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William A. Egan, Governor

DEPARTMENT OF FISH AND GAME
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DIVISION OF GAME
Frank Jones, Director
Donald McKnight, Research Chief

SEA LION PELAGE STUDY

by

John S. Vania

Final Report
Federal Aid in Wildlife Restoration
Projects W-17-3 and W-17-4, Job 8.1R

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FINAL REPORT (RESEARCH)

State: Alaska

Cooperators: John S. Vania

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W-17-4 Investigations

Job No.: 8.1R Job Title: Sea Lion Pelage Study

Period Covered: January 1, 1971 to June 30, 1972

SUMMARY

One hundred and forty-one sea lion pelage specimens were collected from six different sea lion rookeries in Alaska between June 5 and January 29 and were examined for signs of molt. The data indicate the molting period is approximately 20 weeks in duration starting about the last week of July and ending in early December. Harvesting of pups occurs primarily in June and the quality of pelts taken is not affected by molt. Loss of hair from pelts appears to be a result of tissue damage caused by bites from adult sea lions in the rookery.

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BACKGROUND

The Steller sea lion (*Eumetopias jubata*) is a very common resident of Alaska's coast south of Bristol Bay. There are more than 175 known rookeries and hauling grounds in the state (Somerville, et al, 1972). The highest populations exist in the remote areas of the Aleutian Islands and along the Alaska Peninsula. Large populations exist around Kodiak Island and smaller populations are found in Prince William Sound and Southeast Alaska. The total population for the state probably exceeds 180,000 animals (Kenyon and Rice, 1961; Mathisen and Lopp, 1963).

Harvesting of sea lions by man has been at a very low level since the first quarter of the 20th century. A number of animals are killed each year by indiscriminate shooting; a few are taken by fishermen and used for crab or shrimp bait; and from 3,000 to 6,000 pups are annually harvested on selected rookeries for the fur market (Vania, et al, 1969).

The need for quality pelts for the fur industry prompted this investigation of the molt of pup sea lions. After their initial purchase of pup pelts, fur buyers learned that many had patches of hair missing. In most instances these defects did not appear until after the pelt had been through the tanning process. With no information available on the timing of the molt in sea lions, tanning was immediately suspected as the cause of the hair loss. The fur industry also became interested in obtaining prime pelts of pups that had completed their first molt. The present study was initiated to delineate the timing of the first postnatal molt, to determine if observed defects in pup pelts were caused by molting and to determine the periods before and after the molt when pup pelts are prime.

Molt in wild animals has been studied by Bassett and Llewellyn (1948, 1949) in fox and mink, by Scheffer (1962, 1964) in fur seal, by Scheffer and Johnson (1963) in fur seal, and by Stutz (1966, 1967a and 1967b) in harbor seals. Scheffer (1964a) briefly described adult sea lion hair but no studies of molt of the animals have been reported on. Methods for studying hair have been described by Hardy and Plitt (1940), Hausman (1939) and Mathiak (1938).

In this report the molt of sea lion pups is described. Management implications of the findings are discussed.

OBJECTIVES

To describe the structure, growth and replacement of pelage fibers of Steller sea lions with relation to age, sex and seasons.

PROCEDURES

A total of 141 Steller sea lion pups were randomly selected on six rookeries in Alaska and collected for a study of the molting process. Pelage specimens were collected by cutting a strip of skin about 10 cm square from the center of the back between the front shoulders. The skin sample was then fleshed, stretched and tacked on a small board and immersed in a 10 percent formalin solution. After a week or more pieces of skin approximately 2 cm by 8 cm were cut from the center of each square and stored individually in small vials containing formalin. Later each specimen was prepared for examination by cutting thin slices with a razor blade parallel to the lay of the roots. A typical slice was about 1 mm thick and 10 mm wide. At least five such slices were cut from each specimen. The slices were then examined under a low power microscope using isopropyl alcohol or cedarwood oil as a medium for mounting the slides.

FINDINGS

Description of Newborn Pup Sea Lion Hair

The pelage of newborn sea lion pups consists of single shafts of primary hairs, fairly uniformly spaced, with each hair projecting from the surface of the skin through an individual pilary orifice. Only primary hairs (guard hairs) are present. Secondary hairs (underfur) are not present in newborn pups but appear after the first molt. Adult sea lions generally have one but may have as many as three secondary hairs emerging from the same orifice as each guard hair orifice (Scheffer, 1964b).

From a distance pups appear uniform in color, particularly when wet. Upon closer examination one finds that most of the pups are dark brown in color, some are tan in color and a few have a reddish cast to their fur. Tips of the hairs lack pigment and on the dark pups this gives a frosty appearance to the fur. Each hair projects caudally and somewhat ventrally from the pilary orifice. In a sample of 5,000 pelts, one or two generally can be found where the slope of the hair on the back projects cephalically rather than caudally. The hair pattern along the back may be straight or have a rippled appearance similar to that found on lambs.

A typical primary hair taken from the region of the back is flattened, sharply pointed, medullated and bent backward near the middle in side view (Fig. 1). The length of the hair (depth of the fur), as measured by Scheffer (1962) in its natural bent and wavy attitude, is 9 mm to

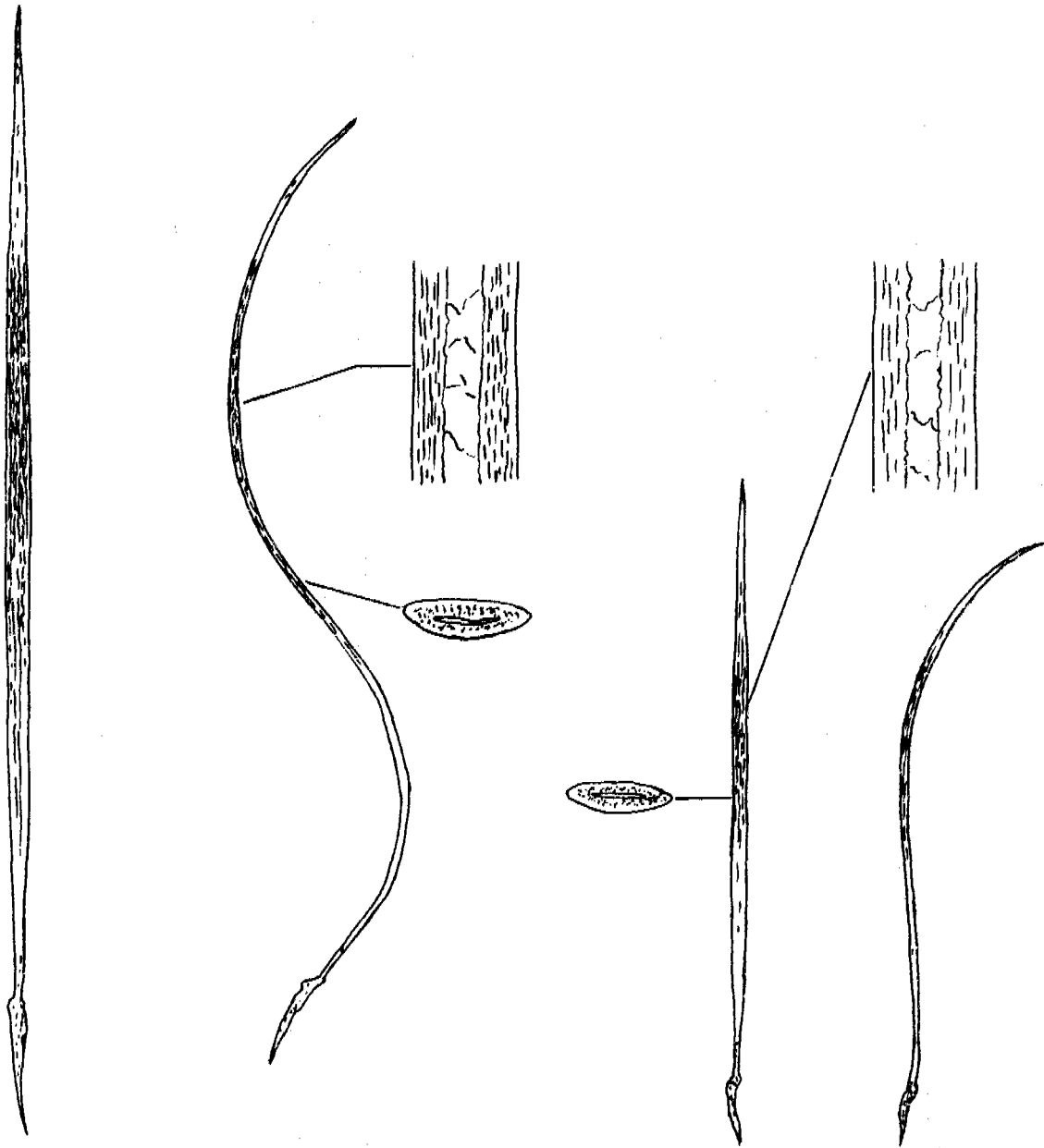


Figure 1. Sketches representing (left to right): a large guard hair in front and side view; enlarged view of longitudinal section showing general shape of the medulla; enlarged cross section showing general shape; a small guard hair in front and side view and an enlarged longitudinal and cross section. Large guard hair taken from mid-back and small guard hair taken from mid-belly of newborn pup.

to 16 mm (50 raw pelts sampled). Fibers that measure 10 mm in their natural bent attitude measure approximately 16 mm when straightened. The tip of each hair is very sharp and lacks pigment for about 3 mm. The shaft is uniform in width throughout most of its length, is elliptical in cross section and is heavily pigmented along its middle one-third. Pigment is contained in the cortex of the fiber and is dark brown in color. The basal one-third of each shaft is lightly pigmented and tan in color. A fiber 16 mm in length measures approximately 50 by 150 microns in cross section in the middle of the shaft.

Belly hair on newborn pups is similar in shape to back hair but is shorter (Fig. 1). Fur depth is 5 mm to 7 mm. The shaft is bent backwards near its terminal one-third and, like the back hairs, has pigment in its cortex. The central and basal portion of the shaft is lightly pigmented and tan in color.

The First Molt

To facilitate describing molt in sea lion pups, various stages were identified and defined. They are:

Resting Stage. All hairs are mature and sharply tipped. Hair roots are colorless and club-shaped. The skin is white and follicles are inactive.

Start of Molt. A few roots are active. Follicles of these active roots are producing melanin. The shaft of the new hair is below the surface of the skin. The skin is white.

Early Molt. Many hair roots are active. A number of the new fibers extend just beyond the surface of the skin. Shedding of old hair is occurring but is not very obvious. The skin is becoming dark in color.

Mid Molt. Most hair roots are active. New fibers are about half their maximum length. Shedding of old hair is very obvious. The skin is visibly dark without magnification.

Late Molt. Only a few roots are active. Most of the new fibers are at maximum length. Old fibers are still present and shedding is still occurring. The skin is white.

Ninety-two specimens collected on four rookeries in Alaska between June 5 and July 23 (Table 1) did not exhibit any signs of surface or sub-surface molt. All specimens were in the resting stage.

Evidence of molt was first noted in seven of 11 specimens collected on Marmot Island on July 25, 1965. The seven specimens were in the start of molt stage. Four of the 11 specimens were still in the resting stage.

Of nine specimens collected on July 30, 1966 on Marmot Island, one was in the resting stage and eight were in the start of molt stage.

Table 1. Sea lion pup pelage specimen collections in Alaska, 1965-1971.

Date Collected	Sex	Weight in lbs.	Area Collected	Stage of Molt
6/5/65	M	44	Sugarloaf Is.	Resting
6/5/65	M	41	Sugarloaf Is.	Resting
6/5/65	M	52	Sugarloaf Is.	Resting
6/5/65	F	46	Sugarloaf Is.	Resting
6/5/65	M	56	Sugarloaf Is.	Resting
6/11/65	M	47	Sugarloaf Is.	Resting
6/11/65	M	43	Sugarloaf Is.	Resting
6/11/65	F	41	Sugarloaf Is.	Resting
6/11/65	M	54	Sugarloaf Is.	Resting
6/11/65	F	40	Sugarloaf Is.	Resting
6/11/65	F	39	Sugarloaf Is.	Resting
6/11/65	F	43	Sugarloaf Is.	Resting
6/11/65	F	44	Sugarloaf Is.	Resting
6/11/65	F	46	Sugarloaf Is.	Resting
6/11/65	M	55	Sugarloaf Is.	Resting
6/11/65	F		Atkins Is.	Resting
6/11/65	M		Atkins Is.	Resting
6/11/65	M		Atkins Is.	Resting
6/11/65	M		Atkins Is.	Resting
6/11/65	F		Atkins Is.	Resting
6/11/65	F		Atkins Is.	Resting
6/11/65	F		Atkins Is.	Resting
6/18/65	F	47	Sugarloaf Is.	Resting
6/18/65	F	40	Sugarloaf Is.	Resting
6/18/65	F	38	Sugarloaf Is.	Resting
6/18/65	M	49	Sugarloaf Is.	Resting
6/18/65	F		Round Is.	Resting
6/18/65	M		Round Is.	Resting
6/18/65	F		Round Is.	Resting
6/18/65	M		Round Is.	Resting
6/18/65	M		Round Is.	Resting
6/18/65	F		Round Is.	Resting
6/18/65	F		Round Is.	Resting
6/18/65	M		Round Is.	Resting
6/24/65	F		Akutan Is.	Resting
6/24/65	M		Akutan Is.	Resting
6/24/65	F		Akutan Is.	Resting
6/24/65	M		Akutan Is.	Resting
6/24/65	M		Akutan Is.	Resting
6/24/65	M		Akutan Is.	Resting
6/24/65	M		Akutan Is.	Resting

Table 1 (cont'd.)

Date Collected	Sex	Weight in lbs.	Area Collected	Stage of Molt
6/26/65	F	49	Sugarloaf Is.	Resting
6/26/65	M	55	Sugarloaf Is.	Resting
6/26/65	M	52	Sugarloaf Is.	Resting
6/26/65	F	37	Sugarloaf Is.	Resting
6/26/65	F	47	Sugarloaf Is.	Resting
6/26/65	F	43	Sugarloaf Is.	Resting
6/26/65	M	48	Sugarloaf Is.	Resting
6/26/65	M	62	Sugarloaf Is.	Resting
6/26/65	M	50	Sugarloaf Is.	Resting
6/26/65	M	53	Sugarloaf Is.	Resting
7/3/65	M	42	Sugarloaf Is.	Resting
7/3/65	M	63	Sugarloaf Is.	Resting
7/3/65	F	45	Sugarloaf Is.	Resting
7/3/65	F	36	Sugarloaf Is.	Resting
7/3/65	M	58	Sugarloaf Is.	Resting
7/3/65	M	59	Sugarloaf Is.	Resting
7/3/65	F	46	Sugarloaf Is.	Resting
7/3/65	M	61	Sugarloaf Is.	Resting
7/3/65	M	53	Sugarloaf Is.	Resting
7/3/65	M	55	Sugarloaf Is.	Resting
7/10/65	F	51	Sugarloaf Is.	Resting
7/10/65	F	42	Sugarloaf Is.	Resting
7/10/65	M	72	Sugarloaf Is.	Resting
7/10/65	F	50	Sugarloaf Is.	Resting
7/10/65	M	41	Sugarloaf Is.	Resting
7/10/65	F	67	Sugarloaf Is.	Resting
7/10/65	M	56	Sugarloaf Is.	Resting
7/10/65	F	54	Sugarloaf Is.	Resting
7/10/65	F	51	Sugarloaf Is.	Resting
7/10/65	M	57	Sugarloaf Is.	Resting
7/17/65	M	56	Sugarloaf Is.	Resting
7/17/65	M	66	Sugarloaf Is.	Resting
7/17/65	M	65	Sugarloaf Is.	Resting
7/17/65	M	76	Sugarloaf Is.	Resting
7/17/65	M	58	Sugarloaf Is.	Resting
7/17/65	F	54	Sugarloaf Is.	Resting
7/17/65	F	56	Sugarloaf Is.	Resting
7/17/65	F	47	Sugarloaf Is.	Resting
7/17/65	M	72	Sugarloaf Is.	Resting
7/17/65	M	89	Sugarloaf Is.	Resting
7/23/66	F	87	Sugarloaf Is.	Resting
7/23/66	M	84	Sugarloaf Is.	Resting

Table 1 (cont'd.)

Date Collected	Sex	Weight in lbs.	Area Collected	Stage of Molt
7/23/66	M	72	Sugarloaf Is.	Resting
7/23/66	M	54	Sugarloaf Is.	Resting
7/23/66	F	58	Sugarloaf Is.	Resting
7/23/66	M	67	Sugarloaf Is.	Resting
7/23/66	F	64	Sugarloaf Is.	Resting
7/23/66	M	57	Sugarloaf Is.	Resting
7/23/66	M	68	Sugarloaf Is.	Resting
7/23/66	F	73	Sugarloaf Is.	Resting
7/23/66	M	65	Sugarloaf Is.	Resting
7/25/65	F	55	Marmot Is.	Start of Molt
7/25/65	F	55	Marmot Is.	Resting
7/25/65	F	70	Marmot Is.	Start of Molt
7/25/65	F	50	Marmot Is.	Resting
7/25/65	M	45	Marmot Is.	Start of Molt
7/25/65	F	65	Marmot Is.	Start of Molt
7/25/65	F	65	Marmot Is.	Resting
7/25/65	M	55	Marmot Is.	Start of Molt
7/25/65	F	45	Marmot Is.	Resting
7/25/65	M	35	Marmot Is.	Start of Molt
7/25/65	M	82	Marmot Is.	Start of Molt
7/30/66	F	62	Marmot Is.	Start of Molt
7/30/66	F	78	Marmot Is.	Start of Molt
7/30/66	M		Marmot Is.	Start of Molt
7/30/66	M		Marmot Is.	Start of Molt
7/30/66	M	52	Marmot Is.	Resting
7/30/66	F	38	Marmot Is.	Start of Molt
7/30/66	M	65	Marmot Is.	Start of Molt
7/30/66	F	81	Marmot Is.	Start of Molt
7/30/66	M	43	Marmot Is.	Start of Molt
8/3/65	M	60	Marmot Is.	Early Molt
8/3/65	F	50	Marmot Is.	Early Molt
8/3/65	M	45	Marmot Is.	Early Molt
8/3/65	F	75	Marmot Is.	Start of Molt
8/3/65	F	40	Marmot Is.	Resting
8/3/65	F	75	Marmot Is.	Start of Molt
10/25/66	F		Marmot Is.	Mid-molt
10/25/66	M		Marmot Is.	Mid-molt
10/25/66	M		Marmot Is.	Mid-molt
10/25/66	M		Marmot Is.	Mid-molt
10/25/66	F		Marmot Is.	Mid-molt
10/25/66	M		Marmot Is.	Mid-molt

Table 1 (cont'd.)

Date Collected	Sex	Weight in lbs.	Area Collected	Stage of Molt
12/3/70	M		Amchitka Is.	Late Molt
12/3/70	M		Amchitka Is.	Late Molt
12/3/70	F		Amchitka Is.	Resting
12/3/70	M		Amchitka Is.	Late Molt
12/3/70	F		Amchitka Is.	Resting
12/3/70	F		Amchitka Is.	Late Molt
12/3/70	F		Amchitka Is.	Resting
12/3/70	M		Amchitka Is.	Late Molt
12/3/70	M		Amchitka Is.	Resting
12/3/70	M		Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting
1/29/71			Amchitka Is.	Resting

Examination of six specimens collected on August 3, 1965 on Marmot Island revealed that one was in the resting stage, two were in the start of molt stage and three were in the early molt stage (Table 1).

Six specimens collected on October 25, 1966 on Marmot Island were all in the mid-molt stage.

Of 10 specimens collected on December 3, 1970 on Amchitka Island, five were in the late molt stage and five were in the resting stage.

Seven specimens collected on January 29, 1971 on Amchitka Island were all in the resting stage.

Although the pelage specimens have been collected over a long period of time and from widely scattered areas, the data suggest that the first molt period of pups is a minimum of 20 weeks in duration; starting about the last week of July and ending the first week in December (Fig. 2). The data indicate that there is individual variation in the timing of molt, all animals are not in the same molt stage at any time during the active molt period, and the molt duration of any one individual is less than 20 weeks. Because specific animals were not followed through the molt period for individual molt information, the exact duration of molt for a single animal is not known.

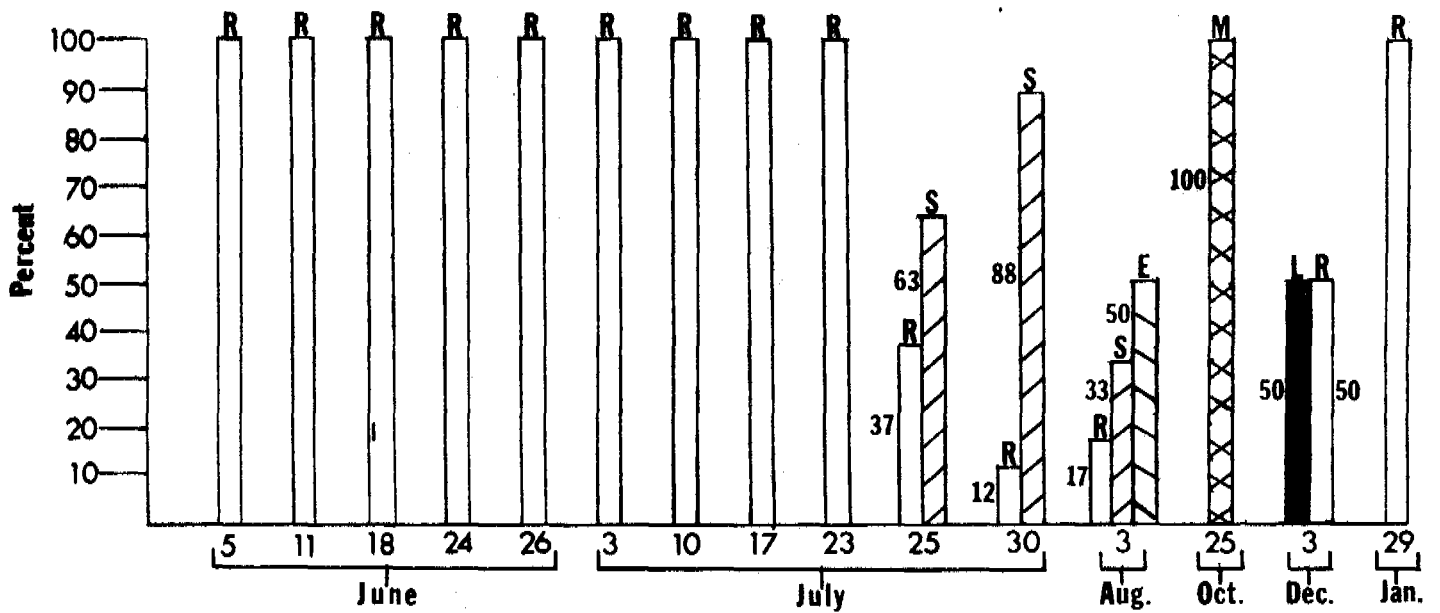
Management Implications

The purpose of the following discussion is to point out how molt, harvesting procedures and certain aspects of sea lion behavior affect harvesting operations and the quality of pelts taken by hunters.

In Alaska sea lion pups are most commonly born during late May and June with the majority of pupping occurring during the first two weeks in June. Pups are harvested for their pelts between June 1 and July 4.

Since present day harvest operations are terminated before July 4, well in advance of the start of molt, molt has no effect on the quality of pup pelts being taken. If molt were the only consideration for harvesting pups, hunters could safely extend their hunting operations at least three weeks into July without loss of pelt quality. Other factors prevent this, however.

In addition to extensive areas of hair missing on some pelts, scars and punctures are found on many pelts. These defects occur primarily on the back of the pup. Through observation of harvest activities and sea lion behavior, it is felt that the damage is caused by females and occasionally males picking up pups with their teeth and biting hard enough to damage the skin tissue resulting in the loss of hair. This theory is supported by the collection of several pelts taken from pups killed immediately after birth before such damage could occur and none showed any signs of hair loss.



R - Resting Stage
 S - Start of Molt
 E - Early Molt
 M - Mid-molt
 L - Late Molt

Figure 2. Percent of pelage specimens in various molt stages by collecting period.

Although some damage is unavoidable, hunters can improve the general quality of the pelts by doing the following:

1. Pups should be harvested as soon after birth as possible. The longer the pup is on the rookery the greater the possibility of its pelt being damaged.
2. Hunters should disturb as little of the rookery as possible during their harvest operation. Disruption of normal rookery activities tends to greatly increase the frequency of adult animals picking up pups.
3. Whenever possible, harvest activities should be conducted in a manner which avoids crowding of the animals. Biting of pups by adults increases significantly under crowded conditions.
4. Hunters should exercise care in selecting the animals they kill. Pups that are badly scarred should be bypassed for animals that exhibit little or no scarring.
5. Pups should not be harvested after July 4 unless the hunter exercises great care in selecting his animals. Most of the pups at this late date have extensive pelt damage.

Pups harvested in December after they have completed their first molt may be of some commercial value. Though many of them show signs of pelt damage, the degree of damage may be sufficiently low to warrant harvesting.

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PREPARED AND SUBMITTED BY:

John S. Vania
Marine Mammal Coordinator

APPROVED BY:

Frank Jones
Director, Division of Game

Donald E. McKnight
Research Chief, Division of Game