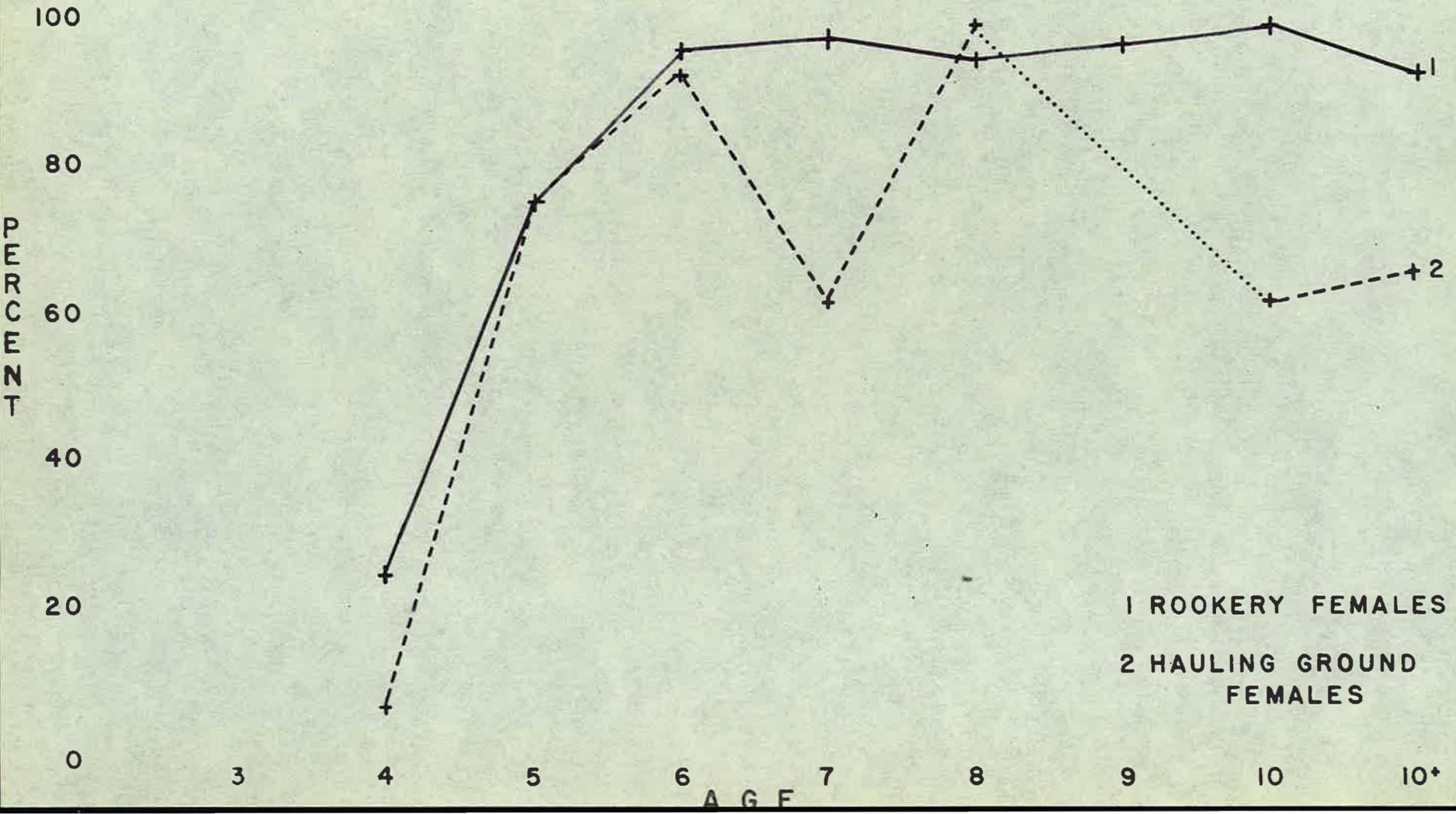


Table 10.--Degree of pregnancy.

Age	No.	Pregnant (impregnated 1952)	
		No.	Percent
<u>From hauling grounds</u>			
3	5	----	----
4	27	2	7.4
5	81	62	77.8
6	31	28	93.5
7	8	5	62.5
8	3	3	100.0
9	----	----	----
10	1	1	100.0
10+	<u>8</u>	<u>5</u>	<u>62.5</u>
TOTAL	164	106	66.7 ^{1/} 78.8 ^{2/}
<u>From rookeries</u>			
3	17	----	----
4	34	8	23.5
5	75	57	76.0
6	84	81	96.4
7	54	53	98.1
8	43	41	95.3
9	43	42	97.7
10	36	36	100.0
10+	<u>165</u>	<u>155</u>	<u>93.9</u>
TOTAL	551	473	85.8 ^{1/} 93.0 ^{2/}

^{1/} Seals 4-10+ years old.

^{2/} Seals 5-10+ years old.

seals from a rookery does not necessarily represent the pregnancy rate in the entire age class. Seals come to a rookery for the specific purpose of bearing a pup and later, copulation. If a seal has aborted or did not become pregnant the previous year she may linger in the sea until later or perhaps never come ashore at all if she has undergone some reproductive upset. Thus, because some segregation related to reproductive condition occurs on land the only fully representative female sample may be a very large pelagic collection. The closest approach to this is a composite made up of females that have been taken in various localities.

Only the 4-, 5-, and 6-year-old females were taken in sufficient numbers on the hauling ground to provide an informative sample. This is not only because young females are more common on the hauling grounds but also because with their dark vibrissae they are mistaken for males. A disparity was found in the degree of pregnancy among 4-year-olds from the two sources; about 7 percent for those from the hauling grounds versus 24 percent for those taken on the rookeries. Among the 5-year-olds the pregnancy rate was nearly the same for animals from hauling grounds and rookeries.

A small percentage of females reach their seventh, eighth, or ninth year before giving birth to their first pup. No instance was found of a female 10 years or older that had never given birth to a pup. Complete sterility would appear to be very rare.

Of 118 first pregnancies, 52 had occurred in the right horn of the uterus and 66 in the left (Table 11). The dominance of the left horn is not well marked. It cannot be concluded from this sample that first pregnancies tend to occur more frequently in the left horn of the uterus.

Table 11.--Uterine horn of first pregnancy.

Age	Side			
	Right	Left		
	<u>Hauling ground cows</u>			
4	1	1		
5	21	29		
6	9	6		
	<u>Rookery cows</u>			
4	1	4		
5	17	21		
6	4	5		
TOTAL	53	66	44 percent	56 percent

Ordinarily, it is possible to tell a nulliparous uterine horn from a parous horn by the slender, smooth appearance of the nulliparous horn as contrasted with the thickened and somewhat wrinkled appearance of a horn which has furnished an implantation site for a fetus. A nulliparous horn is usually not more than 12 mm. in diameter whereas a parous horn is usually 14 mm. or more in diameter even when fully regressed (Table 12). However, there is some overlapping in the diameters of nulliparous and parous horns so diameter alone is not a certain means of separation. When size and appearance will not allow identification of a uterine horn as parous or nulliparous, examination of the ovaries for corpora lutea and corpora albicans^{ta} is necessary.

A gradual increase in the average size of the ovaries occurs as the seals become older (Table 13). This corresponds with the overall increase

Table 12.--Width of uterine horns in fur seals.

Age	No.	Nullipara		No.	Multipara fully regressed		
		Width mm.	Maximum		Width mm.	Minimum	
<u>From hauling grounds</u>							
3	4	10.3 - 10.5	11.0	----	----	----	----
4	21	11.3 - 11.8	15.0	----	----	----	----
5	18	11.4 - 11.1	14.0	----	----	----	----
6	3	10.7 - 10.7	11.0	----	----	----	----
7	----	----	----	3	16.7 - 15.3	13	----
8	----	----	----	----	----	----	----
9	----	----	----	----	----	----	----
10	----	----	----	----	----	----	----
10+	----	----	----	3	18.0 - 18.0	16	----
<u>From rookeries</u>							
3	17	9.1 - 8.6	13.0	----	----	----	----
4	26	9.8 - 9.7	14.0	----	----	----	----
5	19	9.8 - 9.9	13.0	----	----	----	----
6	3	10.6 - 10.6	12.0	----	----	----	----
7	1	8.0 - 8.0	8.0	----	----	----	----
8	1	11.0 - 11.0	11.0	1	20.0 - 22.0	12	----
9	----	----	----	1	32.0 - 33.0	14	----
10	----	----	----	----	----	----	----
10+	----	----	----	13	17.6 - 17.5	12	----

Table 13.--Mean ovary weight and diameter.

Age	No.	Ovary Weight, Gr.		Ovary Weight, mm.	
		Right	Left	Right	Left
<u>Hauling ground females</u>					
3	5	4.0	4.8	21.0	24.0
4	27	6.0	6.3	23.7	24.1
5	81	7.1	7.3	26.0	25.4
6	31	7.8	7.8	25.9	25.4
7	8	8.4	9.4	26.8	28.1
8	3	8.9	9.3	26.7	28.7
9	----	----	----	----	----
10	1	10.6	8.9	28.0	28.0
10+	8	9.3	9.5	27.9	27.5
<u>Rookery females</u>					
3	17	5.1	5.3	22.6	22.9
4	34	6.6	6.6	25.2	24.7
5	75	7.1	7.3	26.1	25.4
6	84	7.6	7.8	25.8	25.8
7	54	7.9	7.9	25.3	26.8
8	43	8.0	8.1	25.9	25.5
9	43	8.2	8.6	26.0	26.6
10	36	8.1	8.4	26.3	26.6
10+	165	8.9	8.9	26.9	25.9

in the size and weight of the female. There are no large changes in ovary size between age classes that might indicate a beginning or a decline in sexual activity. In a small number of non-pregnant females, 10 years old or older, the ovaries had degenerated to less than half the mean size for the age class. These animals undoubtedly had passed their reproductive period. From the standpoint of management such senescent females are not of great concern. They are relatively few in number and cannot be segregated with our present knowledge.

In evaluating the results of this study satisfactorily the following two points are evident: (1) Rookery females are a selected group, not fully representative of all the females in their respective age classes. (2) A high pregnancy rate, 94 percent or higher, exists among rookery females 6 years old or older.

This is appreciably higher than was attained by seals composing pelagic samples (Table 14). There can be little doubt that the pregnancy rate is adequate in the 1953 sample of rookery females. No failure on the part of breeding bulls, either in activity or numbers, is suggested. Much less confidence is justified in appraising the condition of Pribilof females as a whole. Variable rates have occurred in the samples examined. For example, the pregnancy rate of 4-year-old females taken on the hauling grounds in 1953 was seven percent but in 1954 it was 38 percent. Five- and 6-year-olds were very consistent in these two years having rates of 78 and 94 percent in 1953 and 75 and 90 percent in 1954. The impregnation of younger females, many of which arrive after harem breakup, would be affected most quickly by insufficient males. Examination of 607 females from rookeries, 622 from hauling grounds, and 652 from various North

Reconcile the discrepancy and set a quota based on the two estimates and on the commercial quality of the skins.

3. Continue the increased kills for an indefinite period of years.
4. Trace the effect of the changed kill policy by:
 - (a) The trend of the annual bull counts.
 - (b) The pregnancy rate among females taken in the commercial kill. (We propose that females of the proper commercial size continue to be included in the kill as was done in 1954.)

5. Any sustained decline in either harem and idle bull numbers or the pregnancy rate of females taken on the hauling grounds would call for reconsideration of the kill policy. The action to be taken would, of course, depend on what kind of population manipulation was needed to fit existing conditions.

VII. Miscellaneous.

A. Reindeer exclosures.

Two eight-sided exclosures (see Figure 5) were constructed for the purpose of following vegetation changes, if any, caused by the grazing of reindeer. One exclosure is inland from the road between Tolstoi and Little Zapadni. The other is off the road to Lake Hill Lake. It is not anticipated that any changes will be noticed for many years. However, the exclosures should last for twenty years or more without maintenance.

B. Sea lion counts.

1. Northeast Point, St. Paul Island. Seventy large males present on 23 May 1953.
2. Walrus Island. Thirteen hundred forty sea lions, exclusive

of pups counted on 15 July 1953.

3. St. George Island. Nine hundred thirty-two sea lions were counted on 16 and 17 July 1953. This includes only the eastern end of the island from Staraya Artil around to Zapadni.

Figure 7.--Reindeer exclosure near Lake Hill Lake.
Constructed in June 1953. Photograph
taken in July 1953.

APPENDIX

Table A.--Number females, rookery, and date collected
in 1953.

Date	Rookery	Number collected
15 June	Reef	5
16 "	Polovina	10
17 "	Northeast Point	10
18 "	Zapadni Reef	10
19 "	Zapadni	10
20 "	Reef	6
21 "	Reef	1
22 "	Northeast Point	10
23 "	Zapadni Reef	17
25 "	Reef	11
26 "	Polovina	10
29 "	Zapadni Reef	14
30 "	Reef	11
1 July	Polovina	25
5 "	Reef	1
6 "	Polovina	20
7 "	Northeast Point	19
8 "	Zapadni Reef	11
9 "	Reef	1
10 "	Northeast Point	1
11 "	Reef	1
13 "	Polovina	16

Table A.--Number females, rookery, and date collected
in 1953 (continued).

Date	Rookery	Number collected
14 July	Polovina	12
16 "	Polovina	19
20 "	Reef	18
21 "	Polovina	18
22 "	Northeast Point	15
25 "	Reef	1
29 "	Polovina	10
30 "	Reef	19
31 "	Polovina	22
1 August	Reef	1
3 "	Northeast Point	15
4 "	Zapadni Reef	18
5 "	Reef	19
7 "	Reef	1
22 "	Reef	25
23 "	Polovina	25
25 "	Zapadni Reef	25
26 "	Polovina	24
27 "	Reef	26
4 September	Little Polovina	49

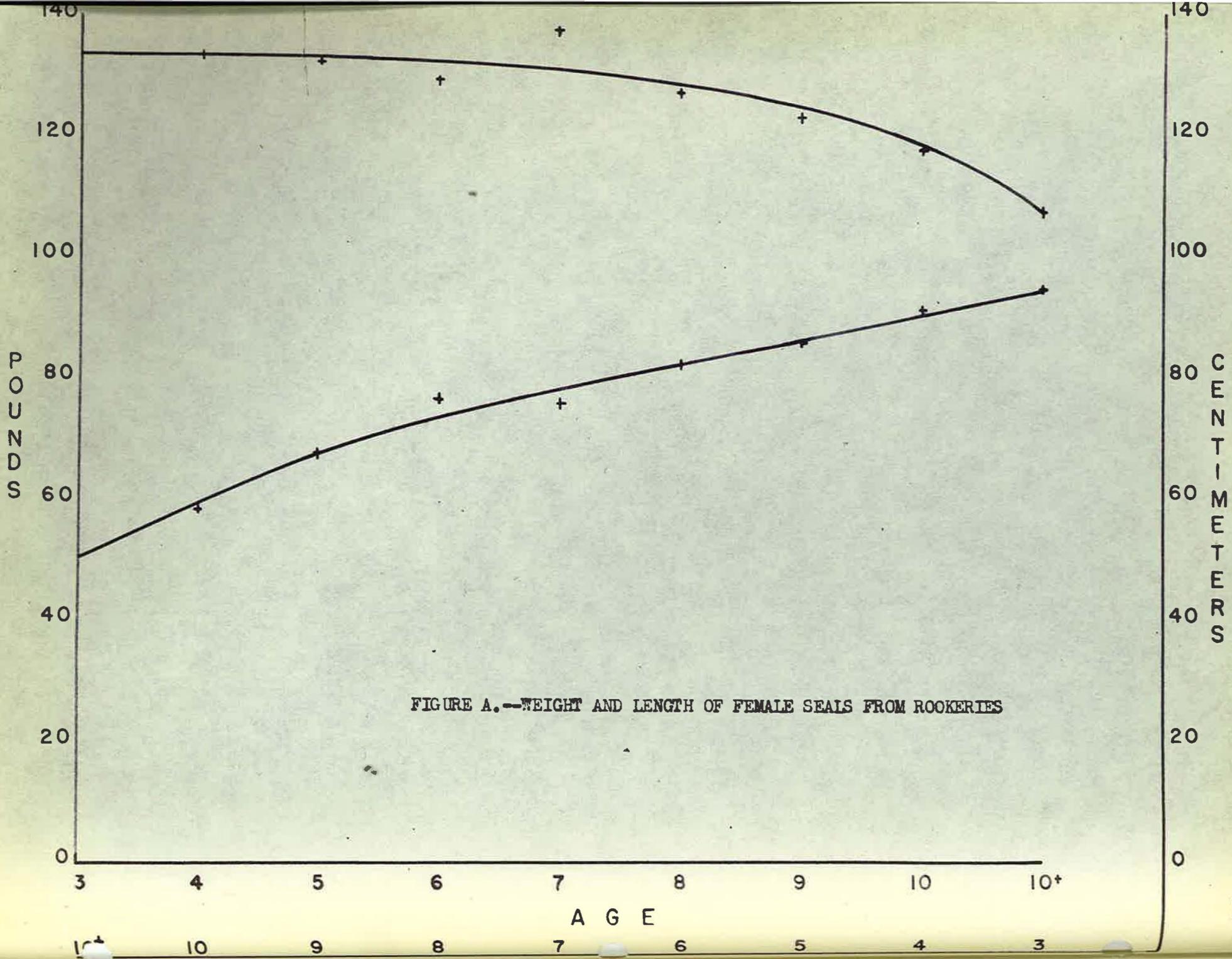


FIGURE A.--WEIGHT AND LENGTH OF FEMALE SEALS FROM ROOKERIES