

ROUTING SLIP

BRANCH OF WILDLIFE REFUGES

DATE: June 16 1949

MR. SALYER fcj

~~MR. KRUMHOLTZ~~ W

MR. DUMONT PAD 9-12-49

~~MISS BAUM~~ AK 10-13-49

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NARRATIVE REPORT

70

REFUGE:

COLD BAY GAME MANAGEMENT

PERIOD:

JANUARY - APRIL 1949

Refer to Mr. Salyer again before final filing

P48



QUARTERLY REFUGE NARRATIVE REPORT

COLD BAY GAME MANAGEMENT

**This report covers the period from 1 January, 1949
through 30 April, 1949**

**Cold Bay, Alaska
18 May, 1949**

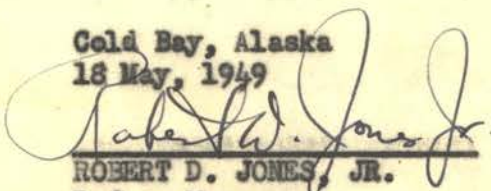

**ROBERT D. JONES, JR.
Refuge Manager**

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This report covers the period from 1 January, 1949 through 30 April, 1949.

I. GENERAL

A. Weather conditions

The following information was obtained from the Air Force Weather station located at Thornbrough Air Base. It is presented in the form recorded by the weather station.

January, 1949

Date	Degrees F.		Precipitation		Snow on Ground
	Max.	Min.	Prevailing Char.	Total (in.)	
1	17	7	- -	.00	11.6
2	23	8	Snow	.02	11.6
3	16	10	Snow	.09	11.8
4	17	10	Snow	.09	12.6
5	20	11	Snow	.02	13.5
6	34	18	Snow	.07	13.8
7	37	33	Rain	.25	14.8
8	38	34	Drizzle	Trace	5.9
9	35	26	- -	.00	3.6
10	32	23	Drizzle	Trace	3.6
11	31	17	Snow & Drizzle	Trace	3.6
12	35	29	Rain	.14	3.6
13	37	30	Snow	.03	3.1
14	34	27	Snow	Trace	3.0
15	30	24	Snow	Trace	3.0
16	35	24	Rain	.04	3.1
17	35	22	Rain	Trace	3.4
18	34	31	Rain	.42	2.8
19	33	29	Snow	Trace	3.2
20	34	29	Drizzle	Trace	3.2
21	35	30	Rain	Trace	2.1
22	33	27	- -	.00	3.0
23	31	28	Snow Showers	.02	3.0
24	31	26	Snow	Trace	3.2
25	31	16	Snow	Trace	3.2
26	32	28	Snow Showers	Trace	3.2
27	32	27	Snow Showers	.03	3.5
28	38	26	Sleet	.08	4.0
29	37	29	Rain	Trace	3.6
30	37	31	Rain	Trace	3.3
31	35	23	Rain	.18	3.1

The Snow on the Ground reading is made at 0055.

February, 1949

Date	Degrees F.		Precipitation		Snow on Ground
	Max.	Min.	Prevailing Char.	Total (in.)	
1	34	24	Rain	.19	31.1
2	36	33	Drizzle	Trace	2.5
3	34	30	Snow Showers	Trace	1.3
4	34	29	Snow Showers	.10	1.1
5	37	27	Snow Showers	.04	1.8
6	38	24	Snow	.15	3.7
7	25	19	Snow	.54	3.6
8	24	11	Snow	.56	9.1
9	27	11	Snow	.15	14.5
10	37	27	Snow	Trace	15.9
11	27	34	Rain	.12	12.8
12	40	31	Rain	.02	4.0
13	35	31	Snow Showers	Trace	4.0
14	31	20	Snow Pellets & Snow	Trace	3.0
15	18	13	Snow	.42	3.0
16	22	11	Snow Showers	Trace	7.0
17	32	24	Snow	Trace	7.0
18	35	31	Snow	.06	7.0
19	36	32	Snow Showers	Trace	2.0
20	34	31	Snow Showers	Trace	1.0
21	34	21	--	--	0.0
22	24	20	--	--	0.0
23	35	20	Snow	.04	0.0
24	34	24	Snow Grains	Trace	1.0
25	35	21	--	--	0.0
26	29	24	Snow	Trace	Trace
27	37	24	Drizzle	.02	Trace
28	33	29	Snow	.05	1.0

March, 1949

1	37	28	Snow Showers	.26	1.0
2	37	33	Rain Showers	.03	1.0
3	39	34	Drizzle	Trace	0.0
4	38	24	Rain	Trace	Trace
5	38	31	Drizzle	.13	Trace
6	37	31	Drizzle	.02	0.0
7	37	32	Rain	.08	0.0
8	36	30	Snow Showers	Trace	0.0
9	39	34	Rain	Trace .15	0.0
10	38	33	Rain	.05	Trace
11	38	27	--	--	Trace
12	36	31	--	--	0.0
13	35	30	Drizzle	.01	0.0
14	37	33	--	--	0.0
15	37	31	--	--	0.0
16	38	30	--	--	0.0
17	38	27	Drizzle	.02	0.0
18	38	33	Snow	.01	Trace

Date	Degrees F.		Prevailing Char.	Precipitation	Snow on Ground
	Max.	Min.		Total (in.)	
19	39	31	--	--	0.0
20	39	32	Drizzle	.05	0.0
21	40	32	Drizzle	.02	0.0
22	42	32	Rain	Trace	0.0
23	36	26	Snow	.71	Trace
24	34	27	Snow	.01	6.0
25	27	23	Snow Showers	.01	6.0
26	36	17	--	--	6.0
27	33	18	Snow	.16	3.0
28	23	17	Snow Showers	.16	6.0
29	24	20	Snow	.21	7.0
30	29	22	Drizzle	Trace	7.0
31	26	19	Snow Showers	.03	7.0

April, 1949

1	24	18	Snow	.06	6.0
2	21	17	Snow	.13	8.0
3	23	18	Snow Showers	Trace	4.0
4	33	18	Snow Showers	.19	8.0
5	28	18	Snow Showers	Trace	8.0
6	26	17	Snow Showers	Trace	7.0
7	25	16	Snow Showers	.03	6.0
8	32	17	Snow Showers	Trace	7.0
9	35	29	Snow Showers	Trace	Trace
10	43	29	Snow Showers	Trace	Trace
11	41	33	Rain	.08	0.0
12	41	33	Rain	.08	0.0
13	38	33	Rain Showers	Trace	0.0
14	36	32	Rain	.05	0.0
15	45	31	--	--	0.0
16	40	27	Freezing Drizzle	Trace	0.0
17	39	33	Rain	.04	0.0
18	39	34	Rain Showers	.01	0.0
19	36	34	Rain	Trace	0.0
20	35	32	Snow Showers	Trace	0.0
21	39	30	Snow Showers	Trace	0.0
22	39	34	Rain	.02	0.0
23	39	32	Snow	Trace	0.0
24	42	30	--	--	0.0
25	40	29	--	--	0.0
26	32	28	Snow	.02	0.0
27	28	24	Snow Showers	.11	Trace
28	33	22	Snow Showers	.02	Trace
29	39	24	Snow Showers	.05	0.0
30	37	29	Snow Showers	.08	0.0

B. Water conditions

The lakes were frozen when the period covered by this report began. Isembek Bay was frozen almost completely during most of the month of January, as were Kinsarof Lagoon and the lagoons of Morzhovoi Bay. Fig. 1 shows the extent of icing in these bodies of water. During most of January and February the streams were frozen on the surface and continued to flow underneath.



Fig. 1

Warm weather in late February and in March melted all but the deepest snow drifts, opened all the streams, and at least a hole or two in the lakes of the plains. Most of the lakes were (i.e., of the plains) completely open until late in March when cold weather set in again and froze them.

The water levels remained normal until the warm weather increased run-off and the levels rose somewhat. The streams were not heavily flooded, however, for the thaw was not rapid. The streams were muddy until about the middle of March, by which time most of them had cleared even though the level remained high. The level in the lakes did not change, for they remained at a point which produced a flow of water from their outlet all winter.

C. Fires

No fires have occurred and no change in the status of preparation for fire has been made.

II. WILDLIFE

A. Migratory birds

1. Population and behaviour

a. Geese - The Emperor Geese remained in the area all winter, moving from place to place as the water in the bays and lagoons froze and thawed. When Izembek Bay was not frozen several thousands of the birds could be found there. With freezing conditions they would move out into the lagoons of Cold Bay and Morzhovoi Bay and into the Shumagin Islands, Sanak Islands, and Aleutian Islands only to return with the reopening of the water. Small flocks could be observed on almost any salt water beach, usually near the mouth of a stream and where some protection from the incessant wind was provided. Never were they observed in dense concentrations until 14 March. In this instance the density did not approach that frequently observed in concentrations of Blue Geese and Snow Geese when migrating through the Dakotas in the spring. On the twelfth and thirteenth of March observations were made in Morzhovoi Bay, Little Lagoon, Middle Lagoon, and Big Lagoon and no geese were found. On the fourteenth of March a heavy concentration was observed in Izembek Bay. On the basis of my own observations on that date (made afoot, and permitting a check on only about a third of the Bay) and those of pilots both shortly before and after that date, there appear to have been over 100,000 geese in the Bay. On 24 March I made a flight over the entire Bay and over Kinzarof Lagoon and observed approximately 100 geese in the whole area. On 25 March approximately 25 geese were observed in Delta Point Lagoon in Cold Bay. On 29 March a flight was made over part of Izembek Bay and no geese were observed. It is believed that some time between 14 March and 24 March the migration of these birds to their nesting grounds began.

When the flocks of these geese arrived in the fall the juvenile birds had grey colored heads and necks. In no instance of birds observed during March were any grey heads noted. All the birds appeared to have attained adult plumage by this time.

The spring migration of Emperor Geese from the Western Aleutian Islands appears to be less abrupt and later than at Cold Bay. From reports, and my own observations on the Island the first geese left Amchitka about the first of April. Thereafter they straggled away all month. On 27 April a few of them were still present on the Island. On 1 May some were reported present on Adak.

No geese other than the Emperors remained in the Cold Bay area during the winter. Elmer Hanson reports seeing two White-Fronted geese on Amchitka I. 7 Nov., 1948.

While making the waterfowl inventory in January an estimated 2500 of these geese were observed in Big Lagoon (Morzhovoi Bay) and 1000 in Kinzarof Lagoon. 500 were observed in small groups around Morzhovoi Bay. At this time Izembek Bay was frozen.

At no time during this period has the taking of geese by eagles been actually observed. However, the remains of Emperor Geese are infrequently observed at typical lookout posts of the Bald Eagle. This, coupled with the habit of the geese taking to the air immediately and with sign of considerable alarm at the approach of a low flying eagle, indicates a certain amount of predation by this bird. There is no reason to believe, however that this predation is serious.

b. Ducks - The overwhelming majority of wintering ducks are the Eiders, the King and the Pacific being the most numerous. At the time of the Waterfowl Inventory an estimated 13,000 ducks were observed in the lagoons of Morzhovoi Bay and Cold Bay, Izembek Bay, and along the Bering Sea coast from Moffet Bay to Big Lagoon (of Morzhovoi Bay). Of these it was estimated 80% were Eiders, 13% Scoters (principally American), 5% Old Squaw, Harlequins 2%. On the basis of subsequent observations I know the number of ducks in the area to be somewhat more than 13,000 and the percentage of Eiders to be greater than 80%.

When observations were made in Izembek Bay on 14 March, as related in the section dealing with Emperor Geese, very extensive numbers of Eiders and Scoters were present. On 24 March in a flight over the Bay the Eiders were observed to be massed in dense flocks. I believe there were less birds than on the 14th, however this may not be true for no accurate or conclusive criteria could be compared. On the 29th a flight was made across Izembek Bay and the birds present had very sharply decreased. Thus it appears the migration to the nesting grounds had begun.

A few Mallards remained through the winter, seeking open water in somewhat protected lagoons. By the 24th of March they were observed in Little Lagoon, Middle Lagoon, Big Lagoon, creeks flowing into all three lagoons, indentations and backwaters of Izembek Bay, creeks flowing into Izembek Bay, Mortenson's Lagoon, in flight over the Base, in short, any place where food and protected open water could be found. Though widely distributed they were not numerous, probably not more than 2000 birds in the entire Refuge.

On the twelfth and thirteenth of March about 150 American Golden-eye ducks were observed in Little and Middle Lagoons of Morzhovoi Bay. A few American Mergansers were observed at the same time.

Predations of the Bald Eagle on ducks is in much the same status as the geese. I believe it likely that a larger number of ducks are taken by the eagle, but again it is not serious.

Ducks observed on Amchitka I. are as follows:

- 6 April, Buffle-head, American Golden-eye, European Teal
- 7 April, American Scoter, White-winged Scoter, Old Squaw, Western Harlequin, Mallard
- 18 April, Green-winged Teal
- 20 April, European Widgeon
- 26 April, Pacific Eider
- 1 May, Pintail, Shoveller

Numerous Scaup were noted to be present the entire month and I

believe them to be both Greater and Lesser but I was unable to determine that definitely.

c. Swans - Elmer Hanson reports four adult Swans were observed near the Base on Amchitka I. late in February of 1947. None were observed in 1948 he reports. In January and February of 1949 six Swans were observed on the Island by several persons.

d. Other waterbirds - Amagat Island and Egg Island in the mouth of Morzhovoi Bay appear to be the nesting site of thousands of waterbirds. They have been visited only in the winter and then I was unable to go ashore, however it appears likely that Cormorants, Kittiwakes, and Puffins nest on these Islands. Very likely the Glaucous-winged Gulls also nest there.

e. Shorebirds - The shorebirds at Cold Bay were the same as last quarter prior to April. During April the Western Sandpiper, Aleutian Sandpiper, and Black Oyster-catcher were observed on Amchitka.

2. Feed and cover

a. No stomach contents are at hand; however, since 30 November, 1948 the Emperor Geese have never been observed where they could obtain other than marine plants and animal life, and the terrestrial plants found on the salt water beaches. Both at Cold Bay and in the Aleutians these birds eat the dried aerial portions of Wild Rye on the beaches, particularly near streams where they come apparently for fresh water.

Elmer Hanson reports one instance on Amchitka I. where he has observed the bird definitely away from the beaches feeding on Wild Rye stalks and dried leaves. Ordinarily in the Aleutians and other areas where *ZOSTERA MARINA* is not present, the Emperor Geese feed on kelp and sponges and other marine forms deposited on the beaches. Specifically what the bird will eat I do not yet know.

All of the ducks wintering in the Cold Bay area take their food from the salt water, at least in part. Very little open fresh water is available to them. Precisely what they find in this region to eat I do not know, judging from the odor of their feces it is principally marine animal life.

In the Aleutians where fresh water is usually available, European Teal and Mallards appear to feed on *SAGITTARIA*, *GALTHA*, *POTAMOGETON*, *MYRIOPHYLLUM*, *CERATOPHYLLUM* and other aquatic plants. These ducks also feed to some extent in the salt water. By the time the migrant ducks arrive in the spring, sufficient open fresh water is available that all but the Eiders seem to find what they desire in fresh water.

The Aleutian Islands produce seed heads that are usually not filled out (and rarely fertile) heads of no importance to waterfowl.

3. No form of disease has been observed or reported among the waterfowl.

B. Upland Game Birds

1. Population and behaviour

a. The Willow Ptarmigan wintered in the alder thickets at the very lowest altitude. Usually they were heavily concentrated in small areas but in some instances very small coveys were encountered by themselves. They were found occasionally out on the heath with only a very tiny patch of alder close by.

Some 1500 to 2000 of the birds wintered within an and a quarter walking distance of this headquarters. The area is on the lower slopes of Simeon. It is a rather extensive series of alder patches following the contours of the gullies and draws but extending several miles along these axes. The birds moved into this area about Christmas time coming from higher up on Frosty. They definitely preferred one area but moved around a great deal. The movements were sudden and en masse. A flock of five or six hundred would take to the air followed by another and another and another until they were all in the air headed for a destination not far off. Needless-to-say, a great clamor attends these movements and the noise of their wings is considerable. After they arrive and get settled the noise subsides and nothing more is heard. If one approaches these concentrations the birds become nervous, walk around a bit talking it over among themselves and then take to the air in a flash of white wings.

Other wintering areas for these birds are found almost continuously around the foot of Frosty, between the mountain and Izembek Bay and Morzhovoi Bay. Across Cold Bay at the foot of the Aghileen Pinnacles the same concentration is reported.

The little piles of white feathers intermingled with a few black eyes found in the spring give mute evidence of the part these birds play in the life of predators. With the birds as plentiful as they are it is probably just as well. Certainly the human take of Ptarmigan is very small.

2. Feed and cover

The stomach contents of 28 Ptarmigan were observed during the winter months. Specifically, they were taken during January and February. In every case the leaves and buds of the plants of the heath were present. The only other food observed during these months is the moss (sp?) growing on the alder brush. Of the plants of the heath, VACCINIUM VITUS-IDEA was predominant. This appears to be their favorite winter food.

At the higher levels snow filled up the alder patches and covered the feed. Undoubtedly this is the reason the birds winter at the lower level. In the areas where the birds were found, both cover and feed were available all winter.

3. Disease among the Ptarmigan has not been observed.

C. Big Game Animals

1. Population and behaviour

a. One Big Brown Bear was killed near the Base on 17 February. No other specimens were known to have come out of hibernation by 6 April when I departed for Anchitka. By 6 May, when I returned, there were numerous reports of Bears out of hibernation. The weather has been "late this spring." By that I mean that cold weather has persisted throughout April and into May, therefore many of the Bears, in fact probably most of the Bears have not yet come down.

b. Between 400 and 500 Caribou came onto the Game Management Area this winter. This pitifully small remnant of the once numerous herd wintered principally on the end of the Peninsula west of Morzhovoi Bay. Apparently a very few wintered around the lagoons at the head of the Bay. None wintered in the Cold Bay area.

2. Food and cover

No change of status occurred during this period. No further observations have been made.

3. Disease

No losses to disease have been observed or reported. I am of the opinion that any diseased animal would shortly fall prey to wolves, and therefore conceal the existence of pathological forms.

D. Fur animals, predators, rodents, and other mammals.

1. Arctic Hare - rare

2. Porcupine - Observed in the alder brush on Simeon and Frosty infrequently. Judging from bequilled dogs now and then one ventures close to the Base. Evidence found near Little Lagoon on Morzhovoi Bay indicates they travel considerable distances away from the brush.

3. Wolverine - Fishermen along Russell Creek report seeing an animal now and then. As reported last quarter they are numerous in the area.

4. Land Otter - As spring has advanced the Land Otter has begun to move around on the land more than it did during the winter months. Otherwise there appears to be no change in its status. Very few were trapped during the winter.
5. Mink - I do not yet know enough about this animal to appreciate its full import in the area. However, I believe they may be more numerous than previously thought.
6. Weasel - No change in the status from last quarter.
7. Red Fox - During the severest part of the winter the Foxes regularly entered the Base, performing acts of mischief blamed on wolves. This created the myth of many hungry wolves wandering about the area at night. No trapping of any consequence was done in the area this winter, hence no change in their status.
8. Wolf - The pros and cons of poison and its use on the Alaskan Peninsula came in for a great deal of discussion at the Game Commission meeting. This resulted in a commitment of our resources to control wolves by a poison campaign. It was agreed that we would so direct our activities as to minimize the hazard to other animals. This was prompted by my concern for the Land Otter and the Big Brown Bear.

With that agreed upon, two wolf control stations have been established during the period of this report. Both are within the Refuge. A third is to be established within and a fourth outside the Refuge. During the winter these stations will be used for strychnine poisons, during the summer for cyanide guns.

9. Rodents - In the Cold Bay area the rodents form an important part of the diet of fur bearers and are consequently held in check. In the Aleutians, however, an unfortunate situation is developing. At some time the Brown Rat was introduced on Amchitka and on Adak. Now the beaches near the Base are overrun with Rats. Naturally they are also present in considerable numbers in the Base. Sooner or later the Military Dept. is going to take action on this matter and it may be ill-considered. One suggestion already put forward is to introduce weasels. I believe we would be wise to take cognizance of this problem and enter into cooperative action with the Military Dept. to control the animals. The Blue Fox does not appear to exercise any control on the rats whatsoever.

E. Predaceous birds

1. The Bald Eagles, Ravens, and Peale's Falcon were observed to be nesting on Amchitka during April. The Ravens were nearly through nesting, judging from the size of the young.
2. At Cold Bay no change in the status of predaceous birds has been noted.

*Memo sent
Reg. Office - no
weasels - suggested
use of poison
under direction
Mr. Kelly & P.R.*

F. Fish

1. Dolly Varden Trout arrived in Russell Creek by 13 March and Steelhead some time subsequent to that date. The men of the Military Detachment at Anchitka were catching large Dolly Varden by the middle of April.

III. REFUGE DEVELOPMENT MAINTENANCE

- A. No Refuge development undertaken.

IV. ECONOMIC USE OF REFUGE

- A. The only economic use of the Refuge this winter was a very small harvest of furs, principally fox. A few Land Otter were taken, five from near Kinzarof Lagoon and one near Moffet Bay.
- B. Two families of natives lived in Kinzarof Lagoon part of the winter. One of them was there for legitimate trapping, but the other was merely there to spend some of the winter and live partly from the land. This unfortunately, is one of the things that must stop if the Caribou are to survive.

V. PUBLIC RELATIONS

- A. Since the opening of the streams and the arrival of sport fish in them, a great deal of sport fishing has been done. The large majority of the take is Dolly Varden Trout and an occasional Steelhead.
- B. At the close of the quarter no visitors had yet arrived, but with Bear season open, it will not be long.
- C. Assistance has been rendered the U.S. Coast Guard in the form of radar repairs aboard the tender "Bittersweet". A lecture concerning "Survival" in the Aleutian region was given to the Base Detachment at the Commanding Officer's request.
- D. A very little Ptarmigan hunting has been done during this quarter. Some unsuccessful Bear hunting was done in February when one hungry Bear came down to the garbage dump and was shot.
- E. In conjunction with wolf control it is hoped an effective enforcement campaign can be waged this fall and winter to cut down the illegal killing of Caribou. In anticipation of this, information is being dispensed by letter and verbally to the residents of the region calling on them to look to the future and help save the Caribou. The fact that the law applies to all men equally regardless of ancestry is brought to their attention; and to the recalcitrant, court action is offered.

I. Dolly Varden Trout arrived in Kasaan Creek by 13 March and Steelhead seem time subsequent to that date. The son of the Military Detachment at Kasaan were catching large Dolly Varden by the middle of April.

III. BEAVER DEVELOPMENT MAINTENANCE

A. No beaver development undertaken.

IV. ECONOMIC USE OF BEAVER

A. The only economic use of the beaver this winter was a very small harvest of fur, principally fox. A few small beaver were taken, five from Kasaan Lagoon and one near Kasaan Bay.

B. Two families of natives lived in Kasaan Lagoon part of the winter. One of them was there for legitimate trapping, but the other was merely there to spend some of the winter and live partly from the land. This unfortunately, is one of the things that must stop if the Caribou are to survive.

V. PUBLIC RELATIONS

A. Since the opening of the stream and the arrival of sport fish in them, a great deal of sport fishing has been done. The large majority of the take is Dolly Varden Trout and an occasional Steelhead.

B. At the close of the winter no visitors had yet arrived, but with Bear season open, it will not be long.

C. Assistance has been rendered the U.S. Coast Guard in the form of radio repairs aboard the cutter "Albatross". A letter concerning "Survival" in the Aleutian region was also delivered to the Commanding Officer's representative.

D. A very little Ptarmigan hunting has been done during the winter. Some unsuccessful Bear hunting was also done. When one hungry bear came down to the edge of the lake and shot.

E. In conjunction with will control it is hoped an effective enforcement campaign can be waged this fall and winter to cut down the illegal killing of Caribou. In anticipation of this, information is being disseminated by letter and verbally to the residents of the region calling on them to look to the future and help save the Caribou. The fact that the law applies to all and equally regardless of ancestry is brought to their attention; and to the residents, some action is urged.

RECORDS AND
COMMUNICATIONS

JUN 16 1949

DEPT. OF THE INTERIOR

ALASKA

WILDERNESS SERVICE

VI. FIELD INVESTIGATIONS OR APPLIED RESEARCH

The principal research problem that concerns this headquarters is the life history of the Sea Otter (*Enhydra lutris*). Studies were conducted during the period covered by this report and the information obtained follows.

The Island of Amchitka lies in the Rat Island group in the Aleutian Islands National Wildlife Refuge. The Island is much older geologically than its neighbors. It is volcanic in origin with subsequent glacial activity that has nearly obliterated the mountains. The highest point on the Island is 1330 feet, consequently travel is not attended with some of the difficulties presented on the other Aleutian Islands. However, the age and degree of erosion has reduced the soil particles to such a small size that greater amounts of moisture are held and produce a muddy soil. Much of the Island is covered with a growth of reindeer moss. A very large percentage of the shoreline is rocky. The lava flows that formed the Island produce this rocky beach. Some of the lava beds have been tilted and faulted, some show columnar structure while others are amorphous conglomerate. Several flows have occurred and show as strata. All of these features have combined to form a shelving type of beach, particularly where the overlying beds are softer and therefore erode more readily. In such shelving formations heavy kelp beds are produced (figs. 6, 7, 8, & 9) and extensive marine life finds a suitable habitat. To what extent this is necessary for large populations of Sea Otter remains to be determined. At-any-rate, it is in this habitat along the shores of Amchitka that our largest concentration is found and very likely will be the principal area for field studies.

A report from Elmer C. Hanson, cooperator on Amchitka, indicating a higher than usual mortality in February and March was the cause for field work at this time. A great deal of time was spent in searching for the bodies of dead Otter on the beaches and a number were recovered. Unfortunately, the Island has Blue Fox on it and these animals destroyed much of the information that could have been learned. Birds, particularly gulls and ravens contributed to this nuisance.

Enough information was obtained to show that some form of illness affected the Otter on the eastern end of the Island. It was definitely determined that the disease had not reached the western end, at least with the same resulting loss. All of the Otter recovered on the western portion of the Island had been stripped by the foxes and birds to mere skeletons or parts thereof so that no symptoms could be observed. However, the small number of recoveries was taken as an indication of freedom from disease. For instance, along the beach from Bird Cape to Aleut Point and on eastward along the south shore of the Island for about three miles, two Otter skeletons were found. Along this beach the live Otter were present in the surf continuously, and in one instance 136 individuals were counted asleep on rocks, while all around were many swimming Otter. They were

visible out at sea several hundred yards in the same area. In Constantine Harbor, however, where about 30 animals can regularly be observed, seven dead Otter were recovered between 6 April and 12 April. The same results have been noted in St. Makarius Bay. By the third of May it had been determined the epidemic had run its course and no new losses were occurring.



Fig. 2 Measuring the length of the Sea Otter

Some of the dead Otter recovered have been preserved by freezing for further studies. In the instances where symptoms could be observed, it was frequently noted the animal came onto the beach and crawled up into the grass where it died. In every case but one, the stomach was empty save for fluids. As far as we can judge the intestinal tract appeared normal. There is indication of hemorrhage in the liver and kidneys. It goes without saying that little concrete scientific evidence has been collected. Only sufficient knowledge has been gained to realize that disease is an important limiting factor in populations of the Otter and to highlight the need for laboratory equipment on Amchitka to more thoroughly investigate the cause of these losses. However, considering the gregarious nature of the animal, I am of the opinion that the disease is not contagious to the Otter. It appears likely that the organism (if such it is) was taken in or with the food of the animal. Considering the area of the affliction the suggestion of a medical officer seems reasonable: that the organism originated in the sewage from the Base and was ingested by some of the animals the Otter feeds upon. These, of course, are merely theories and will require verification, a matter of several years work at Amchitka and elsewhere.

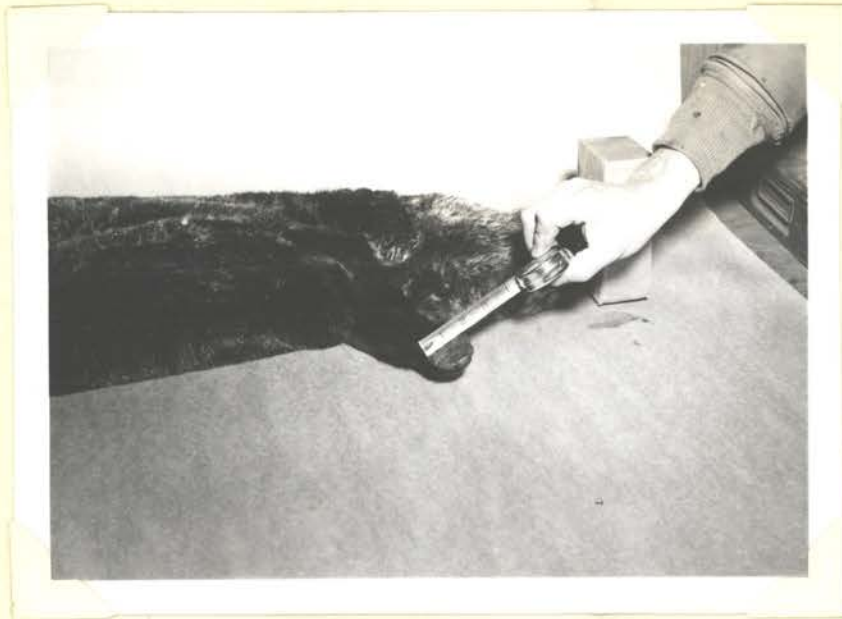


Fig. 3 Measuring the front foot



Fig. 4 Measuring the hind foot

The list of dead animals recovered and the information gained from each is given below. The lack of information that will be noted in many instances arises from the recovery solely of the skeleton or parts thereof. In the instances where measurements were not taken for one reason or another, an effort was made to determine its age

as well as possible. The designation "adult" means it was a large specimen, "immature" indicates one neither large nor small, varying in or near the range of 38 to 42 inches.



Fig. 5 Measuring the tail



Fig. 6 Shelving rock formation in St. Makarius Bay exposed at low tide, and showing typical kelp beds

In the following tabulation the first number in each item is an arbitrary specimen identification number and has no other significance.

- 47 sex unk, immature, collected skull, St. Makarius Bay, 6 Apr. '49
- 48 female, immature, stomach empty, intestinal tract normal, collected skull, Constantine Harbor, 6 Apr. '49
- 49 sex unk, adult, collected skull, St. M. B., 6 Apr. '49
- 50 male, adult, collected skull, St. M. B., 6 Apr. '49
- 51 sex unk, immature, collected skull, St. M. B., 6 Apr. '49
- 107 female, pup, $21\frac{1}{4}$ " long, tail $5\frac{1}{2}$ ", hind foot $4\frac{3}{8}$ ", front foot $3\frac{1}{4}$ ", collected entire animal, 6 Apr. '49
- 46 sex unk, immature, collected skull, St. M. B., 7 Apr. '49
- 30 male, $41\frac{1}{2}$ " long, tail 9", hind foot $8\frac{1}{4}$ ", front foot $1\frac{5}{8}$ ", collected skull, St. M. B., 7 Apr. '49
- 31 sex unk, immature, collected skull, St. M. B., 7 Apr. '49
- 32 sex unk, immature, collected skull, St. M. B., 7 Apr. '49
- 33 male, $39\frac{1}{2}$ " long, tail $8\frac{1}{2}$ ", hind foot $7\frac{1}{2}$ ", front foot $1\frac{3}{4}$ ", collected skull, neck bloody internally, hole in skull (does not appear to be gunshot wound), blood clot around the heart, lung cavity filled with blood, chest muscles bloody, bladder contents bloody, intestinal tract appeared normal, stomach empty, St. M. B., 7 Apr. '49
- 34 female, 49" long, tail 11", hind foot 9", front foot $2\frac{1}{4}$ ", collected skull & parasites (Ascarids) from the stomach, stomach empty of food but filled with fluids, intestinal tract normal, few bits of undigested kelp in intestine, St. M. B., 7 Apr. '49
- 35 sex unk, 47" long, tail $9\frac{3}{4}$ ", hind foot $3\frac{1}{8}$ ", front foot $1\frac{3}{4}$ ", collected skull, stomach contents limpets and limpet shells, St. M. B., 7 Apr. '49
- 37 male, 52" long, tail 12", hind foot $9\frac{1}{2}$ ", front foot 2", collected skull, east of St. Makarius Point, 7 Apr. '49
- 38 sex unk, 51" long, tail 11", hind foot 9", front foot $1\frac{7}{8}$ ", collected skull, east of St. Makarius Point, 7 Apr. '49
- 43 male, $42\frac{1}{2}$ " long, tail $9\frac{1}{4}$ ", hind foot $8\frac{1}{4}$ ", front foot $1\frac{3}{4}$ ", collected entire animal, St. Makarius Point, 7 Apr. '49
- 44 male, 41" long, tail $9\frac{1}{8}$ ", hind foot 8", front foot $1\frac{7}{8}$ ", collected entire animal, St. Makarius Point, 7 Apr. '49

- 45 male, $45\frac{1}{4}$ " long, tail $9\frac{7}{8}$ ", hind foot $8\frac{7}{8}$ ", front foot $1\frac{5}{8}$ ", collected entire animal, St. Makarius Point, 7 Apr. '49
Subsequently learned on autopsy this animal had hemorrhagic liver and kidneys. Gastro-intestinal tract normal, stomach empty, heart and lungs normal.
- 39 sex unk, tail $8\frac{1}{2}$ ", hind foot $7\frac{1}{2}$ ", collected skull, St. Makarius Bay, 8 Apr. '49
- 40 sex unk, $44\frac{1}{2}$ " long, tail $8\frac{1}{2}$ ", hind foot $8\frac{1}{2}$ ", collected skull, St. M. B., 8 Apr. '49
- 41 sex unk, 49" long, tail $10\frac{1}{2}$ ", hind foot 9", front foot $1\frac{3}{4}$ ", collected skull, St. M. B., 8 Apr. '49
- 42 sex unk, $38\frac{1}{2}$ " long, tail $7\frac{1}{2}$ ", hind foot $7\frac{3}{4}$ ", front foot $1\frac{3}{4}$ ", collected skull, St. M. B., 8 Apr. '49
- 52 sex unk, 42" long, tail $10\frac{1}{4}$ ", hind foot $8\frac{1}{4}$ ", front foot $1\frac{3}{4}$ ", breakwater Constantine Harbor, collected skull, 10 Apr. '49
- 53 male, $27\frac{1}{2}$ lbs, $43\frac{3}{4}$ " long, tail $8\frac{1}{2}$ ", hind foot $8\frac{7}{8}$ ", front foot $1\frac{13}{16}$ ", collected entire, breakwater Constantine Harbor, 10 Apr. '49
- 54 female, $21\frac{3}{4}$ lbs, 37" long, tail $8\frac{1}{2}$ ", hind foot $7\frac{1}{2}$ ", front foot $1\frac{5}{8}$ ", rigor mortis still present when collected entire, breakwater Constantine Harbor, 10 Apr. '49
- 55 female, pup, 5 lbs, $22\frac{1}{2}$ " long, tail 5", hind foot $4\frac{3}{4}$ ", front foot 1", collected entire, Constantine Harbor, 10 Apr. '49
- 57 sex unk, immature, collected skull, below Topside, 14 Apr. '49
- 58 sex unk, immature, collected skull, below Topside, 14 Apr. '49
- 59 sex unk, adult, collected skull (smashed), below Topside, 14 Apr. '49
- 60 sex unk, immature, collected skull, below Topside, 14 Apr. '49
- 62 sex unk, immature, collected skull, Aleut Point, 16 Apr. '49
- 63 skull found alone, collected, Aleut Point, 16 Apr. '49
- 64 broken skull found alone, collected Square Bluff, 17 Apr. '49
- 67 sex unk, adult, collected skull, Burr House, 18 Apr. '49
- 68 sex unk, immature, collected skull, Burr House, 18 Apr. '49
- 69 male, $40\frac{1}{4}$ " long, tail $8\frac{1}{2}$ ", hind foot $8\frac{1}{4}$ ", front foot $1\frac{3}{4}$ ", stomach empty except for fluids, intestinal tract normal but with little contents, collected skull, 3 miles east of foothills on south shore, 20 Apr. '49

- 70 male, immature, collected skull, 3 miles east of foothills on south shore, 20 Apr. '49
- 71 skull found alone, collected, old rifle range west of St. M. B., 26 Apr. '49
- 72 skull found alone, collected, old rifle range west of St. M. B., 26 Apr. '49
- 73 skull found alone, collected, old rifle range west of St. M. B., 26 Apr. '49
- 75 sex unk, $40\frac{1}{2}$ " long, tail $9\frac{1}{4}$ ", hind foot $8\frac{1}{4}$ ", front feet $1\frac{7}{16}$ ", collected skull, old rifle range west of St. M. B., 26 Apr. '49
- 76 skull found alone, collected, old rifle range west of St. M. B., 26 Apr. '49
- 77 male, 55" long, hind foot $9\frac{1}{4}$ ", front foot $2\frac{1}{4}$ ", severe erosion of teeth and cavities noted, west St. M. B., 26 Apr. '49
- 78 fragment of a skull found alone, collected, west St. M. B., 26 Apr. '49
- 79 sex unk, adult, collected skull, St. M. B., 26 Apr. '49
- 80 sex unk, adult, without tail $37\frac{3}{4}$ " long, collected skull, east of Constantine Harbor, 26 Apr. '49
- 81 sex unk; adult; 46 " long; collected skull; cavities, erosion, and abscesses noted to be excessive in the teeth; east of Constantine Harbor; 26 Apr. '49
- 82 sex unk, immature, collected skull, east of St. Makarius Point, 27 Apr. '49
- 83 sex unk, immature, collected skull, east of St. Makarius Point, 27 Apr. '49
- 84 skull found alone, east of St. Makarius Point, 27 Apr. '49
- 86 sex unk, collected skull, east of St. Makarius Point, 27 Apr. '49
- 87 female, $43\frac{1}{2}$ lbs, $50\frac{3}{4}$ " long, hind foot $8\frac{3}{4}$ ", tail $10\frac{3}{4}$ ", front foot $2\frac{1}{8}$ " (this is the animal later referred to in reference to the mural thrombus), collected entire, intestine completely empty, stomach empty; evidence of embolism in the kidney, lungs normal, 27 Apr. '49, St. Makarius Point
- 88 male, $56\frac{3}{4}$ " long, hind foot $9\frac{3}{4}$ ", front foot $2\frac{1}{4}$ ", tail $13\frac{1}{2}$ ", collected skull, east of Cyril Cove, 1 May '49
- 89 sex unk, $54\frac{3}{4}$ " long, collected skull, east of Cyril Cove, 1 May '49

- 90 sex unk, 49" plus in length, collected skull, west Kirilof Bay, 1 May '49
- 91 sex unk, 42" long, collected skull, west Kirilof Bay, 1 May '49
- 92 male, 50" long, hind foot $9\frac{1}{2}$ ", front foot $2\frac{1}{8}$ ", tail $10\frac{1}{4}$ ", collected skull, near Island in Kirilof Bay, 1 May '49
- 93 skull found alone, collected, near Island in Kirilof Bay, 1 May '49
- 94 skull found alone, collected, near Island in Kirilof Bay, 1 May '49
- 95 male, 54" long, collected skull, near Island in Kirilof Bay, 1 May '49
- 96 sex unk, immature, collected skull, near Island in Kirilof Bay, 1 May '49
- 97 sex unk, immature, collected smashed skull, near Island in Kirilof Bay, 1 May '49
- 98 sex unk, immature, collected skull, Kirilof Bay, 1 May '49
- 99 sex unk, 50 $\frac{3}{4}$ " long, collected skull, Kirilof Bay, 1 May '49
- 100 sex unk, immature, collected skull, Kirilof Bay, 1 May '49
- 101 sex unk, immature, collected skull, Kirilof Point, 1 May '49
- 102 sex unk, cub, $28\frac{1}{2}$ " long, collected skull, Constantine Harbor, 1 May '49
- 104 skull found alone, collected, near Island in Kirilof Bay, 1 May '49
- 105 skull found alone, collected, near Island in Kirilof Bay, 1 May '49
- 106 broken skull, origin unknown, 1 May '49

It will be noted this totals 70 Otter or parts of Otter recovered. Some of these will represent the average annual attrition. Again recalling my wartime experience, late winter appears to be the season of greatest loss in Sea Otter. Doubtless the loss fluctuates and possibly is caused by the same organism that produced this years epidemic. The 70 accounted for here does not purport to be the total loss (Mr. Hanson recovered something less than 30 specimens prior to 6 April, presumably lost to the same cause) but it is indicative in view of the extensive coverage accomplished (fig. 12). There appear to be four to five thousand Otter at Anchitka (this is an estimate and will require verification). The loss of possibly 200 animals does not seem unduly severe. Studies are continuing with the assistance of the U.S. Public Health Service laboratory at Anchorage to determine the nature of the disease and the cause of the loss. A recurrence will be anticipated next winter and should it so occur pelts

will be taken from the dead animals. The temperatures in February and March inhibit decay and the slipping of the hair from the skin therefore it should be practical to collect a large percentage of the pelts in usable condition.



Fig. 7 Shelving rock formation in St. Makarius Bay exposed at low tide



Fig. 8 Shelving rock formation in St. Makarius Bay exposed at low tide

Measurements of the dead animals have been listed above. All dimensions were taken with a steel tape. The animal was measured from the tip of the nose to the tip of the tail (fig. 2), across the front foot at its widest point (fig. 3), from the tip of the longest digit of the hind foot to the heel (with the digit straightened in the hand, fig. 4), and the length of the vertebral column in the tail (fig. 5). The two most stable measurements appear to be the total length and the length of the hind foot.



Fig. 9 Shelving rock formations in St. Makarius Bay exposed at low tide

When it comes to measurements of live animals we will probably have to be content with hind foot and tail lengths. The animal is not savage; however, when taken captive it addresses itself to escape and pursues that object without relaxation. Its teeth and jaws are not well suited to aggressive action but it doesn't hesitate to use them. I entertain no doubt of the ability of the Otter to crush one's finger, and in this matter my curiosity extends no further. The animal is quite strong and its body very supple. It can easily bend forward and double itself and to bend backwards is but little more restricted. To hoist the animal off the ground by its hind feet is by no means a complete defense against its teeth. Furthermore, it uses the sharp claws of its front feet to assist in its efforts to escape. So successful were the efforts of one very large adult that it proved unmanageable to two men. However, with a sack to engulf its head and front quarters, or some form of muzzle, weight measurements and banding can be accomplished.

There are distinct age groups as judged by size. The pups are tawny colored when born. This color is produced by a long yellow hair

extending through the brown hair. This tawny hair is shed very early and the animal becomes a deep brown with a dark colored head. The next group is composed of subadults. This group has very few if any of the buff colored hairs on its head or body (fig. 10) that characterize the fully adult animal (fig. 11). These animals are considerably lighter in weight than the adults weighing probably less than 30 pounds. Incidentally it is this group that suffered the greatest loss to the disease. The adult animals reach a maximum length of about 55 inches and about 50 pounds in weight. Apparently the buff color of the head and the sprinkling of light-colored guard hairs on the body is a development of adulthood.



Fig. 10 The subadult Sea Otter does not possess the buff-colored hairs of the adult

The suppleness of the animal's body is a product of the length of its vertebral column. There is no special adaptation that is unique. Each vertebra articulates freely upon its neighbor and since the entire column is so long it gives the impression that the animal is swivel-hipped. In swimming the Otter makes use of this characteristic. It appears to undulate through the water, swimming sometimes with a "scissors kick", sometimes using its feet alternately. So far as I know at present it does not use its tail in propelling itself. There does not appear to be sufficient strength in this appendage for such an adaptation. It is used as a stabilizer in swimming. Often the

animal will use only one hind foot in swimming, using the tail to stabilize. The Sea Otter is not an expert swimmer as aquatic mammals go. "It cannot overtake a fish in direct flight, of this I am certain. Elmer C. Hanson has also observed the Otter swimming under the water and he states unequivocally that it cannot catch a fish in flight. The fish it catches are sculpins and flounder according to present information and these fish frequently depend on hiding rather than flight. Very large deposits of feces were observed on the beaches of Amchitka and the paucity of fishbones tends to support these observations. The largest percentage of skeletal remains in the feces were from Sea Urchins. Specimens of these feces were collected and dispatched to the Patuxent Lab. for identification.

In the matter of predators, mankind as usual will occupy the number one position, running a very poor second will be the Killer Whale. Except for these two I have no evidence to believe there are others at Amchitka. There are numerous Sea Lion at the Island but they and the Sea Otter live together with no evidence of predation. I have observed eight Sea Otter in the water on the perimeter of a dense group (about 100) of Sea Lion. In this instance no attacks were made by the Sea Lion nor any alarm evinced by the Otter. This is only one of many cases where I have personally observed the animals together with no evidence of predation. The same is true of the Harbor Seal. At Aleut Point where the densest concentrations of Sea Otter are found, the Seal is also abundant. Here again the two animals live together with no attacks from the one and no alarm from the other. From the predatory standpoint the Blue Fox is more dangerous. Sometimes, though to what extent I do not yet know, the Sea Otter pup will be left on rocks or beaches while the parent dives for food. Under these conditions the ever present fox would have the pup at its mercy. Whether coincidentally or otherwise the fox is most abundant at Aleut Point. These animals can be eliminated on Amchitka I. at this time without sacrificing a commercially valuable pelt in view of fur prices. I believe that it should be done. In accordance with the policy established at the beginning of the fiscal year 1940, control measures aimed at the complete elimination of the fox from Amchitka I. will be instituted during the month of July 1949.

In the matter of predatory humans, at present there is no killing of Sea Otter going on. The military department has made a sincere effort to stop this waste and at present it is successful. In all of the animals recovered dead on the beach none were found to have died of bullet wounds. The least controlled unit on the Island is the Coast Guard Loran station. This outfit is leaving the Island in November of this year or thereabouts. There is an Air Force demolition outfit at work on the island for the summer, destroying ammunition and explosives. After they leave, only the small Base detachment will remain.

Fig. 11 The Sea Otter spends some of its life hauled out on rocks. Three adults and one pup are represented in this photograph.



Indications are that the C. A. A. will be operating the establishment on the Island perhaps by 1951. I strongly urge that the Fish and Wildlife Service insist upon assuming an iron-clad control of the Island at that time. When we begin to take pelts at Amchitka it will be highly desirable to control the movements of humans on the Island.

Fig. 12 Beaches of Amchitka Island examined during the studies covered by this report

Unfortunately the animal is very unwary. While hauled out on land its wariness is most pronounced, but even then it is comparatively easy to approach. Its sense of hearing is keen. The animals will come awake at the sound of a camera shutter from 30 feet. I do not find any reason to believe it has a sense of smell. At last if it does detect human scent it attaches no significance to this fact. The wind doesn't have to be taken into consideration at all in approaching them. The sense of eyesight appears to be reasonably keen. When the animal is in the water it evinces no alarm at the presence of humans. I discharged a .22 calibre handgun into the air while near one. It wasn't even curious enough to look for the cause of the noise, while a half dozen seals close at hand fled in panic.

The front paws are quite useful to the animal. It holds its food, scrubs itself (even the back of its head and neck), and holds its young all with these short paws. On land the young is carried pendulous from the parent's teeth.

A problem in pelting will be the layer of muscle tissue very closely

attached to the inside of the skin. I had skinned one animal in order to save the pelt. As is customary with other skins I tried to take the muscle tissue off and in so doing severely damaged the pelt. Just how this will be managed I do not know, but to do it in the field will be difficult.



Fig. 13 The Sea Otter is inclined to be a bit more wary on land than in the water

The animal's organs, particularly the intestines are attached with a very long mesentery. This produces a pendulous appearance on land, and the animal carries its back arched (fig. 10), presumably to keep its body from dragging. The tendency of the cavity contents to hang much like a rubber bag half full of water gives the animal a gaunt appearance. Its backbone and ribs are always visible when the Otter swims or rolls in the water and especially when walking on land.

When feeding, the Otter grasps its food between its front paws, thrusts it between the molars and crushes. What portion of the shell falls away as it is then washed by dipping in the water or by the entire animal rolling is discarded. The remainder is simply swallowed to

pass through untouched by digestive juices. Small clams, mussels, crabs, etc. are eaten whole. The digestive juices dissolve the contents from the animals so eaten and passes them on without separating the two halves of a bi-valve for instance. The small intestine is very long, there is no gross evidence of a pyloric sphincter, the calcareous residue is passed on swiftly while the usable portion remains longer in the intestine. Evidently the animal consumes large quantities of food, judging from the deposits of excreta and the contents of the intestines.

Bill Parker
Oct 11-55

Fig. 14 A pod of Sea Otter, some on the rocks and some in the water

In the male animal there are no external sex organs. The penis is made in part of a bone. It is carried internally in the same relative position as a dog and is extruded when in use through a genital pore. There are two testes lying in the inguinal canal. The male can only be identified as such by feeling the penis bone beneath the skin of the abdomen, it cannot be identified by sight. Perhaps some secondary characteristic will become evident as studies are continued. The female organs are not unusual. There is a

vaginal opening and two mammae so far as external characteristics are concerned. The female can be identified by a visual inspection.



Fig. 15 A Sea Otter floating on its back

Severe erosion of the teeth of adults was noted, in addition to cavities and abscesses (fig. 17).

A relationship exists between the Otter and the gulls. When an Otter is feeding gulls frequently rest on the water beside them picking up any items discarded and stealing from the Otter when an opportunity offers. One juvenile Bald Eagle was observed in what I believe was an attempt to make the Otter release what it was feeding on and dive. It dove, but carried its food with it.

It appears that the Otter spends considerable time hauled out on rocks during the rough weather of the winter. During the summer it moves away from the shore and spends its time in the kelp beds. Our inventorying operations will only be successful if we take this into account and make the inventory when the pods are away

from the rocks and beaches so they may be accurately counted. Happily at this time of year the seas are sufficiently calm to permit seeing the animals in the water. I believe we should have a Navy type "duck" or "kingfisher" aircraft to conduct this most successfully. These both have open cockpits and are fairly slow. My experience trying to inventory Sea Otter from the nose of a B17 at 140 to 150 MPH has not been very successful principally because of the speed. However, within a very short time we will be trying it with the Navy patrol bombers and we'll have a definite answer. Inventorying from the land will be most useful during the winter but even then will be of doubtful value. Perhaps something can be done, this coming winter will tell the story.

Fig. 16 A Sea Otter floating on its back

One very sick Otter was taken captive on 27 April. The animal was quite old, female, 50 $\frac{3}{4}$ inches long, hind foot 8 $\frac{3}{4}$, tail 10 $\frac{3}{4}$, front foot 2 $\frac{1}{8}$, weighed 43 $\frac{1}{2}$ lbs. This animal died not long after capture. An autopsy revealed that it had probably died of a heart attack. There was a right posterior

ventricular infarct as evidenced by intimal discoloration and presence of an adherent blood element clot (diagnosis of heart condition by John K. White, Capt., M. C. and Stanley Foulson, Capt., M. C.).

There appears to be a definite breeding season at Amchitka I. for during the month of April only 4 pups were noted while well over 1000 adult Otter were seen. Further studies will provide more definite and accurate knowledge but I have a distinct recollection (from my wartime days on Amchitka) that the pups were present only during the summer.

Through the courtesy of Dr. Victor B. Scheffer of the Seattle office 100 monel metal tags have been provided. These will be affixed to Otter as soon as possible. Further studies must be conducted in order to understand the movements of the animal. The habit of the animal showing its hind feet above the water suggests placing colored bands on the digits. If the problem of manufacturing such bands that will withstand the beating they will be subjected to can be solved, the studies will be greatly expedited. There is some doubt in my mind that we can put a band or tag on the animal and keep it there, but I shall certainly not give it up until considerable effort has proven it to be futile. It appears that ear tags will be the only possibility with pups, for the digits are much smaller than in an adult. This is also true in the case of the subadults.

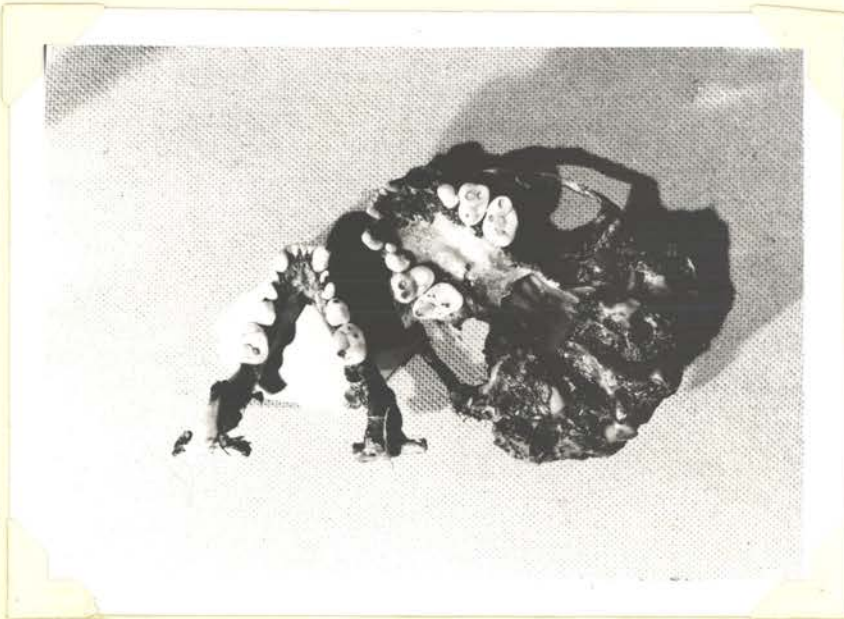


Fig. 17 Severe cavities are present in the teeth of adult Sea Otter

We are indebted to Mr. Elmer G. Hanson for material assistance in the

field at Amchitka. The Air Force has been most cooperative in providing transportation at no cost, both from the standpoint of aircraft and motor vehicles. Many individuals of the Air Force and the Army Transportation Corps might herein be named as cooperators but it would make a rather long compilation. Specific assistance was extended by Capt. Floyd Puckett, commander at Amchitka, Lt. Samuel Robinson of the Army Transportation Service at Adak, and Lt. Orin J. Roys, Special Service Officer and pilot at Adak. We are indebted to Capt. John K. White, Medical Officer at Cold Bay for lending his medical knowledge to the present problem and to planning for the future. Frankly, without the assistance of these men and many others along the line we are not yet set up to achieve much in the way of Sea Otter studies and I mention it here lest at some time in the future when we are better equipped we forget who helped us now.

field at Annapolis. The Air Force has been most cooperative in providing transportation at no cost, both from the standpoint of aircraft and motor vehicles. Many individuals of the Air Force and the Army have been very helpful in making arrangements but it would be a rather long compilation. General's assistance was rendered by Capt. Floyd Finkbeiner, commander of Annapolis, Lt. General Robinson of the Army Transportation Service at Annapolis, and Lt. Col. J. Hays, Special Service Officer and Chief of Staff, who are indebted to Capt. John E. White, Medical Officer at Cold Bay for handling his medical personnel to the present problem and to planning for the future. Finally, without the assistance of these men and many others along the line we are not yet up to achieve much in the way of new ideas and I mention it here just at some time in the future when we are better acquainted with those who helped us now.

