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REPORT ON A STUDY OF THE ALASKA FUR SEAL HERD IN THE SUMMER OF 1946

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Itinerary.--The biologist arrived via "Brown Bear" on St. Paul, Pribilof Islands, on June 16 and left via "Penquin" on August 10. Dr. Georges Prefontaine and Dr. G. Clifford Carl, representing the Canadian Government, arrived via "Penquin" on St. Paul Island June 23. Dr. Prefontaine left on July 30 and Dr. Carl on August 10, both via "Penquin".

Cooperation.--The aim of the Canadian visitors was to study the methods employed by the Fish and Wildlife Service in managing the fur seal herd, especially in apportioning to Canada her share of the take. The biologist found it a pleasure to work with these men. He endeavored to give them a background of facts and theories pertaining to fur seal biology and management. At the close of the summer 32 photographs (in duplicate) of sealing operations were supplied out of the biological files to each of the Canadian visitors, supplementing photographic records which they themselves obtained. The Canadians were of daily assistance in the regular program of fur seal research, and not only contributed manual labor, but also offered suggestions and ideas which will be useful in planing future research.

Alfred G. Milotte and wife Elma, professional photographers under contract with Walt Disney Studios, were on St. Paul Island from the middle of June to the end of July. They obtained 16 mm Kodachrome movies, as well as stills, of the natural history of the fur seal. The biologist helped to

acquaint them with the various seal rookeries and photographic vantage points, and placed a car at their disposal. The Milottes, in turn, were generous with advice on modern photographic techniques and apparatus useful in biological research.

General manager E. C. Johnston kindly loaned the services of Hugh Travis, sealing assistant, who worked with the biological party for six weeks during the rush period.

The field men of the Fouke Fur Company were helpful and considerate, as ever, in the handling of specimen skins.

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Anatomical Studies, Miscellaneous.—A technique was worked out for separating the pituitary gland from the brain. Thirteen glands were removed on July 4, preserved in acetone, and forwarded to Dr. Robert K. Enders on September 25.

Behavior, Miscellaneous.—The statement is often heard that the newborn fur seal cannot swim. To test this point, the biologist picked up a newborn, 9-pound pup on Tolstoi Sands after a drive and placed it in one of the tanks of seawater in which skins are washed. The pup swam with vigorous, leaping strokes for 20 minutes, after which it seemed to be tiring and was lifted out.

The Milottes took movies of a seal pup that had apparently fallen into the sea from a rocky ledge. It swam for about 15 minutes before it sank from sight and was seen no more.

As an aid to close-up photography, a "cage" is being constructed on Polovina Rookery, to be ready for use in the spring of 1947. It will be

simply a walled-in section of one of the catwalks on the rookery, with a trapdoor above and camera ports along the sides.

Byproducts.—At the request of Frank G. Ashbrook, eight livers of seals from the killing fields were preserved by freezing and were forwarded to the technology laboratory of the Division of Commercial Fisheries, in Seattle. The livers were tested for oil and Vitamin A content by Dave Miyauchi, under the direction of Bruce Sanford, and reported on September 12. They showed great variation in oil content, the richest having over 10 times as much oil (on a percentage basis) as the poorest. They showed even greater variation in Vitamin A content, from about 13,000 units per gram of oil to nearly 400,000.

Growth and Measurements.—Specimens of branded seals of known age were carried to the laboratory and measured, as follows:

5-year males; 10 specimens from the killing field. These completed a sample of about 25 which is considered the minimum for study of variation. Pelts were left with the commercial take.

5-year females; 3 specimens killed by rifle fire on Lukanin Rookery; pelts were saved for the National Museum.

6-year males; 1 specimen; pelt saved for the National Museum.

Several newborn pups and mature fetuses, and about 10 bulls found dead, were measured and their skulls preserved. When, and if, opportunity arises to compare the Pribilof-breeding seal with the Asiatic-breeding seal, skulls of bulls will probably serve as the best material for study.

Marking Seals (Tagging, Branding, Dyeing, etc.).—No fur seals were marked in 1946. As an experiment to test the value of ear tags, hitherto unused on pinnipeds, 66 sea-lion pups were tagged at Northeast Point on June

20. Workmen were not available to handle additional pups. From periodic observations of the rookery it was concluded that the best times for tagging in future years would be the first week in June and the first week in July. At both times the pups are more or less helpless, because of their inability to swim, and the adults withdraw from the rookeries at the approach of man, allowing access to the pups. The results of the 1946 ear-tagging experiment will not be evident until 1947.

Observations were made of tagged and branded fur seals of the 1940-1941 series. Relatively few marked males were seen in drives, as they were 5 and 6 years old; well above the average age of hauling-ground animals. Metal tags in service for 5 years showed signs of wear; but some, it is believed, will be good for another 5 years or more.

No tagged yearlings had been seen in 1946 up to the time that the biologist left on August 10. It will be recalled that 973 pups were tagged on Tolstoi Rookery in the fall of 1945.

Three rubber necklaces were found on bachelor seals on the killing fields. One, recovered July 15 from a 45-inch male, was of the same peculiar rolled construction and creamy color as 2 recovered in 1944 and 1 recovered in 1945. It will be recalled that the B. F. Goodrich Company analyzed those rings in 1944 and concluded that they were of foreign manufacture. A second necklace was recovered from a 42-inch male killed August 4. It was similar in construction to the ring just described, but was black rather than light brown.

Each year the seals on which rings of this type are found are slightly larger and, presumably, older. The writer believes it probable that seals

were tagged as pups in 1941 by parties on the Aleutian shore. It is planned to send, through the Director, the rings recovered in 1946 to agents in Japan and Russia who might be able to trace their source.

A third necklace, flat and of black rubber, was recovered July 26 from a 42-inch bachelor. The biologist will attempt to find out whether it is of domestic or foreign manufacture.

Migration; Arrival and Departure.—The haul-out of bachelors in the 1946 sealing season was poor. The kill was only three-fourths of the anticipated value and, at that, was obtained by extending the season until August 8. The 1946 kill was similar to that of 1944, while the latter was considered at the time the poorest season (on a percentage basis) in the era of modern sealing.

Cumulative kill on St. Paul Island to the end of July:

1944	1945	1946
39,846	52,527	43,127

It is perhaps no coincidence that the unusual return of bachelors in 1946 followed a winter which established an all-time record for low temperatures on the Pribilof Islands. No direct relation between temperature and behavior of seals can, however, be established on the basis of data at hand.

In order to visualize the pattern of arrival on land of bachelor seals in past years, the biologist has prepared four graphs (attached herewith). It is his belief that graphical analysis of the sealing statistics should be a regular feature of management research on the fur seal herd. The present graphs have been designed, after much sorting and shifting of ideas, to show the three most important features of the seal harvest:

1. Seals killed; seals of all ages, but 80-90% of them believed to be 3-year-olds. A separate line showing "official" 3-year-olds measuring 41-45 inches, would, if included, tend to complicate the graph.

2. Seals rejected; seals older and younger than 3 appearing on the hauling grounds; also females, unimportant until late summer.

3. Seals driven; including nearly all seals appearing on the hauling grounds. Those omitted are the ones which drop out of line as they are driven from the beach.

The data are plotted by five-day intervals starting with June 18. The management has wisely adopted the practice of starting the regular killing season each year on June 18, and of killing on the same rookeries on the same calendar date (up to the last day or two, when the routine is disarranged). While the kill from day to day varies widely, the average of a five-day round is quite uniform.

Data from St. Paul Island, rather than from the Pribilof group, are used. To combine the St. Paul and the St. George data would probably obscure certain biological facts.

A supplementary set of graphs might be prepared showing the hauling-out pattern as percentage of total kill (or total anticipated kill) instead of as absolute values. Such graphs would, for example, enable the reader to compare the pattern of the 1935 season with that of the 1945 season by directly superimposing the appropriate graph.

The appended graphs show certain characteristics of the hauling-out rhythm of the bachelor seals, as follows:

1. Fluctuation in the magnitude and pattern of the variates, even from one year to the next, is considerable. Thus, only 12,000 seals were driven i

the peak round of 1944, while 20,000 were driven a year later. Again, the line representing seals driven in 1935-40 bears little resemblance to the corresponding line for 1946.

2. The arrival of each age class from 2-4 is usually revealed by a "bump" on the appropriate curve. For example, during 1935-40 the mean height of the 3-year-old season is revealed as about July 10, and the height of the 2-year-old season about July 25. The height of the 4-year-old season, on or about June 30, is shown best in the 1946 chart.

3. The count of early season rejects in one year is an indication of the escapement of 3's in the previous year. In 1944, the season was late and relatively few 3-year-olds were taken. The graph for 1945 shows an unusual abundance of rejects in the early part of the season.

4. In a season having a late 3-year-old peak, there is a tendency for the spread between the peaks of the age classes to increase. A late season seems to affect the young males differentially, according to the age and, presumably, the importance of the sex drive in members of each class. For example, in a normal season let us say that the peaks of the 4, 3, and 2-year-old classes are, respectively, June 30, July 10, and July 25. In a late (and cold?) season these might shift, disproportionately, to July 5, July 20, and August 10. Conclusive evidence on this point is not expected until the statistics from 5-10 years of regular, peacetime, sealing operations shall have accumulated.

Migration Away from Pribilofs.—Large numbers of fur seals were seen at sea from the deck of the "Brown Bear" on June 10, 1946. The ship was travelling west over Portlock Bank in about 130 fathoms of water, 50 miles

E.S.E. of Marmot Island, Kodiak group. In 35 minutes between 4:40 and 5:15 p.m. the biologist counted 80 seals as the ship moved along at a speed of 10 knots. The seals were grouped as follows:

Number in group....	1	2	3	4	5	6	7	8
Frequency.....	23	25	18	11	1	0	1	1

At 6 p.m., not a seal was in sight, although a great many shear-waters and 1 whale were seen, presumably feeding on the riches of the Bank.

Was the unusual concentration of fur seals here a result of the extremely cold winter of 1945-46?

Mortality (Parasites, Diseases, Abnormalities, etc.).—Three cryptorchid seals were killed and studied. Two of them weighed, respectively, 329 and 222 pounds, while the third was judged to weigh less than 100. Cryptorchid seals examined over the past 5 years have shown considerable variation in pelage and body proportions. Each, however, has displayed a long, ungainly body, large flippers, and insignificant mane.

About a dozen vials of nasal mites (*Halarachne*) were saved for Dr. Irwin M. Newell, who has in press a report on his study of mites collected on St. Paul Island in 1945. Dr. Newell conferred with the writer in Seattle on September 4 as the former was enroute from Woods Hole, Massachusetts, to Eugene, Oregon.

Hookworms (*Uncinaria lucasi*) killed relatively few pups this season. Where several hundred dead pups were counted at Northeast Point in July 1944 and again in July 1945, only a few dozen were seen in 1946. Did the severe weather of 1945-1946 kill hookworm eggs or larvae wintering in the sand?

The condition known as "mange", which the biologist is inclined to consider a physiological condition rather than a pathological one, was nearly

absent from both cows and pups in 1946. During the annual bull count, E. C. Johnston was impressed with the small number of mangy animals. Is mange common in dry summers and rare in cold, wet summers like the one of 1946? Future observations on this should be recorded.

On July 16, E. C. Johnston collected a seal pup suffering from an interesting disease. The pup was about 1 week old and was alive but helpless when it was recovered. The body was puffed up like a balloon. Autopsy revealed that the subcutaneous fat, muscles, and most of the organs were frothy with gas bubbles. The flippers felt as though they were filled with sponge rubber, and gave off a crackling noise when they were pressed. Tissue sections and a blood smear were preserved by Dr. Prefontaine.

Seven bottles of fur seal tapeworms were sent on September 14 to Dr. R. A. Wardle of the Unive sity of Manitoba. Dr. Wardle had asked for study material in connection with a mongraph in preparation on cestodes. The species of tapeworm commonly seen in the fur seal has not been identified.

Three bottles of roundworms were sent for identification on September 17 to Dr. H. A. Baylis, British Museum.

Samples of diseased and normal fur seal spleens were sent on September 25 to the Balboa Park Zoo, San Diego.

Oceanography and Weather.—Efforts were continued toward the installation of a self-registering seawater thermometer on St. Paul Island. The seawater temperatures during the summer months will be studied in relation to the movements of seals. Mr. Glen Jefferson, direction of the Weather Bureau for the Alaska region, visited St. Paul by plane on July 13 and saw the proposed location of the thermometer on East Landing. He requested

photographs and measurements of the site, tide and storm data. The biologist took photographs of the landing and will forward them to Mr. Jefferson in the near future, but has been unable to locate any photographs showing storm, snow, and ice conditions during the winter of 1945-1946.

Pelage.—An important objective of the 1946 season of research was to start a study of the 4-year male pelt. (The killable class has traditionally included only 3-year-olds, or, rather, seals measuring 41-45 inches in length.) It has been the biologist's conviction for the past two years that a new policy should be established, on an experimental basis, of killing 10-20 thousand 4-year-olds while they are available in the early weeks of the killing season, in addition to 3-year-olds throughout the season. The important reasons for so doing would be, first, to control the present excessive fluctuation in the annual take of sealskins and, second, to shorten the season, especially at the August end when killing operations are not only arduous and inefficient but are harmful to the breeding stock.

The killing of both age classes has not yet been attempted (excepting in the 1943 season when an effort was made to compensate for no kill at all in 1942). One of the reasons has been lack of information on the 4-year pelt. Thus, to what extent would labor and material costs be increased in the curing and processing of 4-year-olds as compared with 3's? What recepti would 10-20 thousand of the larger skins have in the fur market?

A second reason why the Service has been cautious about killing into the larger age-class is that the taking of 4-year-olds might conceivably shift, in a dangerous direction, the complex equilibrium that exists among

the males and the females of various ages on the breeding grounds. In the opinion of the writer, however, the difference between the behavior of the 3's and the 4's is so slight that members of one class might as readily be taken as those of the other, as far as effect on the breeding reserve is concerned.

A conference should be arranged in the near future between officials of the Service and the Fur Company to discuss the advisability of killing into the 4-year class. It would be understood that such a policy would be on a trial basis for perhaps 5 years, in order thoroughly to explore the effects of 4-year killing on both the seal herd and upon the fur market. At any time, and for sufficient reason, the policy would be abandoned.

Assuming, for the moment, that an agreement between the Government and the Company to an experimental kill, or series of kills, has been effected, the questions arise:

1. How many larger skins can be released at a profit on a fur market conditioned to handle mostly 3-year-olds?

2. Seals of <u>what range in length</u> shall be selected on the killing field in order to conform in size with the factory grades decided upon as acceptable to the fur market?

It can be assumed that the Fur Company, with a background of experience in such matters, can predict fairly well what will be the effect of so-many thousands of "large" and "extra large" grades upon the market. There are not available, however, the data necessary to translate factory sizes or grades into field measurements (length from snout to base of tail). With this lack in mind, the biologist carried out certain preliminary field work which

will lead to a correlation between field lengths and factory sizes. An outline of the work accomplished and the work proposed is given below.

Between June 18 and July 20, 1946, 523 seal skins were sampled and individually marked with numbers corresponding to their field lengths in inches. An effort was made to keep the sample representative of the driven seals. Thus, in early season when large seals are normally dominant more 4-year-olds were collected than 3's. Again, in mid-season when both 3's and 4's are more abundant than in either of the end quarters, more 3's and 4's were collected. (See Table 1)

TABLE 1 COMMERCIAL-EXPERIMENTAL SKINS, 1946: NUMBER OF SEALS SAMPLED IN EACH INCH-CLASS

	"Three-year-olds", length in inches					"Four-year-olds", length in inches						
	41	42	43	44	45	46	47	48	49	50	51	Total
First quarter, June 18–June 24	6	6	5	5	5	19	15	17	17	16 (1) 17	(2) 16	118
Second quarter, June 28–July 2	11	11	12	10	11	21	21	24	16	6	3	146
Third quarter, July 10–July 12	22	19	22	16	20	16	15	12	1	2	2	147
Fourth quarter, July 18–July 20	17	19	14	21	16	7	6	6	5	0	1	112
Season total	56	55	53	52	52	63	57	59	39	24 25	13 12	523

At the start of the season it was planned to sample all six of the inch-classes in the 4-year group, but after a little deliberation on the killing grounds it was realized that an adequate sample of the larger classes: 49, 50, and 51 inches, would be obtained only with effort exceeding the value of the results. Furthermore, it is certain that seals longer than 48 inches will never intentionally be killed for the fur market. While 76 seals in the larger classes were sampled, the data from these should not be considered on a par with the data obtained from the smaller inch-classes.

The biologist went to the killing field prepared with a stack of white cards measuring 4x5 inches, each marked in waterproof pencil with a code designation, for example "45 R 4". When a 45-inch seal (for example) was announced by the caliper man, the biologist placed a card in its mouth. About 5 minutes later, when the strippers reached the seal, the skin and

the card were placed together at one edge of the field. At the conclusion of the morning's kill, a loop of strong cotton line (diameter 1/8 inch, halibut size) was fastened through the armhole of each skin. The line was about 2 feet long before it was tied, making a generous loop that did not interfere with the operation of blubbering on the following day. By a series of knots numbering 0-5 in the line and by use of the right and left armhole, the inch classes from 43 to 51 were designated. The sampled skins were placed with the catch for the morning and were not segregated until they passed through the wringer on the following day.

At this stage, the biologist re-translated the knotted lines into inch measurements and marked a large "45" (for example) with indelible pencil on the freshly blubbered side of the skin. Where a loop had accidentally been cut and re-tied by the blubberer, the biologist removed the loop and placed the skin with the commercial kill. Perhaps 1 out of 25 skins were thus discarded. The sample skins were then salted along with the commercial kill, but were barreled separately. Seven barrels were filled (Table 2).

TABLE 2 COMMERCIAL-EXPERIMENTAL SKINS, 1946: BARRELING RECORD

Quarter in which skins were sampled (see Table 1)	Date barreled, July	Identifying letter on barrel and number of skins in each barrel*						
		A	B	C	D	E	F	G
	3	60						
First	5	20						
	5		38					
	9		42					
	9			9				
Second	10			59				
	12			12				
	12				2			
	14				22			
	21				56			
	21					32		
Third	22					35		
	23					13		
	23						11	
	29						47	
Fourth	30						22	
	30							36
	31							7

*Each barrel with the exception of G contained 80 sample skins. G contained 43 sample skins and 37 unmarked commercial skins; the latter added to fill the barrel.

In sampling the 1946 kill, the biologist recorded field lengths as they were called by the caliper man, although a seal was occasionally observed as it lay in a twisted position on rough ground, when its length was obviously greater than the value announced by the caliper man as he moved quickly along the row. In order to collect a sample representative of actual sealing methods, each skin was marked with its "official" length, not with a length arrived at by a special measuring method which the biologist might have employed had he chosen.

It goes without saying that the terms "3-year-old" and "4-year-old" as used in this discussion represent seals of estimated ages. Branded animals of known age were not included because, having a brand scar, their skins are considered by the fur trade as abnormal.

During the sampling operations, especially those carried out on the killing field, it was found very difficult to avoid errors. When the skins ultimately reach the grading room, it is possible that certain inconsistencies will be detected. Provision was made, by sampling 52-63 skins in each inch-class, for the elimination of all but 50 of the best samples at the time of the final summation of data.

For the purposes of the present study the 7 barrels of sampled skins should be processed and sold as soon as possible. Ideally, a similar number of unmarked, run-of-the-mill skins from the 1946 catch should also be handled, as a control lot. To assemble a control lot, however, would be difficult, and the data derived therefrom would be little, if any, better than those obtained from a study of factory records from past years.