THE NORTHERN FUR SEAL

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

Circular 169

Breeding grounds of the northern fur seals: Robben Island (Kaihyōtō or Tyuleniy Island) off Sakhalin; the Commander Islands (Bering Island and Medny or Copper Island) at the Soviet end of the Aleutian chain; and the Pribilof Islands — St. Paul Island, St. George Island, Otter Island, Walrus Island, and Sea Lion Rock.

UNITED STATES DEPARTMENT OF THE INTERIOR
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by

Ralph C. Baker, Ford Wilke
and C. Howard Baltzo

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Created in 1849, the Department of the Interior — America's Department of Natural Resources — is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

As the Nation's principal conservation agency, the Department works to assure that nonrenewable resources are developed and used wisely, that park and recreational resources are conserved for the future, and that renewable resources make their full contribution to the progress, prosperity, and security of the United States — now and in the future.

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Early History of Fur Sealing

Over 220 years ago Georg Wilhelm Steller drew up the first scientific description of the fur seal when he survived the wreck of the vessel commanded by Vitus Bering off what is now called Bering Island in the Commander Islands.

Forty-two years later Gerassim Pribilof, navigator in the service of Imperial Russia, joined the search for other breeding grounds of the North Pacific fur seals. Each spring the seals were seen to swim northward through the passes of the Aleutian Islands and disappear into the fog and mist of Bering Sea. In 1786, 3 years after his search began, Pribilof came upon the islands that now bear his name and found fur seals along the beaches in seemingly uncountable numbers. Almost immediately the teeming rookeries began to yield sealskins for the fur markets of the world, at about the time the 13 colonies on the Atlantic coast of North America were forming a new nation.

Two years before the discovery of the Pribilof Islands, adventurous skippers from New England and Europe had discovered commercial possibilities in the great herds of fur seals in the South Sea Islands. The first experimental cargo of 13,000 pelts from the Southern Hemisphere appears to have been taken at the Falkland Islands in 1784 by the crew of the American vessel *States* from Boston.

In the 50 years that followed, the fur seal rookeries on Mas-a-Fuero, Juan Fernandez, the South Shetlands, Prince Edward, the Antipodes, and countless other islands were destroyed as fast as they were discovered. Literally millions of pelts were taken to the Canton market to trade for tea, silks, and other products of China. The huge populations of fur seals south of the equator were rapidly decimated. Some herds survived, however, and are still found off the coasts of South Africa, South America, Australia, New Zealand, the Galapagos Islands, and some of the subantarctic islands.

The exploitation of the Alaska herd at first followed the same destructive pattern as that pursued by sealers in the southern seas. Twice during the Russian administration the herd on the Pribilof Islands was threatened by annihilation: first, through failure to restrict the numbers of seals killed, and later by failure to adequately protect the females. The killing of females finally was forbidden by Russia after 1834, and the herd began to increase. The Russians are said to have taken more than 2½ million pelts between the time of the discovery of the islands and the sale of Alaska to the United States in 1867.

Immediately after the purchase of Alaska by the United States, a number of independent companies began sealing operations on the Pribilof

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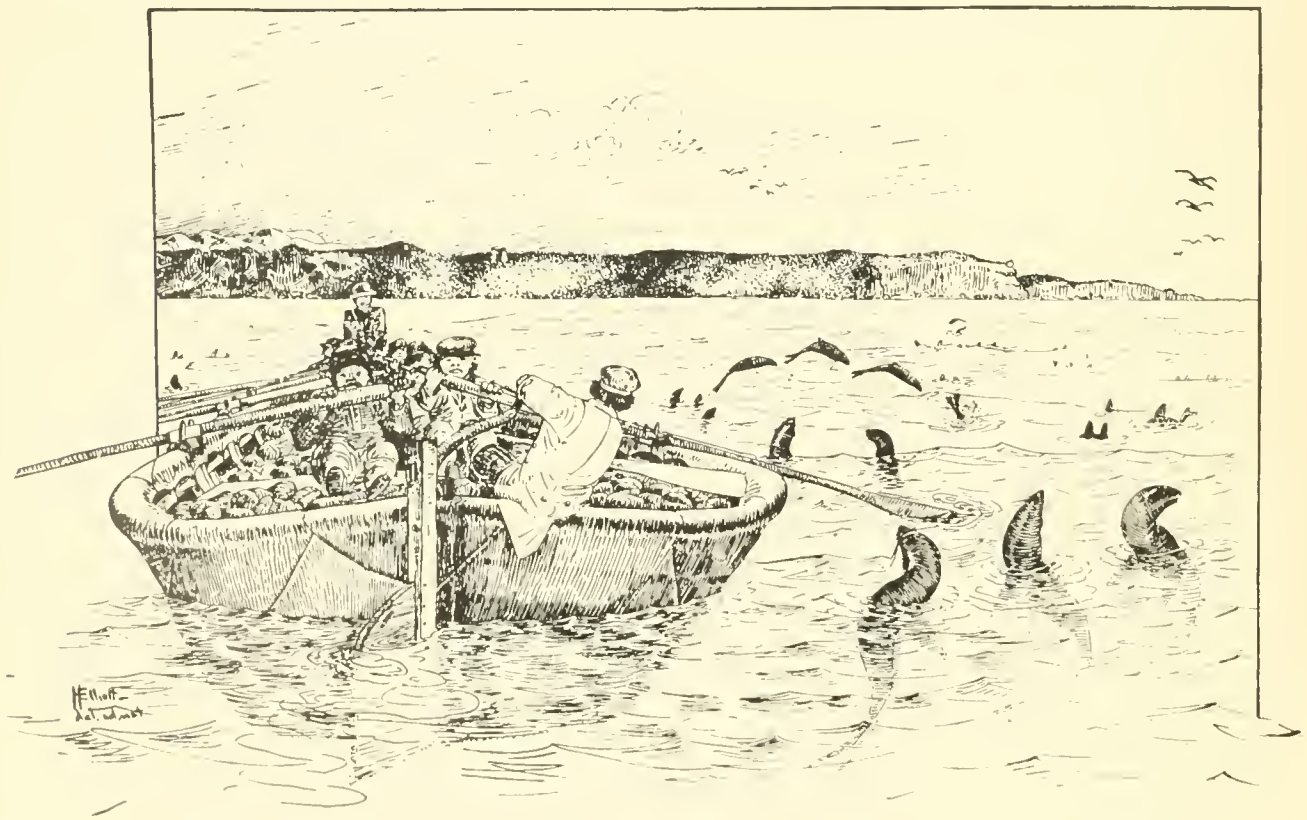
Islands, taking about 300,000 skins the first season. An Act of Congress on 27 July 1868 prohibited the killing of fur seals, and on 3 March 1869 the islands were set aside by the U.S. Government as a special reservation for the protection of the animals. A year later the U.S. Treasury Department was authorized to lease exclusive rights to take seals on the islands, with the stipulation that no females were to be taken. Further legislation in 1874 authorized the Secretary of the Treasury to establish catch quotas and open seasons for the lessee.

Under the first 20-year lease, beginning in 1870, the Alaska Commercial Company took 1,977,377 sealskins. A second 20-year lease, to the North American Commercial Company, produced only 342,651 sealskins for the period ending in 1909. The leasing system was discontinued in 1910, and since then the Alaska fur seal herd has been under the management of the Federal Government, first by the Secretary of Commerce through the former Bureau of Fisheries and now by the Secretary of the Interior through the Bureau of Commercial Fisheries of the U.S. Fish and Wildlife Service.

Fur seals are vulnerable to capture while at sea as well as on land. Pelagic sealing, or taking of fur seals at sea, began to develop on a commercial scale about 1879. As practiced extensively by American, Canadian, and Japanese sealers in the North Pacific, pelagic sealing resulted in the indiscriminate killing of the seals, without regard to age or sex. The pelagic take of sealskins reached a peak of 61,838 in 1894.

"Fur seals sporting around the baidar — Natives of St. Paul lightering off the bundled sealskins to the ship from the Village Cove." A sketch by Henry W. Elliott, who visited the Pribilofs for the Treasury Department and the Smithsonian Institution in 1872, shortly after purchase of the islands from Russia. The baidar, or bidarrah, was made of sea lion skins, canvas-covered bidarrahs are still used in ship-to-shore ferrying.



Almost a million skins were taken on the high seas from 1879 to 1909, and many of the seals shot or speared in the open sea were not recovered. Because females comprised 60 to 80 percent of the pelagic catch, the effect on the Alaska herd was disastrous. In 1912, when the first complete census was taken, 215,900 seals were counted or estimated. Although scientists believe this estimate was too low, a severe reduction in the Pribilof herd had undoubtedly taken place, and the two smaller herds off the Asian coast were faced with extinction.

After extended diplomatic negotiations and a long series of ineffectual bilateral agreements, the United States, Great Britain, Japan, and Russia concluded a Convention on 7 July 1911, for the protection of the fur seals of the North Pacific. Pelagic sealing was prohibited except by aborigines using primitive weapons. Each country owning fur seal rookeries agreed to share 30 percent of its annual take of sealskins—Canada and Japan each to receive 15 percent of the sealskins from the Pribilof Islands and 15 percent of those from the Commander Islands; and Canada, Russia, and the United States each to receive 10 percent of the pelts from Robben Island.

The Convention of 1911 provided for the first time a sound basis for the management of the North Pacific fur seals. It remained in force for 30 years, until terminated by Japan on 23 October 1941. From 1942 to 1957 the Pribilof herd was protected by a provisional agreement between Canada and the United States, which reserved to Canada 20 percent of the skins taken each summer on the Pribilof Islands.

On 9 February 1957, a new interim North Pacific Fur Seal Convention was concluded by Canada, Japan, the Union of Soviet Socialist Republics, and the United States, similar in form to the 1911 Convention. The present Convention provides in principle that Canada and Japan each shall receive 15 percent of the sealskins taken commercially by the United States and by the U.S.S.R.

Under international protection and a rational management program, the Alaska fur seal herd has increased from the low point of about 216,000 animals in 1912 to its present level of over 1½ million animals. From 1940 to 1962 the herd has sustained an average yield of 62,300 male sealskins. Since 1956, the annual kill of female seals has averaged 32,300.

Distribution and Movements of Seals

The northern fur seal, an abundant and widely ranging mammal, is seldom observed alive except by fishermen and seamen working offshore or by visitors to the Alaskan and Asian islands where the seals breed. Every winter beachcombers find fur seal carcasses, mostly pups of the previous summer, on beaches from the Alaska Peninsula south to northern Oregon. Few young seals migrate south of Oregon in winter.

Originally the fur seals that breed on the Pribilof Islands, on the Commander Islands, and on Robben Island and some of the Kurile Islands[1] were described as three separate species because of supposed differences in color and in shape of head and neck. They have since been found to be indistinguishable by physical appearance and measurements; their wintering grounds overlap; and tagged seals, especially young males, are regularly found in small numbers on rookery islands other than where born. Therefore, the fur seals of the North Pacific are now considered to belong to a single species, *Callorhinus ursinus*.

[1] Pribilof Islands are U. S. territory; Commander, Robben, and Kurile Islands are under the administration of the U.S.S.R.

In late June this 9-year-old bull fur seal is approaching the age when he will compete actively for territory on a rookery. Probably the territory he seeks will be near the spot where he was born.

Except as stragglers, few fur seals range north of the Pribilof Islands. They migrate south to the Channel Islands off Santa Barbara, Calif. In the west they range from the vicinity of the Commander Islands to the seas southwest of Kinkazan Peninsula on northern Honshu and into the Sea of Japan.

Fur seals breed on the following islands: St. Paul and St. George Islands and Sea Lion Rock of the Pribilof group in Alaska; Copper and Bering Islands of the Commander group off Kamchatka; Robben Island, off Sakhalin; Kotikovaya Rock and Srednevoya Island in the Kurile Chain of Islands. Seals were also reported by the Soviet Institute of Oceanology to be on the Kurile Islands, Paramushir and Urup, but no pups were seen. Fur seals of the Kurile Islands were thought to be exterminated by sealers in the 1890's; however, in 1955 and 1956, investigations revealed their presence once again, in small numbers. About 80 percent of the northern fur seals are from the Pribilof Islands.

From preliminary research on the intermixing of seals from American and Asian islands, scientists believe that a third or more of the seals found off the coast of Japan in winter and spring come from the Pribilof Islands. The proportion of the eastern Pacific seals that originated on Asian islands has not yet been estimated. Only 1 Soviet-tagged seal was taken on the Pribilof Islands before 1960, but 8 were found in 1961 and 21 in 1962. More may be expected from the enlarged tagging program begun on Soviet islands in 1958.

Unless sick or injured, fur seals rarely land from the time they leave their rookery islands in the fall until they return the following spring, summer, or fall. The one known exception is Samalga Island near the west end of Umnak Island where seals, apparently males, have been observed hauled out on a reef. A living pup was born on the Washington coast in early July 1959. Such an occurrence is extremely rare. During some winters, adult females enter West Crawfish Inlet near Sitka, Alaska, to feed on herring to within one-half mile of shore.

Seals are usually seen 10 to 90 miles offshore and are frequently most abundant between 30 and 70 miles. Most people living along coastal areas of the western United States, particularly California, are unaware that many thousands of fur seals feed and rest for several winter months on the nearby ocean.

The top speed of fur seals in water is not accurately known. For short distances they can keep ahead of a ship moving at 10 to 15 miles per hour. They can be overtaken if chased persistently by a ship with a speed of only 9 miles per hour.

On the ocean surface the seals are often seen asleep, floating on their side or back, with all four flippers folded or with one or more idly stretched into the air. On the island rookeries, activity continues unabated day and night.

In the open ocean seals may occur singly or in small groups. Food will often attract concentrations of from 6 to 20 seals. Several such groups may be in view at one time. A loose grouping of up to 100 has been observed. The density of seals on wintering grounds is extremely variable, ranging from none to over 70 per square mile.

A wide range of surface water temperatures is found where seals occur, ranging from 30° up to 59° F. They are found in greatest abundance in waters with surface temperature of from 47° to 54° F. What seems to be a preference for water of certain temperature may actually be a response to available food.

Bull seals winter principally in Alaska waters. They have been seen most frequently in the Gulf of Alaska. They begin landing at their breeding rookeries on the Pribilof Islands in late April and appear in increasing numbers until the middle of June.

The oldest bulls arrive first, and others follow in order of age. The oldest and earliest females appear in June. Occasional yearlings have appeared ashore as early as August, but most of them land in October and early November and may remain only 2 or 3 weeks before going to sea again. More male than female yearlings come ashore. Only a small proportion of the yearlings come ashore at all.

During autumn, most of the animals ashore appear to prefer areas farther up from the beaches than during the summer. The main exodus of seals from their breeding grounds takes place during November even while some yearlings may be still arriving.

Three- and four-year-old males, which make up the bulk of the commercial kill, arrive in late June, July, and early August. The midpoint for 4-year-old male arrivals is 13-18 July and for 3-year-old arrivals 20-28 July. The midpoint for 4-year-old female arrivals is more than a month later. Three-year-old females arrive still later, and 2-year-old females are found mixed with yearling males in October and early November.

Summer on a typical fur seal rookery — Kitovi Rookery on St. Paul Island. Characteristically, the fur seals return each summer to the rookeries where they were born. In May and June come the harem bulls or beachmasters, later the females.

13 JUNE. — By mid-June most of the harem bulls have established stations and await the arrival of the females.

28 JUNE. — By late June, the first females arrive, and harems begin to form.

The pups are born soon after the females come ashore. The pups grow stronger, they wander over the rookery and eventually gather in groups or pods, while their mothers spend much time at sea searching for food.

3 AUGUST. — In late July or early August the harems begin to break up.

8 JULY. — In early July the harem groups remain closely knit.

Food

Fur seals feed particularly on small, schooling fish such as anchovy, capelin, and herring but will feed on whatever species are available. Squid is a mainstay of their diet almost everywhere. Anchovy, hake, squid, saury, and rockfish are principal food items off California and Oregon. Off Washington, herring, rockfish, and anchovy are leading foods. Herring and walleye pollock are important food items off Southeastern Alaska. Capelin and sand lance are part of the seals' diet in the Gulf of Alaska, the Aleutian Island passes, and the Bering Sea. Salmon occurred in 28 of the 1,829 stomachs containing food, collected in 1958 and 1959, in the northeast Pacific. Twelve of the 28 salmon-containing stomachs were from seals taken in Alaska. Forty-eight species of fish and 8 species of squid were found in seal stomachs collected off North America from 1958 to 1961. In the same period 24 species of fish and 9 species of squid were identified from seals in the western Pacific where lantern fishes are a very important food.

At sea, seals feed primarily at night because some of the important food species rise to the upper water layers during darkness. Where food is available during the day, seals feed then also.

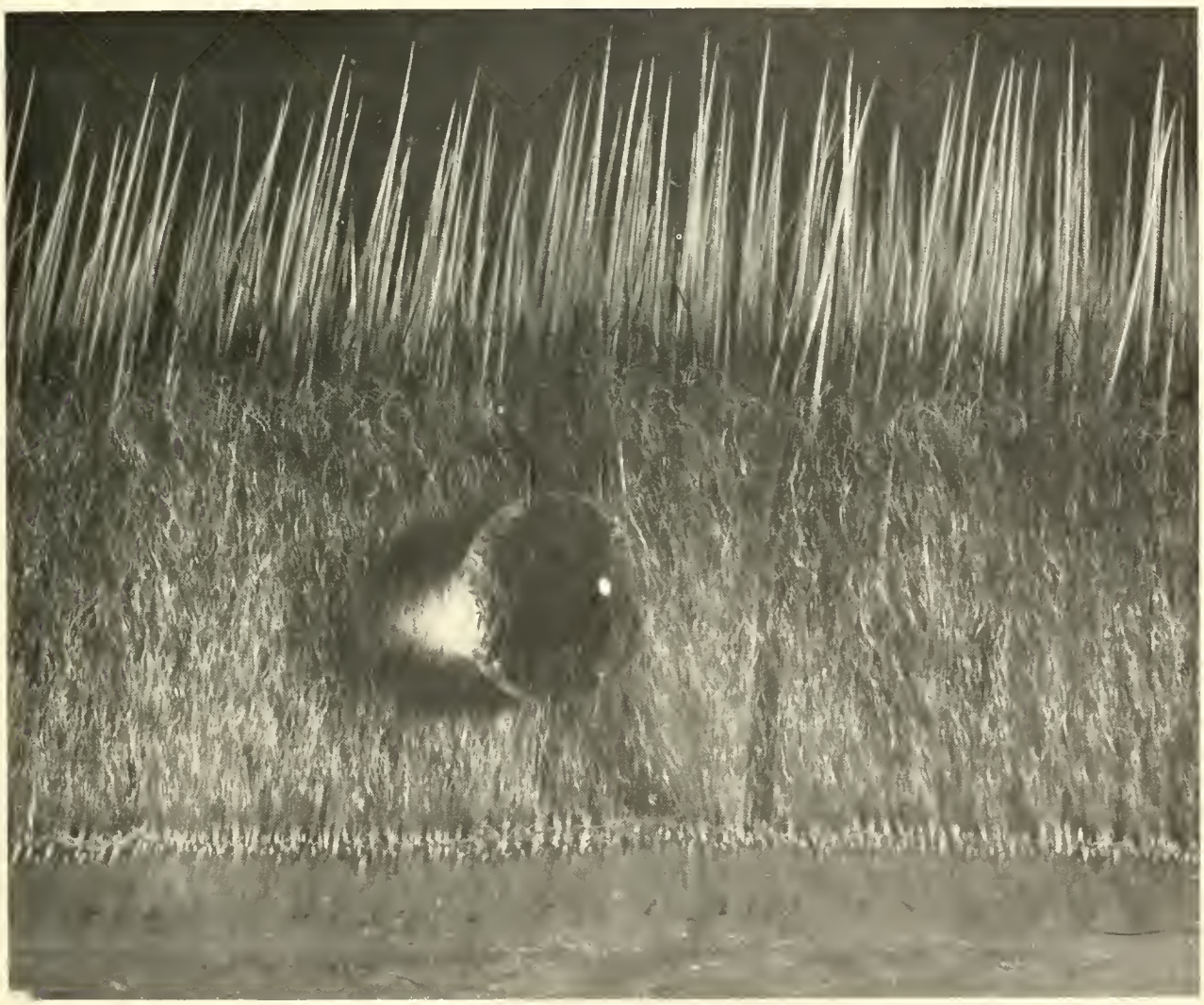
Physical Characteristics

Compared with other seals and sea lions, the fur seal has unusually large flippers. The large flipper area is useful for cooling, especially on land, since dense fur effectively insulates other parts of the body. The fur, which contains over 300,000 hairs per square inch, is so impermeable to water that the skin remains dry even when the seal rubs or scratches itself in the water. Molt is incomplete because part of the hairs remain fixed in the skin more than one year. Body temperature is about 100° F. Overheating from unusual exertion or sunshine when on land causes obvious discomfort. Body temperatures above 107° F. result in heat prostration and usually death.

The eyes are relatively large and capable of gathering enough light for night activity. The nostrils can be closed and the external ears are small, tightly rolled cylinders with a narrow, waxy orifice that prevents the entrance of water. A fish or squid held by the 36 teeth has no chance of escape. The lower incisors fit into a notch in the upper incisors and the upper molar and premolar teeth interlock with the lower, making a highly efficient bite.

The question "How much does a fur seal weigh?" has many answers. A 10-to 12-pound pup eventually becomes either a mature female weighing 95 to 110 pounds or a bull weighing from 400 to over 600 pounds. Three-year-old males as selected for the commercial kill average 62 pounds, and 4-year-old males 78 pounds. The size difference between male and female is apparent even before birth. In early May unborn males are about an inch longer and ½ pound heavier than females. At birth an average male is 26 inches long and a female an inch shorter. A large adult female measures 56 inches from the tip of its nose to tip of tail and a bull 84 inches.

While at sea the females and young males are gray in color. After a few days ashore they turn yellow-brown from staining by the mud and excrement on the rookeries. Although cleaned somewhat during trips to sea, unstained pelage is not restored until molt occurs. Pups are black when born but assume a gray pelage in September. Males over 6 years old are predominantly brownish-black, but they vary greatly and may also be dark gray and reddish brown. An adult male develops a short bushy mane on his shoulders and neck.



The pelage of fur seals effectively prevents the animals from becoming wet. The photograph demonstrates the water repellent nature of the underfur in a section freshly cut from a yearling seal. Magnification is 4 times.

Reproduction

Motivated by a strong homing instinct, bulls usually return to the rookery of their birth to establish a territory which they will defend, whether or not they are joined by females. A female seal or group of seals occupying a territory is called a harem. Harems vary in size from 1 to over 100 females; the average is about 40. Location determines the size of a bull's territory and his harem and the rapidity with which he will acquire females. Generally, locations near the water attract the most females but there are many exceptions. Locations that appear almost identical to the human eye either may be crowded with seals or completely unused. Females seek a location rather than a specific male. The most vigorous efforts of a bull are not sufficient to retain a female that is determined to leave.

On the Pribilof Islands in 1962, 12,674 harem bulls were counted in addition to 11,759 bulls without harems.

Age determinations have been made for seals up to 26 years of age. Tagged seals 21 years old were recovered in 1962. The maximum life span is believed to be about 30 years. Most fur seals have their first pups when 4 to 6 years of age. Few bear young after age 18 or 19. Some 70 percent of the adult females in the Pribilof herd in any one year bear young.

A large proportion of the fur seal pups are born during the first three weeks of July. Females give birth to one pup usually a day after first coming ashore on the rookery. Five days later they are impregnated, usually in a single mating, and sometime in the following week make a trip to sea to feed. Feeding excursions may last 5 to 14 days, but average 8 days. Females nurse only their own offspring, which they recognize by a combination of location, sound, and smell. The pup must obtain enough of the rich milk, containing about 45 percent fat, to survive between the widely spaced feedings. During the nursing period the pup's stomach occupies most of the body cavity. A well-fed pup in September resembles a football with flippers! No food other than milk is taken by the pup before it leaves the island in the fall at weaned age of 3 or 4 months. By the time the young are ready to leave the rookery in November, the larger ones weigh over 30 pounds. Nursing ends abruptly when the female leaves the islands to migrate southward. The pups must then begin finding their own food in the form of fish and squids. After several months at sea they may not have gained or may even have lost weight, but their contours are more nearly those of an adult.

A much-repeated fallacy is that young fur seals are taught to swim. The pups can swim from the moment of their birth, and none ever receives lessons from its mother. At first they swim rather awkwardly with head high out of the water but soon gain in skill and endurance.

During the first day or two after birth of her pup the female will attempt to protect it and will sometimes carry it in her mouth. Thereafter, the female flees from an intruder without making any attempt to protect her pup. A pup that falls into a crevice in rocks dies because the mother will not retrieve it.

Fur seal pups sleeping on the sand near Tolstoi Rookery, St. Paul Island, in late July. These pups, which are less than a month old, are resting during one of the 5- to 14-day intervals between nursings.

Mortality and Disease

When the Pribilof herd was small, about 2 percent of the pups died on land; now from 10 to 15 percent are dead before the autumn migration. In each of recent years, from 40,000 to over 100,000 have died on the Pribilof Islands. More than half perish from the effects of hookworm infection. Starvation, physical injuries, congenital defects, and bacterial infections also kill many. No epizootic diseases have been identified, although the sudden death of several hundred seals on the Commander Islands in 1958 and off St. George Island in 1962 places suspicion on a disease or food toxin.

Hookworms occur in the tissues of seals of all ages. The parasites are apparently able to penetrate the skin, at least on bare surfaces such as the flippers. Pups are infected through nursing, and the parasite attaches principally to the small intestine. Bloodsucking by the worm causes severe anemia. By fall, the intestinal infection disappears, but hookworms are retained in the blubber, mammary tissue, and perhaps other tissues. There is no evidence that adult worms from the intestines move into the blubber. Larval worms that penetrate the skin hatch from eggs passing from the intestine of pups. Reasons

for variation in mortality on land from year to year are not clear, but possibly variation is related to the effect of weather on the number and infectivity of hookworm larvae. High mortality of pups on land is correlated with low survival to age 3 even though mortality on land may be only 20 percent of the total loss. This suggests that pups surviving a severe hookworm attack are left in a weakened condition and are unable to withstand the rigors of ocean life.

Little is known about the causes of death at sea. The killer whale and great white shark are known predators of seals. Parasites probably also kill seals. Evidence in the form of emaciated young seals that drift ashore in winter suggests that inadequate food and violent weather are the greatest hazards during the first year at sea. At this time the pups make a sudden transition from nursing to finding their own food in the cold, stormy, winter ocean. Many perish. As high as 85 percent of some year classes may be lost by the time they are 3 years old.

Each year a few brown, yellow, almost white, or piebald seal pups are born. Light colored adults are occasionally seen but true albinos rarely survive.

Population

When the Convention of 1911 first gave international protection to fur seals, the Pribilof herd numbered about 200,000 and could be counted with reasonable success. After 1924, only bulls were counted because crowding and constant interchange of animals on the rookeries made a meaningful count impossible. Until 1948, the size of the herd was estimated annually on the basis of calculated geometric rates of increase established just after the turn of the century. The calculated and actual increase corresponded well until the mid-1930's, but by 1947 the method was discontinued because there was then no basis for calculating the increase rate, with useful accuracy, for a population that was near the peak of the growth potential. The estimate of the number of pups born in 1957 was 770,000. The total Pribilof herd exceeds 1,500,000. The population on all other North Pacific islands (Commanders, Robben, Kuriles) is about 250,000 in late summer. The herds on these islands have rates of increase that are similar to the rate demonstrated by the herd on the Pribilof Islands in the 1920's when it was growing rapidly. Seals on the western Pacific islands have a better survival of pups and higher reproduction rates among young females. The change in growth rate as these herds mature will be followed with interest by students of animal population dynamics.

Satisfactory management requires some measure of changes in various segments of the population. These include number of pups born, survival of year classes, number of bulls, pregnancy rates, and extent of mortality at various ages. Marking of seals for management purposes began in 1912. Since 1947 tagging has been used as a means of estimating the population. Over 500,000 seal pups were tagged between 1947 and 1962. The current rate of tagging is 50,000 per year. By combining (1) information from tag recoveries, (2) age classification of the kill through tooth growth-ring counts, (3) pregnancy rates, and (4) pup mortality counts, annual estimates of the number of pups born are statistically calculated.

Management

Fur seal habits are such that a program of wise utilization is readily devised. The success of such a program, however, depends on international cooperation because the seals live much of the time outside territorial waters. In Alaska, fur seals come ashore only on the Pribilof Islands, always about the same date each year. Because seals are highly polygynous and the sexes are born in equal numbers, it is possible to take many males without adversely affecting the productivity of the herd. The young males, whose pelts are most valuable, habitually haul out on the islands apart from the breeding animals in the harems, so that little difficulty is experienced in obtaining them.

Harvesting of the seals is limited for the most part to the 3- and 4-year-old males. In 1918, age-length relationships were established by the U. S. Government from measurements taken of seals of known age, branded as pups in 1912. Until recently this age-length relation has served as the basis for estimating the age of animals to be utilized commercially. The kills are now classified into age categories by counting the annular ridges on a 10-percent sample of canine teeth. Also the range of lengths within ages is more fully understood through extensive recent measurements of tagged seals.

From 1911 to 1917, seals were killed only for

the residents of the Pribilof Islands to use as food. Commercial killing for skins was resumed in 1918 after the 6-year cessation. From 1918 to 1922, harvests of seals were high in relation to population size because of the accumulation of males. The kill declined after these were removed, but thereafter steadily increased until 1940. From 1940 to 1955, it averaged about 66,000 males annually. Since then, male production has varied from a high of 96,000 in 1956 to a low of 30,000 in 1959. Part of the difference between these extremes resulted from an extended season in 1956 which made available a larger proportion of the 3-year-old class, but recent fluctuations are caused primarily by variations in year class survival.

In the management of the fur seal herd, the Federal Government has adhered to a policy of taking pelts from seals considered surplus to breeding requirements. From 1923 to 1932, a minimum yearly breeding reserve of several thousand bachelors was provided by marking them with a brand or by shearing a patch of fur, then permitting them to return to the sea. This precaution may not have been necessary, but it insured that the number of males escaping the kill would be adequate.

From 1932 to 1955, a sufficient breeding stock was assured by limiting the killing season each year to a selected period from about the middle of June to the end of July. Only the male seals 41 to 45 inches long were taken as they appeared in the daily drives on the islands during the sealing season. From one-half to two-thirds of the animals in this group are 3 years old, and most of the remainder are 4 years old; a small number of 2- and 5-year-old males are included. The proportion of 3- and 4-year-old animals taken depends on the relative survival of year classes.

In recent years the sealing season has been adjusted to the number of young males that are available and to some extent to the age and size of seals that are wanted. Early seasons produce a larger proportion of 4-year-old seals and later seasons a larger proportion of 3-year-old seals, since they arrive in order of age. Currently, the season for male seals begins on 2 July and ends on 5 August. Close cropping of 3-year-old seals during a late season leaves relatively few 4-year-old males to be taken early in the following year. Forecasts of year class strength made before the 3-year-old seals appear in the kill are still inaccurate. Therefore, exact advance planning for harvests of a given size is not possible.

The number of males that have been escaping the kill is considered to be more than adequate. As a result, the upper size limit of harvestable male seals has been increased recently. This change permits closer cropping by taking animals that would have been rejected solely because of size under the former limit even though they had skins of good quality. It also compensates for the change in the method of measuring length. Length is now measured from nose to tip of tail rather than from nose to base of tail.

Failure of the harem bulls and the male kill to increase in number after 1940 caused biologists to conclude by 1952 that the herd had reached, or was near, its peak of development. One major factor that precludes further possible growth of the herd is the limited food supply available to the nursing females in the summer and to the pups during their first months at sea in the fall. Estimates of the number of pups born, based on tag recoveries, indicate that production is high but that survival to age 3 is now much more variable than when the herd was smaller and growing rapidly. On the basis of experience with other animal populations and on calculations of the relation of pups born to the return of males at age 3, it is believed that the maximum sustainable yield can be achieved from a fur seal herd that produces about 500,000 pups annually. The adult female component of the herd has been undergoing reduction since 1956 in order to bring it to a level that will produce this optimum number of pups.

This scene on Tolstoi Rookery, St. Paul Island, in late July illustrates the fact that after mid-July a large part of the females that have a pup to nurse are feeding in the sea and therefore many more pups than females are to be seen on the rookeries.

Female seals do not appear on the hauling grounds or the margins of rookeries, where they are available for driving without disturbing seals on the breeding areas, until August. Most females, therefore, are not taken until after the harvest of males is concluded. Females occurring on hauling grounds are principally (1) young animals, (2) those not pregnant during the previous year, or (3) those whose pups have died. Female seals most numerous on hauling grounds in middle and late August are from 3 to 6 years old. Their skins are more valuable than those of older animals because they have fewer scars and do not lose fur on the belly in the course of fur processing.

Females can be roughly separated into three age groups by the color of their whiskers. Dark-whiskered females are rarely over 4 years old, those with mixed dark and white whiskers are 4 to 6 years old, and those with white whiskers are usually 7 years or older. Thus the commercially valuable, young, female seals may be readily selected because of a fortunate combination of location, time, and physical appearance.

Future harvests of fur seals on the Pribilof Islands will continue to be composed of both sexes. Reproducing females range from 4 to over 20 years of age. The abundance of any age group depends upon its success at survival, principally during the first year of life. It is estimated that from 15,000 to 30,000 surplus females should be harvested annually when the herd is reduced to the level of maximum sustained yield. At this stage, females 3 to 6 years old are preferred, both because they furnish the highest quality skins and because they are most easily available. Males only are taken by the U.S.S.R. on Robben Island and the Commander Islands, but females may be taken in the future if the Asian herds regain their optimum size.

As knowledge of population dynamics accumulates, the probability increases of successfully forecasting year class survival and the resulting harvest.

When hauled out on land, fur seals are easily cut off from the sea and driven to nearby fields. Because of their insulating fur, they must be driven slowly and for moderate distances to avoid heat prostration.

Research

On their respective islands the United States and the U.S.S.R. carry on research programs that emphasize population dynamics. Tagging, tag recovery, kill records by age and sex, and studies of mortality and reproduction are all essential to understanding fur seal populations. In addition, research on growth, pelage and other anatomical features, behavior, and parasitism and other infections are underway or completed.

Canada, Japan, the U.S.S.R., and the United States cooperate in a widespread investigation of the ocean life of fur seals. The distribution, ocean abundance, food habits, and intermingling of seals of different origins are studied.

Most of the investigations are of aid to management, certain broad principles of animal populations are being tested, and zoological knowledge of marine mammals is increased.

Sealing Activity on the Pribilof Islands

The harem or rookery areas and adjacent hauling grounds of the bachelors and idle bulls are situated at widely separated points along the southern and eastern beaches of St. Paul Island and along the northern and western shores of St. George Island. Owing, in part at least, to the high bluffs characteristic of St. George Island, only about 20 percent of the herd frequents the limited beach areas of that island.

The greater part of the herd congregates on the low-lying beaches of St. Paul Island, 40 miles to the north. A few thousand fur seals haul out on Sea Lion Rock, off the southern tip of St. Paul Island. For convenience in administration, the hauling grounds are divided into five groups on St. Paul Island and four on St. George Island. On each island during the sealing season the hauling grounds are worked in rotation.

The labor required in the taking of sealskins and the year-round maintenance of two Government stations on the islands is supplied by the native Aleut inhabitants who are employees of the Bureau of Commercial Fisheries. During the summer season the local labor supply is supplemented by Aleut workmen from the Aleutian Islands.

On a typical day in the sealing season, a crew of 20 to 50 Aleut sealers proceeds in trucks from the village to the hauling ground. Leaving their trucks, the sealers cautiously work their way upwind along the beach between the bachelor seals and the water. With the line of escape to the sea cut off, it is an easy matter to surround several hundred to several thousand seals and drive them slowly inland a short distance to the grass-covered killing field. Two or three Aleut boys provide the only guard necessary to prevent a stampede of the animals back to the beach and the open sea.

The sealing crew is well-trained and clubbers are adept at selecting animals of commercial size. The work is efficiently organized and carefully supervised. One small group of seals after another is separated from the main group. Seals judged to be less than 41 inches, or of poor pelage quality are permitted to return to the beach. Animals of the desired size are quickly and humanely dispatched with a single blow on the head from a hardwood pole.

Each sealskin is stripped from the carcass by the Aleut sealers in a matter of seconds. The day's collection of skins is transported by trucks to the village processing plant. Here they are thoroughly soaked in cold sea water, blubbered, and brine-cured. Boric-acid powder is applied to the skin side of each cured and drained pelt to prevent bacterial action, and a small quantity of salt is sprinkled over the skins as they are packed in barrels for shipment to the mainland, where they are held in cold storage until processed.

On St. Paul Island from 1918 to 1961, most of the carcasses and the blubber removed from the skins were converted to meal and oil in a byproducts plant operated by the Government. About 350 tons of meal and 40,000 gallons of oil were produced each season and sold to the highest bidder at Seattle, Wash. The meal was used as a protein supplement in animal feeds, and oil was used in soap making and tanning. On St. George Island the number of carcasses has never been sufficient to justify a reduction operation, but much of the blubber from that island is salted and later cold pressed to extract oil for tanning seal skins. The byproducts plant operation became uneconomical after 1961 and was discontinued. The use of seal meat to feed mink is being tested.

Processing and Sale of Fur Seal Skins

The processing and sale of all Government-owned skins is by a private company serving as agent for the Government. About 100 different operations by highly skilled workmen are involved in converting Pribilof Island sealskins into the beautiful, soft, supple furs sold to the fur trade at semi-annual auctions.

The first major step in the processing of sealskins is the removal of the coarse guard hair that overlies the dense, soft underfur. The pelts are thoroughly washed and subjected to moist heat to loosen the guard hair so it can be extracted by scraping. After the unhairing process, the pelts are tanned and dyed.

U. S. Government sealskins have been dyed four shades of colors: (1) black, (2) a rich dark brown, (3) a neutral brown with overtones of bluish gray, and (4), a midnight gray with highlights of silver and a subtle blue cast. Closely sheared pelts that are not unhaired are being introduced onto the market in increasing volume as a new type of garment fur.

Pelts of northern fur seal have consistently brought the highest prices of all sealskins on the world market. The world human population is increasing rapidly but only moderate increases in the production of seal skins can be expected, a situation that should strengthen the market.

Six to eight sealskins are needed to make a full coat. Pelts remain the property of the U. S. Government until sold at public auction held semi-annually by the contracting processor for the Government.

Nearly 2 million sealskins from surplus males have been taken by the Government since restoration of the herd was begun 45 years ago. The net profit to the Federal Treasury from the United States share of these skins has exceeded $25 million. A portion of the receipts are made available by Congress to the Bureau of Commercial Fisheries to defray expenses of administering the Pribilof Islands and the fur seal industry; 70% of the net proceeds are given to Alaska under terms of its statehood Act.

The future of the Alaska fur seal herd seems assured as long as the nations of the world continue to work together in the solution of problems peculiar to such migratory wildlife populations. An epilogue for the Alaska fur seal story is found in the words of Dr. G.C.L. Bertram, English biologist, following his visit to the Pribilof Islands: "One can give no higher praise than sincerely to hope that planning and agreement for the future may be as beneficent and rational as have been the administration and conservation of the herd during the last forty years."

Skins that have been washed, cleaned of blubber, cured in a saturated salt solution, and drained are rubbed with salt and boric-acid powder, rolled, and tightly packed in barrels for shipment.

The village of St. Poul on the south cape of St. Paul Island is close to severol seol rookeries, including Reef, the largest.

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The Pribilof Islands in Bering Sea are the homeland of the largest fur seal herd in the world. Here the fur seals come ashore to bear their young on the rocks and sands above tidewater. The story behind the restoration and development of the Alaska fur seal herd is one of adventure and international diplomacy. It is a heartening account of cooperation among nations — an outstanding example of wildlife conservation.