ALASKA DEPARTMENT OF FISH AND GAME

JUNEAU, ALASKA

STATE OF ALASKA
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MARINE MAMMAL REPORT

by

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Volume X
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Project W-14-R-3 and W-17-1, Work Plan G

(Printed May, 1969)

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-14-R-3 and W-17-1 TITLE: Marine Mammal Investigations

WORK PLAN: G TITLE: Sea Lions, Sea Otters, Hair Seals, and Beluga Whales

JOB: 1 TITLE: Sea Lions

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To determine factors relating to the breeding biology and productivity of sea lions.

To inventory and classify rookery and hauling out grounds.

To obtain information on the molt of sea lions.

To monitor all commercial operations engaged in the harvesting of sea lion pups and adults.

TECHNIQUES

No field work was accomplished on the first three objectives as personnel were working on a sea otter transplant from Amchitka Island to Southeast Alaska. Sea lion pup harvesting operations were monitored by temporary Department personnel on Sugarloaf Island and Marmot Island during June.

FINDINGS

Sugarloaf Island

During twelve days of harvesting activities starting on June 2 and ending on June 13, 1968, nine hunters collected a total of 1,968 sea lion pups at Sugarloaf Island. No adult animals were harvested. The number of pups taken in previous years is shown in Table 1.

There was a noticeable decline from the previous year in the number of adults and pups found on the island. Based on ground and boat surveys, the total pup production was estimated to be in the area of 3,000 animals. In 1967 it was estimated that a minimum of 5,200 had been born on the island.

Most of the animals were found along the south and southeast side of the island, areas which are difficult to get to by the hunters. The north side of the island in past years had the highest concentrations of animals. Disturbance by the hunters before the animals have established territories appears to be the major reason for the change in distribution. The reason for the decline in the adult population is not understood. The population at Sugarloaf Island has been fluctuating widely since our first visit in 1963 whereas Marmot Island, which is approximately 50 miles away, has remained fairly constant. Hunters have been harvesting on both islands for a number of years.

Marmot Island

A total of 2,150 pups were harvested at Marmot Island during the month of June. This compares with a harvest of 2,675 animals in 1967. No adult animals were taken.

The total pup production for the island exceeded 5,000 animals. Most of the animals were again found in a large bite on the south side near the center of the island. A large rocky expanse of beach on the southwest corner of the island again failed to attract many adult animals in spite of the fact that the hunters did not arrive at the island until after the animals had established territories. This particular stretch of beach prior to 1966 generally contained at least 50 percent of the adult and pup populations on the island. It has been abandoned since hunters have been using the area for a camp site.

Other Areas

Permits were issued to two other hunting parties who engaged in harvesting activities but whose operations were not monitored. One party of two hunters is reported to have taken approximately 80 pups from Akutan Island. The second party, a mink rancher from Sitkalidak Island, is reported to have taken 30 adult animals for mink food. Most of the collected were females.

Table 1. Sea lion harvest.

	1964	1965	1966	1967	1968
Sugarloaf Island	1500	2005	1400	2180	1968
Marmot Island	-	1024	1650	2675	2150
Akutan Island	-	1659	857	-	80
Jude Island	-	72	-	-	-
Atkins Island	-	259	-	-	-
Round Island	-	574	-	-	-

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-14-R-3 and W-17-1 TITLE: Marine Mammal Investigations

WORK PLAN: G TITLE: Sea Lions, Sea Otters, Hair Seals and Beluga Whales

JOB NO: 2 TITLE: Sea Otter

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

1. To determine population abundance, distribution and trends of sea otters in the coastal waters from Prince William Sound to the Near Islands.

2. To obtain information relating to the molt, breeding biology, population, sex and age composition, growth and food habits of the sea otters in selected parts of its range.

3. To evaluate the success of transplanted sea otters and to monitor populations and habitat changes at release sites.

TECHNIQUES

Surveys

On April 30, 1968 an aerial survey of sea otters was made around Tanaga, Kanaga, Adak and Kagalaska Islands. An Aero Commander 500B aircraft was flown around each island slightly off shore at an altitude of 300 feet and an airspeed of 90 mph. One observer sat next to the pilot and counted animals near shore and ahead of the aircraft. Another observer sat behind the pilot and counted off shore and a third observer recorded sightings and watched for animals missed by the first observer.

A 10 to 13 knot westerly wind blew throughout the survey. In the morning there were scattered clouds which increased to a broken overcast with occasional rain showers. Showers and surface glare impaired visibility in some areas.

Between June 15 and June 20, portions of Tanaga and Kanaga Islands were surveyed from a skiff. One observer counted while another individual operated the skiff. An attempt was made to get into all bays and around off-shore rocks. Where dense kelp beds were extensive, it was sometimes necessary to stay a mile off shore. Choppy seas reduced visibility on parts of the count around Kanaga and the Cape Sudak area of Tanaga. However, calm seas and a high overcast created excellent counting conditions for most of the survey.

On June 25, all of Adak Island except the Cape Moffet-Cape Adagdak area was surveyed from a U.S. Navy helicopter. The helicopter was flown slightly off shore at an altitude of 100 feet and an airspeed of 60 mph. One observer kneeled behind the cockpit and looked out between the pilot and copilot, who also helped spot animals. An attempt to have another observer count off-shore failed because of the seating arrangement and voice communication problems. Coverage of an area within 200 yards of shore was very good but off-shore coverage was poor. Weather conditions produced exellent visibility.

During July and August, several surveys were flown around Amchitka Island in a Sikorsky S-55 helicopter at an altitude of 100 to 150 feet and an airspeed of 50 to 60 mph. One observer sat next to the pilot. These counts were made at different times of day and under different conditions of visibility to determine some of the factors affecting counts and the degree of variability that can occur as a result of these factors. These counts have been continued by U.S. Fish and Wildlife Service personnel.

Specimen Collection

Data were collected from 667 sea otters in 1968. These animals were killed during the annual, State-financed harvest on Kanaga and Adak Islands; died during transplanting operations on Amchitka Island; or were found dead on beaches throughout Alaska. Collection and analysis of specimen material were financed by Federal Aid in Wildlife Restoration funds.

Body measurements, including weight, curvilinear length and girth behind the forelegs, were taken from most of the animals collected. Female reproductive tracts and skulls or teeth were collected whenever possible. Collections of stomach contents and testes were restricted by time and collecting conditions. In June and July, pelage samples were collected from 75 Amchitka pelts.

Female Reproductive Tracts

Female reproductive tracts were examined from 456 animals collected at Adak and Amchitka Islands. Ovaries were weighed, sliced to a thickness of approximately 1 mm and examined macroscopically for follicles, corpora lutea and corpora albicantia. The horns of the uterus were measured and examined for placental scars. Weight, crown-rump and total length measurements were taken from each fetus and the sex, horn of pregnancy and presentation (caudal or cephalic) were recorded.

Animals were considered nulliparous on the basis of the appearance of the uterine horns. Proestrous and estrous animals have been lumped together for the present. If an animal had one or more follicles over 3.5 mm in diameter, it was considered either proestrous or estrous. The presence of a corpus luteum with no evidence of implantation was considered an unimplanted pregnancy. Animals considered postpartum had a fresh looking placental scar, a slightly enlarged horn and a large, fresh looking corpus albicans. These criteria are somewhat arbitrary but are the best we can use at our present state of knowledge.

Reproductive tracts collected at Adak Island were inadvertently frozen after being fixed in formalin resulting in considerable tissue damage. This made it more difficult to recognize faint placental scars and older corpora albicantia.

Reproductive tracts collected during the 1968 harvest from Adak and Kanaga Islands have not been examined.

Age Determination

Experiments in 1967 revealed the presence of cementum layers in sea otter teeth. In 1968, a number of methods for preparation of tooth sections were tried. Most of these involved decalcifying the tooth and staining frozen sections, but fluorescence microscopy was also tried. Staining with Harris' Hemotoxylin and Paragon Multiple Stain for Frozen Sections produced useable results; longitudinal sections of the first, lower premolar stained with Giemsa's stain produced the best results. Several hundred teeth have been prepared by this method including one from a known-age animal obtained from Karl Kenyon of the U.S.F.W.S.

Food Habits

Stomach contents from animals collected on the 1967 harvest have been partially identified. Additional entire stomachs or complete stomach contents were collected from some animals collected in 1968. A lack of time and manpower prevented large collections.

Pelt Quality

Records of individual pelts were kept to permit analysis of the effects of pelt size and color, age and sex, and location and time of kill on the price of pelts. No detailed study has been made of the pelt samples collected thus far.

Analysis of skull and baculum measurements and testes has been deferred in favor of higher priority material.

Transplanted Populations

No surveys were made specifically to locate transplanted sea otters in 1968, however a reconnaissance flight to locate possible release sites

for a new transplant was made in southeastern Alaska and a short search for otter was made near the original release site. A file has been kept on sightings reported by the public.

During the summer of 1968 the Alaska Department of Fish and Game in cooperation with the Atomic Energy Commission transplanted 302 sea otters to several points in southeastern Alaska and 57 to the Pribilof Islands. This additional transplant will make further evaluation of the 1965 and 1966 transplants impossible. Surveys will be made periodically to determine the success of the new transplants.

FINDINGS

Surveys

The results of the April 30 aerial survey are as follows:

Tanaga Island	584
Kanaga Island	456
Adak Island	679
Kagalaska Island	304

The Tanaga, Kanaga, and Adak counts are approximately half those made by the U.S. Fish and Wildlife Service in 1965. The Kagalaska count was slightly higher. The lower counts may be attributed to survey conditions, less experienced observers, time of day or possibly actual changes in the population. Subsequent counts do not substantiate the idea of a large reduction in the population. In fact, the Kagalaska count may indicate a substantial increase on that island. Such an increase would be consistent with population trends in the area.

The skiff survey covered the area on Tanaga Island from the head of Tanaga Bay, around the south side of the island and north to the tip of Cape Sudak and on Kanaga Island from the point east of Ship Rock around the south side to Round Head. The counts were as follows:

Tanaga Island	1703 adults	120 pups
Kanaga Island	2149 adults	143 pups

The pup counts are minimal and should not be considered true indicators of population composition.

In the area covered by both skiff and aerial surveys, 5.3 times as many adults on Tanaga and 5.8 times as many on Kanaga were seen from the skiff. By applying these factors to the entire islands, estimates of what the skiff counts would have been if the entire islands were counted are 3049 adults for Tanaga and 2619 adults for Kanaga. There are obvious potential problems with this type of estimate but they should be adequate for rough comparison

The helicopter count around Adak covered the shore from Shagak Bay around the south side of the island and up to Sweeper Cove. The principal observer counted 1620 adults and 67 pups. A second observer counted 644; some of these, possibly half, were duplications of those counted by the principal observer. This is three times the fixed-wing aerial count.

Fog at Amchitka prevented repeated, comparable counts, but the counts that were made illustrate some interesting points. On July 8, 1968 a total count of 886 adults was made in the morning. On this count, 194 were seen between Kirilof Point and Chitka Point. On July 12, 335 were counted in this same area in the evening. The difference can be attributed in part to better visibility, but the primary difference is probably the activity of the sea otters. In the morning, they are scattered and feeding. In the evening they tend to rest in groups in the kelp beds making them easier to count. This was further illustrated on the evening of August 8 when a count of all of the island except the northwest end showed 1664 adults. Between the two counts approximately 350 sea otters had been removed from the island during transplanting operations.

The U.S. Fish and Wildlife Service has continued the counts and have reported seeing over 2300 on a single count. A 1965 fixed-wing aerial count made by the U.S.F.W.S. showed 1,144 animals. Over 700 animals were removed from the population through harvests, scientific experiments and transplants between September 1967 and August 1968 making a significant increase in the population since 1965 unlikely. The differences in counts are probably due to variations in counting techniques and conditions.

Some serious questions about the value of certain survey techniques are raised by the above counts. Fixed-wing aerial counts are obviously very low. One fixed-wing count may be comparable to another, however many factors influence these counts. Experience of observers and pilots, weather conditions preceeding and during the count, time of day, visibility, tide conditions, time of year as related to distribution and density of kelp beds and conformation of the shore line are some of the factors that affect all types of counts.

Helicopter counts tend to be higher than fixed-wing counts, but again are influenced by many factors and may be sufficient to detect only major changes in populations.

The skiff counts have given the highest counts, however it is obvious that even these are quite low. Animals off shore, diving or in dense kelp are often missed. In an area where 320 otter were counted by skiff on June 18, 1968, two hunters killed 121 in 5.5 hours on October 15. Similarly, on October 20, 82 animals were killed in an area where 139 were counted from a helicopter on June 25 and 31 from a fixed-wing aircraft on April 30. Also, no change was evident in fixed-wing counts in the Bay of Islands on Adak after 300 had been removed. These examples do not mean much by themselves but tend to illustrate possible deficiencies in survey techniques.

Because there are many factors influencing counts, it is difficult to estimate population sizes and to compare either populations on different islands or the same population from year to year. The skiff count on Kanaga was probably poorer than that on Tanaga and the Adak helicopter count was undoubtedly poorer than either skiff count. Estimates of 4,000 sea otters, exclusive of dependent pups, on each of Tanaga, Kanaga and Adak and 3,000 on Amchitka are probably conservative and should be safe working estimates.

Body Measurements

Body measurements, date and location of kill, cause of death and sex of the animals collected are listed in Table 1. Girth measurements may be exaggerated on some animals that died during the transplant because of rigor mortis. Weights are only approximate because of blood loss and accumulation of water on the fur. Some animals exhibited a substantial weight loss in captivity. The weights given are those taken at time of death.

Reproduction

The stages in the reproductive cycle of the female reproductive tracts are summarized in Table 2. Analysis of the information is not complete and will not be reported in detail until more information is available.

These samples were not collected randomly and several sources of bias should be considered before conclusions are drawn from these data. The 1967 samples were shot by hunters who attempted to select larger, single animals. This means a larger proportion of males and females that are nulliparous or are proestrous, estrous, or pregnant in the sample than in the population. Females with pups which would be postpartum or anestrous were avoided but are represented in small numbers in the samples. The higher percentage of nulliparous animals in the Amchitka sample may be due to poorer hunting conditions giving the hunters less choice as to animal size. The 1968 Amchitka sample consists of animals that died as a result of handling during a transplant operation. It is likely that pregnant animals, particularly those supporting a large fetus, would be more susceptible to injury when handled. Three females with large fetuses died when the fetus rotated, twisting the horns of the uterus and the large intestine together causing internal bleeding. Collecting techniques for the two 1967 samples may be comparable, but neither sample is comparable with the 1968 Amchitka sample.

Twinning

Four instances of twin fetuses were found in the tracts examined. Two of these were from Adak animals taken in September. The other two were from Amchitka, one in October and one in July. In all four cases, both fetuses were in the same horn, but had separate placentas. In one instance both were males, another, both females, and in the other two cases one of each sex. Two corpora lutea were found in each case. Three had both corpora

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068- 2	2/16	Constantine Hbr., Hinchinbrook I.	♂	26	107	42	Collected
3	2/19	Green I.,Prince William Sound	♂	68	140	57	"
4	2/14	Boswell Bay Hinchinbrook I.	♀	40	126	42	Beach Dead
22	6/4	Tugidak I.	♂	-	150	64	"
26	6/23	Bat I. - Cr. Reefer, Amchitka I.	♀	56	126	51	Transplant
27	"	" " "	♀	45	125	43	"
28	"	" " "	♀	38	128	47	"
29	6/25	" " "	♀	46	123	47	"
30	"	" " "	♀	43	122	48	"
31	"	" " "	♀	49	128	50	"
32	"	" " "	♀	11	67	42	"
33	6/27	" " "	♀	50	130	51	"
34	6/28	" " "	♀	11	84	26	"
35	"	" " "	♀	54	129	52	"
36	"	" " "	♀	60	130	50	"
37	"	" " "	♀	48	121	51	"
38	"	" " "	♀	59	130	49	"
39	6/29	" " "	♀	56	131	49	"
40	"	" " "	♀	46	126	46	"
42	6/30	" " "	♀	42	126	54	"
43	"	" " "	♀	51	122	56	"
44	"	" " "	♂	48	132	53	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-45	6/30	Bat I. - Cr. Reefer, Amchitka I.	♂	65	139	60	Transplant
46	"	"	♀	42	128	55	"
47	"	"	♀	36	112	52	"
49	7/1	"	♀	34	116	44	"
50	"	"	♂	62	144	55	"
51	"	"	♀	44	130	46	"
52	"	"	♂	62	135	58	"
53	"	"	♂	22	99	35	"
54	"	"	♀	50	135	48	"
55	"	"	♀	45	127	52	"
56	"	"	♂	32	113	47	"
57	7/2	"	♂	42	136	51	"
58	7/3	"	♀	28	103	40	"
59	"	"	♀	56	131	49	"
60	"	"	♂	52	138	55	"
61	"	"	♀	50	138	58	"
62	7/4	"	♀	48	128	48	"
63	"	"	♂	26	106	37	"
64	"	"	♀	30	109	43	"
65	7/5	"	♂	23	96	38	"
66	"	"	♀	46	139	47	"
67	"	"	♂	47	134	50	"
68	"	"	♂	34	111	39	"
69	"	"	♂	50	140	50	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-70	7/5	Bat I. - Cr. Reefer, Amchitka I.	♀	42	126	49	Transplant
71	7/7	" " "	♂	36	115	48	"
72	"	" " "	♀	48	129	49	"
73	"	" " "	♂	36	125	46	"
74	"	" " "	♀	56	132	45	"
75	7/8	" " "	♀	9	85	29	"
76	7/9	" " "	♂	44	125	46	"
77	"	" " "	♂	50	129	48	"
78	7/10	" " "	♀	31	111	41	"
79	"	" " "	♀	38	117	44	"
80	7/13	" " "	♀	6	76	22	"
81	7/7	" " "	♀	28	115	37	"
82	7/14	" " "	♂	34	127	45	"
83	7/17	Amchitka	♂	28	117	38	Beach Dead
84	4/7	Rifle Range Pt., Anchitka	♀	46	125	48	"
85	4/7	" "	♂	19	100	35	"
86	4/7	" "	♂	17	98	35	"
87	7/16	Cr. Reefer-Ivakin Pt., Amchitka	♀	17	89	34	Transplant
88	7/17	" " "	♂	26	104	30	"
89	"	" " "	♀	46	131	50	"
90	7/18	" " "	♂	28	109	46	"
91	"	" " "	♀	54	132	54	"
92	7/20	" " "	♂	30	107	48	"
93	"	" " "	♀	59	132	59	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-94	7/20	Cr. Reefer-Ivakin Pt., Amchitka	♀	46	123	52	Transplant
95	7/21	" " "	♂	35	112	45	"
96	7/22	" " "	♀	18	-	-	"
97	"	" " "	♂	45	120	51	"
98	7/25	" " "	♂	56	136	53	"
99	"	" " "	♂	62	140	58	"
103	7/27	" " "	♂	35	110	42	"
104	"	" " "	♂	28	102	34	"
105	"	" " "	♀	57	130	48	"
106	"	" " "	♀	50	135	48	"
107	"	" " "	♀	54	134	46	"
108	"	" " "	♀	30	108	35	"
109	7/28	" " "	♀	44	131	51	"
110	7/30	" " "	♂	28	107	39	"
111	"	" " "	♀	28	104	30	"
112	7/31	" " "	♀	52	129	53	"
113	"	" " "	♀	30	103	41	"
114	8/1	" " "	-	42	115	49	"
115	8/2	" " "	♀	55	127	58	"
116	"	" " "	♀	45	129	55	"
118	8/5	" " "	♀	36	104	48	"
119	"	" " "	♀	33	119	43	"
120	"	" " "	♀	32	114	41	"
121	8/7	" " "	♀	26	99	38	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-122	8/7	Cr. Reefer-Ivakin Pt.,Amchitka	♀	38	97	38	Transplant
123	"	" " "	♀	40	115	48	"
124	"	" " "	♀	54	125	53	"
125	8/8	Crown Reefer Pt., Anchitka	♀	50	125	51	"
126	"	" "	♂	40	125	46	"
127	"	" "	♀	44	127	53	"
128	"	" "	♀	31	112	38	"
129	"	" "	♀	42	132	46	"
130	"	" "	♂	42	119	46	"
131	"	" "	♀	44	130	48	"
132	8/9	" "	♀	48	132	56	"
133	"	St. Makarius Bay, Amchitka	♀	48	130	53	"
134	"	Cyril Cove, Amchitka	♀	41	127	46	"
135	8/10	Crown Reefer Pt., Amchitka	♀	40	125	51	"
136	8/13	Cyril Cove, Amchitka	♀	43	130	51	"
137	"	" "	♂	41	130	48	"
140	9/?	Adak Island	♀	23	109	38	Beach Dead
141	10/12	Round Hd.-Shoal Pt.,Kanaga I.	♀	35	121	44	Harvest
142	"	" " "	♂	41	121	43	"
143	"	" " "	♀	37	108	40	"
144	"	" " "	♂	34	120	44	"
145	"	" " "	♂	42	116	45	"
146	"	" " "	♀	41	128	41	"
147	"	" " "	♂	31	110	40	"
148	"	" " "	♀	42	124	43	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-149	10/12	Round Hd.-Shoal Pt., Kanaga I.	♂	80	149	57	Harvest
150	"	"	♂	40	123	45	"
151	"	"	♂	49	131	48	"
152	"	"	♀	33	112	39	"
153	"	"	♀	53	134	44	"
154	"	"	♀	52	136	44	"
155	"	"	♀	46	133	44	"
156	"	"	♀	42	117	40	"
157	"	"	♀	51	135	47	"
158	"	"	♂	15	88	29	"
159	"	"	♀	46	127	41	"
160	"	"	♂	26	100	33	"
161	"	"	♀	44	126	44	"
162	"	"	♀	47	129	42	"
163	"	"	♀	47	130	43	"
164	"	"	♀	42	131	43	"
165	"	"	♂	41	116	41	"
166	"	"	♀	44	127	39	"
167	"	"	♂	6	64	21	"
168	"	"	♂	34	109	39	"
169	"	"	♀	34	114	38	"
170	"	"	♀	40	122	45	"
171	"	"	♂	42	118	41	"
172	"	"	♂	57	136	52	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-173	10/12	Round Head-Shoal Pt., Kanaga I.	♂	44	141	42	Harvest
174	"	"	♂	65	145	51	"
175	"	"	♂	53	134	49	"
176	"	"	♂	75	142	54	"
177	"	"	♂	33	114	39	"
178	"	"	♀	42	121	44	"
179	"	"	♀	47	130	45	"
180	"	"	♀	42	128	44	"
181	"	"	♀	30	110	35	"
182	"	"	♀	38	113	43	"
183	"	"	♂	36	114	39	"
184	"	"	♂	65	141	55	"
185	"	"	♂	71	142	55	"
186	"	"	♂	53	135	51	"
187	"	"	♀	15	87	29	"
188	"	"	♀	29	110	39	"
189	"	"	♂	28	104	34	"
190	"	"	♀	50	133	51	"
191	"	"	♀	46	125	43	"
192	10/13	Naga Pt., Kanaga I.	♀	40	127	41	"
193	"	"	♀	50	134	48	"
194	"	"	♀	42	129	40	"
195	"	"	♀	54	141	48	"
196	"	"	♀	40	130	43	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-197	10/13	Naga Pt., Kanaga Island	♀	50	132	46	Harvest
198	"	" "	♂	67	141	52	"
199	"	" "	♀	47	130	43	"
200	"	" "	♀	42	128	41	"
201	"	" "	♀	43	128	42	"
202	"	" "	♀	62	133	46	"
203	"	" "	♀	50	137	47	"
204	"	" "	♀	18	94	29	"
205	"	" "	♀	18	93	30	"
206	"	" "	♀	39	126	42	"
207	"	" "	♀	53	132	46	"
208	"	" "	♂	22	102	33	"
209	"	" "	♂	61	136	52	"
210	"	" "	♀	39	126	39	"
211	"	" "	♀	42	126	43	"
212	"	" "	♀	53	140	49	"
213	"	" "	♀	42	123	43	"
214	"	" "	♀	52	136	45	"
215	"	" "	♀	53	136	45	"
216	"	" "	♂	68	144	56	"
217	"	" "	♂	18	91	32	"
218	"	" "	♀	43	126	45	"
219	"	" "	♀	54	134	46	"
220	"	" "	♀	51	131	48	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-221	10/13	Naga Pt., Kanaga Island	♀	20	93	36	Harvest
222	"	" "	♀	36	119	40	"
223	"	" "	♀	43	126	44	"
224	"	" "	♀	62	133	48	"
225	"	" "	♀	48	130	45	"
226	"	" "	♂	71	144	58	"
227	"	" "	♀	46	132	42	"
228	"	" "	♂	75	144	58	"
229	"	" "	♀	48	132	43	"
231	"	Naga Pt.-Kanaga Bay, Kanaga I.	♀	50	134	43	"
232	"	" " "	♂	70	141	57	"
233	"	" " "	♀	39	120	40	"
234	"	" " "	♂	70	146	55	"
235	"	" " "	♂	80	150	54	"
236	"	" " "	♀	51	140	41	"
237	"	" " "	♂	74	147	54	"
238	"	" " "	♀	46	131	40	"
239	"	" " "	♂	64	140	53	"
240	"	" " "	♂	24	97	33	"
241	"	" " "	♀	48	131	40	"
242	"	" " "	♀	28	103	36	"
243	"	" " "	♀	50	134	44	"
244	"	" " "	♀	44	133	42	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-245	10/13	Naga Pt.-Kanaga Bay, Kanaga I.	♀	41	125	40	Harvest
246	"	" " "	♀	45	129	41	"
247	"	" " "	♀	19	97	34	"
248	"	" " "	♀	49	131	44	"
249	"	" " "	♀	45	121	43	"
250	"	" " "	♀	42	133	44	"
251	"	" " "	♀	55	130	44	"
252	"	" " "	♀	43	132	42	"
253	"	" " "	♀	56	131	48	"
254	"	" " "	♀	23	99	34	"
255	"	" " "	♀	55	135	47	"
256	"	" " "	♀	57	135	49	"
257	"	" " "	♀	50	130	48	"
258	"	" " "	♀	50	127	49	"
259	"	" " "	♀	52	128	48	"
260	"	" " "	♂	82	154	57	"
261	"	" " "	♀	57	135	48	"
262	"	" " "	♀	47	121	47	"
263	"	" " "	♀	35	127	40	"
264	"	" " "	♀	45	121	45	"
265	"	" " "	♂	21	98	39	"
266	"	" " "	♀	39	121	44	"
267	"	" " "	♀	44	123	46	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-268	10/13	Naga Pt.-Kanaga Bay, Kanaga I.	♀	13	83	27	Harvest
269	"	"	♂	77	149	58	"
270	10/14	C.Chlanak-C.Tusik, Kanaga I.	♀	44	127	41	"
271	"	"	♀	36	115	38	"
272	"	"	♀	69	133	46	"
273	"	"	♂	19	93	33	"
274	"	"	♀	57	134	46	"
275	"	"	♀	45	129	45	"
276	"	"	♀	49	123	47	"
277	"	"	♂	35	111	39	"
278	"	"	♀	44	123	41	"
279	"	"	♀	53	138	47	"
280	"	"	♀	48	134	45	"
281	"	"	♀	28	105	38	"
282	"	"	♀	42	134	48	"
283	"	"	♀	35	111	39	"
284	"	"	♀	42	126	40	"
285	"	"	♂	22	98	33	"
286	"	"	♂	63	138	52	"
287	"	"	♂	25	99	34	"
288	"	"	♀	47	135	44	"
289	"	"	♂	64	136	54	"
290	"	"	♀	46	122	44	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-291	10/14	C.Chlanak-C.Tusik, Kanaga I.	♀	68	134	48	Harvest
292	"	" " "	♀	45	129	44	"
293	"	" " "	♂	73	144	57	"
294	"	" " "	♂	70	140	55	"
295	"	" " "	♀	45	133	42	"
296	"	" " "	♀	35	113	37	"
297	"	" " "	♂	67	141	52	"
298	"	" " "	♂	81	146	57	"
299	"	" " "	♂	35	110	38	"
300	"	" " "	♀	59	139	48	"
301	"	" " "	♂	90	147	65	"
302	"	" " "	♀	50	131	48	"
303	"	" " "	♀	55	134	44	"
304	"	" " "	♀	48	131	42	"
305	"	" " "	♂	21	96	34	"
306	"	" " "	♀	35	118	45	"
307	"	" " "	♀	34	111	42	"
308	"	" " "	♀	50	139	44	"
309	"	" " "	♂	65	139	52	"
310	"	" " "	♀	52	130	48	"
311	"	" " "	♀	44	126	44	"
312	"	" " "	♂	32	110	38	"
313	"	" " "	♀	37	122	42	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-314	10/14	C.Chlanak-C.Tusik, Kanaga I.	♂	14	86	29	Harvest
315	"	"	♀	47	137	43	"
316	"	"	♀	57	131	50	"
317	"	"	♀	43	126	43	"
318	"	"	♀	59	138	49	"
319	"	"	♂	73	144	56	"
320	"	"	♀	23	98	36	"
321	"	"	♀	41	128	46	"
322	"	"	♀	49	129	46	"
323	"	"	♂	78	145	58	"
324	"	"	♂	25	102	37	"
325	"	"	♀	45	131	44	"
326	"	"	♂	25	103	34	"
327	"	"	♂	82	143	60	"
328	"	"	♀	25	99	37	"
329	"	"	♀	46	130	46	"
330	"	"	♀	32	120	41	"
331	"	"	♀	47	130	47	"
332	"	"	♀	47	128	47	"
333	"	"	♀	49	133	46	"
338	10/15	Eddy Rk-Hive Rk, Kanaga I.	♂	43	126	45	"
339	"	"	♂	41	121	42	"
340	"	"	♀	27	106	37	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-341	10/15	Eddy Rk-Hive Rk, Kanaga I.	♂	40	122	42	Harvest
342	"	" " "	♀	45	127	44	"
343	"	" " "	♂	38	117	39	"
344	"	" " "	♀	36	113	38	"
345	"	" " "	♀	38	126	42	"
346	"	" " "	♀	42	125	45	"
347	"	" " "	♀	50	129	43	"
348	"	" " "	♀	48	133	46	"
349	"	" " "	♂	34	112	39	"
350	"	" " "	♂	32	107	39	"
351	"	" " "	♂	55	141	48	"
352	"	" " "	♀	38	121	42	"
353	"	" " "	♂	55	139	50	"
354	"	" " "	♂	36	117	42	"
355	"	" " "	♂	40	116	41	"
356	"	" " "	♀	35	113	39	"
357	"	" " "	♂	53	138	46	"
358	"	" " "	♂	43	123	45	"
359	"	" " "	♀	45	127	45	"
360	"	" " "	♂	36	118	39	"
361	"	" " "	♂	64	138	57	"
362	"	" " "	♂	46	128	48	"
363	"	" " "	♂	36	121	44	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-364	10/15	Eddy Rk-Hive Rk, Kanaga I.	♂	47	132	47	Harvest
365	"	" " "	♂	36	111	42	"
366	"	" " "	♂	31	105	42	"
367	"	" " "	♂	62	140	48	"
368	"	" " "	♀	45	126	42	"
369	"	" " "	♂	22	98	34	"
370	"	" " "	♀	55	144	47	"
371	"	" " "	♂	65	138	50	"
372	"	" " "	♀	43	127	40	"
373	"	" " "	♀	49	133	43	"
374	"	" " "	♀	43	128	40	"
375	"	" " "	♀	29	98	38	"
376	"	" " "	♀	54	130	44	"
377	"	" " "	♂	72	143	57	"
378	"	" " "	♀	42	128	41	"
379	"	" " "	♂	31	101	38	"
380	"	" " "	♀	43	127	41	"
381	"	" " "	♀	36	110	42	"
382	"	" " "	♀	50	133	44	"
383	"	" " "	♂	58	136	50	"
384	"	" " "	♀	45	129	42	"
385	"	" " "	♀	43	123	41	"
386	"	" " "	♀	32	105	48	"
387	"	" " "	♀	38	124	40	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-388	10/15	Eddy Rk-Hive Rk, Kanaga I.	♀	50	131	44	Harvest
389	"	"	♂	43	131	43	"
390	"	"	♀	45	127	46	"
391	"	"	♀	45	126	42	"
392	"	"	♀	49	128	43	"
393	"	"	♀	52	127	46	"
394	"	"	♂	63	142	55	"
395	"	"	♂	22	96	33	"
396	"	"	♀	45	127	44	"
397	"	"	♀	50	128	46	"
398	"	"	♀	44	126	46	"
399	"	"	♂	50	135	47	"
400	"	"	♀	47	129	45	"
401	"	"	♀	49	126	42	"
402	"	"	♀	44	121	45	"
403	"	"	♀	57	133	47	"
404	"	"	♀	46	129	48	"
405	"	"	♀	43	125	42	"
406	"	"	♂	72	138	53	"
407	"	"	♀	40	117	42	"
408	"	"	♂	60	135	49	"
409	"	"	♂	60	141	50	"
410	"	"	♀	37	119	43	"
411	"	"	♀	55	126	48	"
412	"	"	♂	71	145	57	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-413	10/15	Eddy Rk.-Hive Rk., Kanaga I.	♀	40	120	44	Harvest
414	"	" " "	♀	42	130	44	"
415	"	" " "	♀	53	131	48	"
416	"	" " "	♂	72	140	55	"
417	"	" " "	♂	53	138	48	"
418	"	" " "	♂	34	114	37	"
419	"	" " "	♂	65	145	55	"
420	"	" " "	♀	14	84	27	"
421	"	" " "	♀	52	127	46	"
422	"	" " "	♂	52	127	48	"
423	"	" " "	♂	42	125	45	"
424	"	" " "	♀	35	112	36	"
425	"	" " "	♀	51	134	46	"
426	"	" " "	♀	41	124	42	"
427	"	" " "	♀	22	97	33	"
428	"	" " "	♂	49	133	48	"
429	"	" " "	♂	30	106	37	"
430	"	" " "	♀	49	-	45	"
431	"	" " "	♀	48	130	46	"
432	"	" " "	♂	44	125	44	"
433	"	" " "	♀	46	129	47	"
434	"	" " "	♂	65	141	52	"
435	"	" " "	♂	49	137	44	"
436	"	" " "	♀	57	137	48	"
437	"	" " "	♀	42	123	45	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-438	10/15	Eddy Rk.-Hive Rk., Kanaga I.	♂	76	142	58	Harvest
439	"	" " "	♀	41	123	42	"
440	"	" " "	♂	34	114	41	"
441	"	" " "	♂	49	134	46	"
442	"	" " "	♂	65	139	53	"
443	"	" " "	♂	38	114	39	"
444	"	" " "	♀	47	129	44	"
445	"	" " "	♀	37	116	43	"
446	"	" " "	♂	38	117	37	"
447	"	" " "	♀	35	118	42	"
448	"	" " "	♂	58	135	46	"
449	"	" " "	♂	44	123	43	"
450	"	" " "	♂	68	139	59	"
451	"	" " "	♂	19	94	30	"
452	"	" " "	♂	56	135	49	"
453	"	" " "	♀	41	119	43	"
454	"	" " "	♀	38	121	40	"
455	"	" " "	♂	35	112	39	"
456	"	" " "	♀	52	126	44	"
457	"	" " "	♂	35	113	39	"
458	"	" " "	♂	41	126	42	"
459	10/17	Three Arm Bay, Adak I.	♂	84	156	53	"
460	"	" "	♀	46	134	43	"
461	"	" "	♀	38	129	40	"
462	"	" "	♀	58	142	50	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-463	10/17	Three Arm Bay, Adak I.	♀	46	132	50	Harvest
464	"	" "	♀	37	121	40	"
465	"	" "	♀	43	132	43	"
466	"	" "	♀	52	140	49	"
467	"	" "	♀	34	117	37	"
468	"	" "	♀	45	134	45	"
470	"	" "	♀	42	127	46	"
471	"	" "	♂	19	90	29	"
472	"	" "	♂	74	150	53	"
473	"	" "	♀	54	139	48	"
474	10/18	Bay of Islands, Adak I.	♀	45	131	40	"
475	"	" "	♂	11	79	29	"
476	"	" "	♀	44	126	44	"
478	"	" "	♀	43	131	42	"
479	"	" "	♀	53	130	46	"
480	"	" "	♀	46	139	42	"
481	"	" "	♀	21	104	29	"
482	"	" "	♀	40	127	42	"
483	"	" "	♀	51	139	43	"
484	"	" "	♀	44	130	44	"
485	"	" "	♀	47	138	43	"
486	"	" "	♀	50	130	46	"
487	"	" "	♂	74	150	55	"
488	"	" "	♂	72	148	55	"
489	"	" "	♂	80	146	47	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-490	10/18	Bay of Islands, Adak I.	♀	40	124	39	Harvest
491	"	" "	♀	52	137	44	"
492	"	" "	♀	39	124	43	"
493	"	" "	♀	46	129	40	"
494	"	" "	♀	46	132	42	"
495	"	" "	♀	46	132	46	"
496	"	" "	♀	39	131	40	"
497	"	" "	♀	63	141	47	"
498	"	" "	♀	32	112	39	"
499	"	" "	♀	57	132	48	"
500	"	" "	♀	43	131	43	"
501	"	" "	♀	25	98	35	"
502	"	" "	♂	20	96	31	"
503	"	" "	♂	17	94	29	"
504	"	" "	♀	41	127	40	"
505	"	" "	♀	35	115	38	"
506	"	" "	♀	41	130	46	"
507	"	" "	♀	43	127	40	"
508	"	" "	♂	63	140	56	"
509	"	" "	♂	57	135	53	"
510	"	" "	♀	60	131	49	"
511	"	" "	♀	-	135	45	"
512	"	" "	♀	19	90	29	"
513	"	" "	♀	30	108	34	"
514	"	" "	♀	35	114	35	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-515	10/18	Bay of Islands, Adak I.	♀	45	127	42	Harvest
516	"	" "	♀	58	136	49	"
517	"	" "	♂	28	104	32	"
518	"	" "	♀	32	114	34	"
519	"	" "	♀	56	139	53	"
520	"	" "	♀	53	133	47	"
521	"	" "	♂	58	143	54	"
522	"	" "	♀	40	121	46	"
523	"	" "	♀	44	129	40	"
524	"	" "	♀	44	130	41	"
525	"	" "	♀	33	109	37	"
526	"	" "	♀	39	128	42	"
527	"	" "	♀	31	112	40	"
528	"	" "	♂	82	138	60	"
529	"	" "	♀	22	101	32	"
530	"	" "	♂	73	136	57	"
531	"	" "	♂	62	135	55	"
532	"	" "	♂	25	101	35	"
533	"	" "	♂	66	138	52	"
534	"	" "	♀	35	113	38	"
535	"	" "	♀	44	125	44	"
536	"	" "	♂	59	137	54	"
537	"	" "	♀	60	140	49	"
538	"	" "	♀	45	130	46	"
539	"	" "	♀	43	128	42	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-540	10/18	Bay of Islands, Adak I.	♂	20	94	30	Harvest
541	"	"	♀	28	107	38	"
542	"	"	♀	50	129	49	"
543	"	"	♀	47	130	44	"
544	"	"	♀	21	93	29	"
545	"	"	♀	51	127	51	"
546	"	"	♀	41	131	41	"
547	"	"	♀	58	132	45	"
548	"	"	♂	63	139	57	"
549	"	"	♀	42	120	47	"
550	"	"	♂	72	142	55	"
551	"	"	♀	51	130	42	"
552	"	"	♀	51	135	48	"
553	"	"	♀	52	132	47	"
554	"	"	♀	44	134	43	"
555	"	"	♀	42	130	42	"
556	"	"	♀	58	136	49	"
557	"	"	♀	45	128	39	"
558	"	"	♀	44	136	46	"
559	"	"	♀	25	101	31	"
560	"	"	♀	25	100	32	"
561	"	"	♀	53	134	45	"
562	"	"	♂	67	153	50	"
563	"	"	♀	26	101	32	"
564	"	"	♂	22	97	32	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-565	10/18	Bay of Islands, Adak I.	♀	57	134	45	Harvest
566	"	" "	♀	48	127	46	"
567	"	" "	♀	48	130	48	"
568	"	" "	♀	25	103	35	"
569	"	" "	♀	47	132	43	"
570	"	" "	♀	52	134	47	"
571	"	" "	♂	74	142	60	"
572	"	" "	♀	49	133	43	"
573	"	" "	♂	85	152	63	"
574	10/20	Mid Pt. - Blind Pt., Adak I.	♀	52	140	49	"
576	"	" " "	♂	78	149	61	"
577	"	" " "	♀	52	131	46	"
578	"	" " "	♀	53	135	45	"
579	"	" " "	♂	25	101	38	"
580	"	" " "	♂	71	148	57	"
581	"	" " "	♀	39	122	40	"
582	"	" " "	♀	61	143	49	"
583	"	" " "	♀	25	104	34	"
584	"	" " "	♀	26	106	35	"
585	"	" " "	♀	49	136	44	"
586	"	" " "	♀	34	118	37	"
587	"	" " "	♂	33	109	37	"
588	"	" " "	♀	57	138	48	"
589	"	" " "	♀	58	138	51	"
590	"	" " "	♂	86	150	60	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-591	10/20	Mid Pt. - Blind Pt., Adak I.	♀	54	138	47	Harvest
592	"	" " "	♀	48	133	47	"
593	"	" " "	♀	30	106	37	"
594	"	" " "	♀	52	136	48	"
595	"	" " "	♀	35	112	39	"
596	"	" " "	♀	30	117	37	"
597	"	" " "	♀	50	135	46	"
598	"	" " "	♀	31	110	39	"
599	"	" " "	♀	21	90	28	"
600	"	" " "	♀	55	137	47	"
601	"	" " "	♂	88	151	60	"
602	"	" " "	♀	43	132	48	"
603	"	" " "	♂	24	98	30	"
604	"	" " "	♀	46	132	46	"
605	"	" " "	♀	47	128	44	"
606	"	" " "	♂	83	145	65	"
607	"	" " "	♀	48	135	44	"
608	"	" " "	♂	34	111	42	"
609	"	" " "	♀	48	137	45	"
610	"	" " "	♂	87	147	63	"
611	"	" " "	♀	56	140	48	"
612	"	" " "	♀	53	131	50	"
613	"	" " "	♀	49	133	41	"
614	"	" " "	♂	88	153	55	"
615	"	" " "	♂	16	92	26	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-616	10/20	Mid Pt. - Blind Pt., Adak I.	♀	39	111	43	Harvest
617	"	"	♀	49	131	47	"
618	"	"	♀	49	125	46	"
619	"	"	♀	53	138	43	"
620	"	"	♂	29	107	35	"
621	"	"	♀	45	126	44	"
622	"	"	♀	41	123	43	"
623	"	"	♀	54	143	44	"
624	"	"	♂	74	-	56	"
625	"	"	♂	76	141	53	"
626	"	"	♀	50	136	44	"
627	"	"	♂	73	144	55	"
628	"	"	♀	51	136	41	"
629	"	"	♀	50	135	43	"
630	"	"	♂	42	115	43	"
631	"	"	♀	48	135	46	"
632	"	"	♀	40	115	45	"
633	"	"	♂	66	140	54	"
634	"	"	♀	53	142	46	"
635	"	"	♀	60	134	47	"
636	"	"	♀	47	129	43	"
637	"	"	♂	29	110	38	"
638	"	"	♂	84	149	64	"
639	"	"	♂	81	144	61	"
640	"	"	♂	80	145	60	"

Table 1. Measurements of Sea Otter Collected - 1968

Accession Number	Date	Location	Sex	Weight (lb)	T L (cm)	Girth (cm)	Cause of Death
S068-641	10/20	Mid Pt. - Blind Pt., Adak I.	♀	54	134	49	Harvest
642	"	" " "	♀	65	142	48	"
643	"	" " "	♀	63	130	47	"
644	"	" " "	♂	80	144	59	"
645	"	" " "	♂	80	150	60	"
646	"	" " "	♀	55	134	51	"
647	"	" " "	♀	45	129	47	"
648	"	" " "	♀	42	126	45	"
649	"	" " "	♀	58	138	49	"
650	"	" " "	♂	84	146	59	"
651	"	" " "	♀	56	138	49	"
652	"	" " "	♂	30	104	38	"
653	"	" " "	♂	72	141	56	"
654	"	" " "	♂	69	146	58	"
655	"	" " "	♀	46	128	45	"
656	"	" " "	♂	89	150	64	"

Table 2. Summary of Female Reproductive Information

Dates	Island	Nulliparous	PRIMIPAROUS-MULTIPAROUS[1]									Unknown	Total
			Anestrus	Proestrus -Estrus	Unimplant. Pregnant	Implanted Pregnant[2] 1	2	3	4	5	Post-Partum		
6/23-8/13/68	Amchitka	20	17 (38.6)[3]	2 (4.6)	3 (6.8)	1 (2.3)	2 (4.6)	3 (6.8)	5 (11.3)	9 (20.4)	2 (4.6)	3	67
9/10-9/17/67	Adak	53	71 (44.4)	14 (8.8)	30 (18.8)	6 (3.8)	6 (3.8)	8 (5.0)	9 (5.6)	11 (6.8)	5 (3.0)	4	217
9/25-10/6/67	Amchitka	54	55 (47.8)	18 (15.7)	19 (16.5)	4 (3.5)	0 (0)	0 (0)	10 (8.7)	3 (2.6)	6 (5.2)	3	172

1. Includes all animals after they become pregnant for the first time.

2. Fetus size classes (1= 0-1g, 2= 1-10g, 3= 10-100g, 4=100-1000g, 5=1000+g).

3. Percent of sexually mature animals.

lutea in the ovary of the horn supporting the fetuses. In the fourth case, one corpus luteum was found in each ovary. This is the only instance where there is evidence of a possible crossover from one horn of the uterus to the other. The fetuses appear to be the product of two ova in each case.

In two instances, two corpora lutea and in one instance three were found in animals supporting a single fetus. Two corpora lutea were also found in two animals with unimplanted pregnancies. One other case had a small luteinized structure adjacent to a normal corpus luteum, however this appeared to be a case of involvement of an attritic follicle rather than the result of two ovulations.

It is obvious that multiple ovulations do occur regularly in sea otters and a certain percentage of these probably result in twin births. However, it is unlikely that both pups survive long after birth. The female appears to be physically and behaviorally adapted to handle one pup at a time. Therefore, twinning probably has no significance to the overall production of a population. The possibility of multiple ovulations and pregnancies should be kept in mind when one is trying to interpret numbers of corpora albicantia and other structures when examining reproductive tracts.

Age Determination

Analysis of cementum layers in teeth is still at an early stage. Efforts have been directed mainly toward refining a technique for preparation of sections. Layers often are not distinct and intermediate layering during the first three years creates confusion, however a regular pattern does seem to exist. Evidence from a known-age, 7-year-old animal indicates that one light and one dark layer are laid down annually. The fact that sea otters may be born at any time of year and ignorance of factors causing the layering make precise age determination unlikely at the present time. However, in most cases it should be possible to estimate the age of animals within one or two years. This level of precision should be adequate for population studies. A more detailed report will be made after more information is available.

Food Habits

The following is a partial list of invertebrates found in sea otter stomachs at Adak and Amchitka. Identification was made by Rae Baxter of the Alaska Department of Fish and Game in Bethel. In addition to the species listed, there were various starfish, shrimp, sand fleas, crabs, and fish which have not been identified. Fish was a major food in terms of volume and frequency.

Clinocardium californiense - Cockle

Modiolus modiolus - Snail

Hiatella arctica

Macoma sp. - Macoma clam

Musculus discors - Mussel

Musculus vernicosa - Mussel

Mya truncata - Truncated myaclam

Mya sp. - Soft shelled clam

Mytilus edulis - Blue mussel

Nuculana sp. - Nut sp.

Protothaca staminea - Little neck clam

Pododesmus macroschisma- Perly monia

Saxidomus giganteus - Butter clam

Serripes groenlandicus - Greenland cockle

Littorina cf. sitkana - Sitka periwinkle

Tonicella lineata - Chiton

Tonicella sp. - Chiton

Paralithodes camtschatica - King crab

Strongylocentrotus drobachiensis - Green sea urchin

Further analysis will be delayed until sufficient material is available to warrant the time involved.

Transplanted Sea Otter Sightings

On May 23, 1968 one sea otter was sighted from the air south of the Granite Islands less than two miles from the release site.

On December 28, 1967 several sea otters were reported in Fish Bay on the north end of Baranof Island. After the 1968 transplants there have been a few sightings in southeastern Alaska, however the validity of these seldom can be checked.

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-14-R-3 and W-17-1 TITLE: Marine Mammal Investigations

WORK PLAN: G TITLE: Sea Lions, Sea Otter, Harbor Seals, and Buluga Whales

JOB NO: 3 TITLE: Harbor Seals

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To continue to determine patterns of dispersal and obtain known age specimens.

To monitor commercial operations engaged in the harvesting of seals.

To investigate various aspects of reproduction and age determination in the harbor seal.

To determine the current numbers of seals in major pupping areas.

To gather information on natural mortality during the first two months of growth.

To maintain current information on the magnitude and location of the seal harvest.

TECHNIQUES

Motor scooters equipped with large tires were used on Tugidak Island to rapidly approach seal herds that had hauled-out on the beach. At Port Heiden, a 20-foot inboard-outboard skiff was used to approach hauled-out seals. Pups were caught and tagged with a colored nylon tag attached to the web of the right hind flipper.

Harvest operations were monitored on Tugidak Island and on the Alaska Peninsula. A motor scooter was used to travel to camps where hunters were interviewed at least every three days. Hunters at Port Moller were contacted at the completion of each aerial survey of the area.

Specimen material has been collected during June and July since 1966 at Tugidak Island and at Port Heiden. All reproductive material was preserved in 10 percent formalin. Ovaries were sectioned with a razor blade into sections one to two millimeters in thickness. These sections were examined for corpora lutea, corpora albicantia, and extent of follicular development, and the diameter of these were measured. Testes were weighed without the epididymus attached. The epididymus was then sectioned and examined under a 125X microscope for the presence of sperm.

Age determinations were based on the number of cementum layers counted in sections of the canine teeth. Sections 40 microns thick were stained with hematoxylin and examined with low magnification on a binocular microscope.

Aerial surveys and ground counts were conducted on Tugidak Island and in the Port Heiden-Port Moller areas of the Alaska Peninsula. A Cessna 180 on floats and a Grumman Widgeon were used for aerial counting. All surveys were flown at an altitude of 200 to 300 feet and as near to the time of low tide as possible. Aerial photographic techniques were not investigated due to personnel and equipment being used on another project.

Little was accomplished on investigating pup mortality and obtaining herd counts for pup to adult radios. Personnel familiar with securing these data were assigned to another project.

Information on the total harvest of harbor seals was gathered by direct contact with hunters and from seal buying stations. A mail-in hunter report card has been designed and submitted for approval.

FINDINGS

Tagging

From June 4 to June 30, fourteen hundred and sixty-one seal pups were tagged on Tugidak Island. A 2-1/4 X 3/4 inch, two-piece yellow and white nylon Jumbo Rototag (Oberarch Patents, Ltd., London, England) was attached to the web of the right hind flipper of each animal. Table 1 shows the number of pups tagged each day and the tag numbers attached.

All tagging efforts were concentrated on obviously healthy animals. Pups in a weak physical condition were not marked. From June 20 on, most pups had developed enough coordination to reach the water before they could be approached. Although tagging efforts continued, success dropped sharply.

Table 1. Daily Tagging Effort at Tugidak Island

DATE	TAG NO.'S	NO. TAGGED	TOTAL
June 4	7501- 7516	16	16
5	7517- 7541	25	41
6	7542- 7559	18	59
7	7560- 7600	41	100
8	7601- 7704	104	204
9	7705- 7808	103	307
10	7809- 7872	64	371
11	7873- 8000	128	499
12	8001- 8151	151	650
13	8152- 8272	121	771
14	8273- 8427	155	926
15	8428- 8482	55	981
16	9500- 9621	113	1094
17	9622- 9686	65	1159
19	9687- 9774	88	1247
20	9775- 9800	26	1273
	9901- 9920	20	1293
	9941- 9953	13	1306
21	9921- 9932	12	1318
	9954- 9975	22	1340
25	9933- 9940	8	1348
	9976- 9982	7	1355
26	9983-10000	18	1373
27	9801- 9804	4	1377
29	9813- 9872	56	1433
30	9873- 9900	28	1461

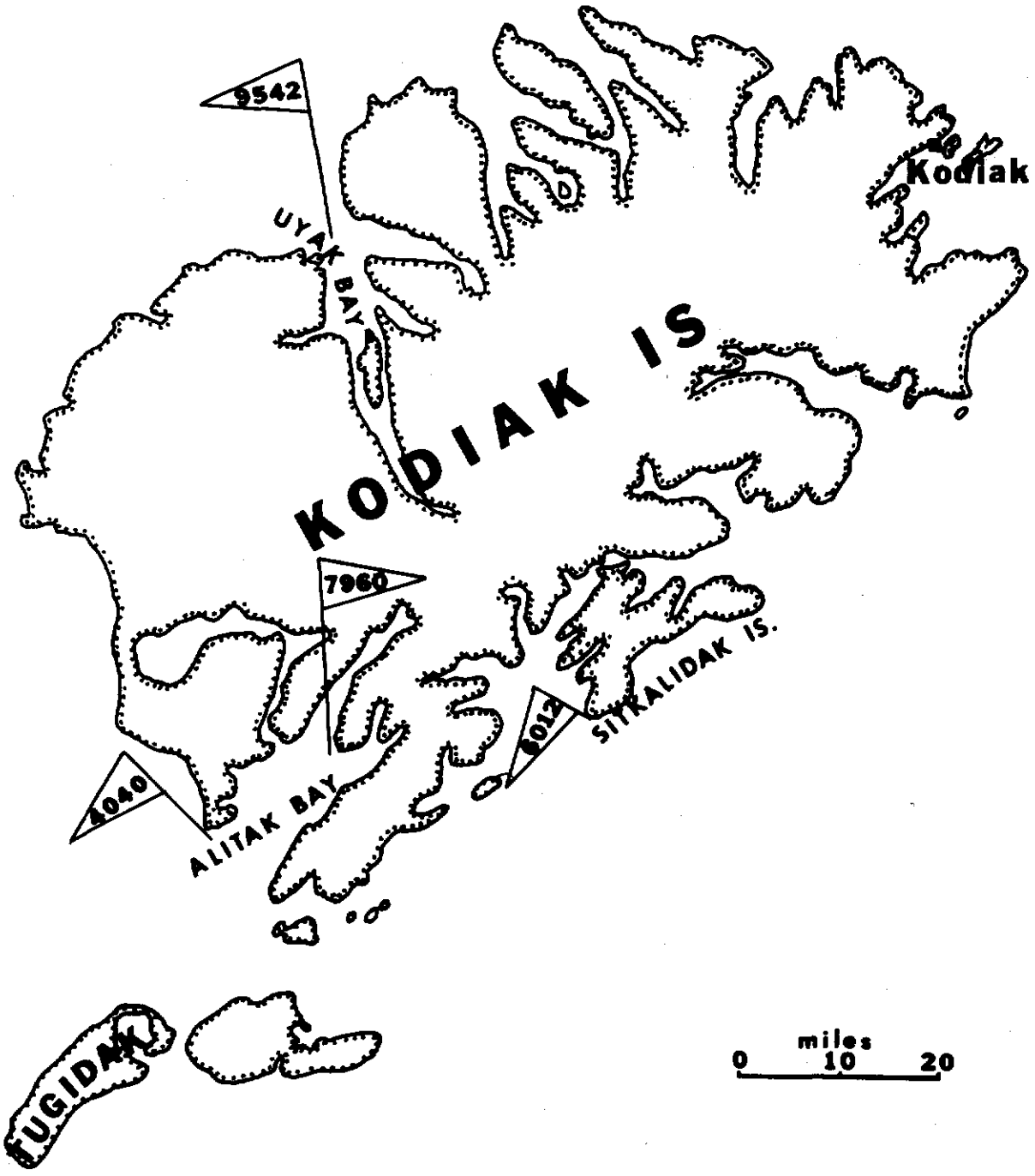

Figure 1. Tag recovery locations

Tugidak Island beaches were surveyed for dead tagged pups and 172 were found. Hunters collected 84 tags from July 1 to July 20. Total recovery was 256 animals, or a 17 percent known loss. This loss must be considered minimal as the beaches were not checked on a regular basis and several hunters lost tags they had previously recovered.

Four tagged seals have been recovered away from Tugidak Island; all in the Kodiak Island area (Figure 1). Tag #4040 was attached on June 11, 1967 and recovered at Cape Alitak on July 3, 1967. Animal # 6012 was tagged on June 20, 1967 and recoverd near Sitkalidak Island on April 4, 1968. Tag #7960 was attached on June 11, 1967 and recovered in Alitak Bay on July 8, 1968. Animal #9542 was tagged on June 16, 1968 and recovered in Uyak Bay on July 30, 1968. No tagged seals have been recovered from the 300 animals marked in 1966 at Tugidak Island.

At Port Heiden, 246 seal pups were tagged (#5701-#5949) with blue and yellow nylon tags from June 24 to June 28. Hunters recovered 119 tags within Port Heiden Bay from July 1 to August 1. No tagged pups were recovered outside of the Port Heiden area.

In 1967 seal pups were also tagged at Port Heiden and it was reported that all tag recoveries were made within the Port Heiden area. However, a seal hunter recently reported that he took "about half-a-dozen" tagged pups at Cinder River during the 1967 season.

Although seals were present in large numbers, tagging at Port Heiden again proved to be difficult. A fast inboard-outboard skiff was used to approach seals that were hauled-out on exposed sandbars. As the season progressed, seals became wary of boats moving in the area and frequent winds and heavy seas often prevented boat travel.

Pup Harvest

Five hunters were engaged in harvesting seal pups on Tugidak Island. Harvest operations began on July 1 and ended on July 20. During this period 800 pups were harvested. Due to the lateness of the season opening, the animals were extremely wary and difficult to catch. Consequently a major portion of the Tugidak Island harvest consisted of deserted pups and animals born in late June and early July.

Tugidak Island hunters used a variety of equipment for transportation. As in the past, two-wheeled motor scooters were used. This year, the addition of a 21-foot outboard skiff proved useful when sea and weather conditions permitted. Hunters also utilized a Volkswagon bus that was equipped with size 900 tires on the front and size 1300 tires on the rear.

Five hunting parties operated at Port Heiden and one at Port Moller, with some incidental hunting at Cinder River. The harvest began on July 1 and ended when the season closed on July 31. During this period 2,180 pups were taken at Port Heiden and 1,091 from Port Moller.

Hunters at Port Heiden and Port Moller used .22 caliber rifles to take seal pups. Some animals were also taken in gillnets of 9-1/2 inch stretched mesh that were staked-out on sandbars at low tide and tended at low tide the following day.

Low fur prices continue to affect the interest in harvesting seal pups. The number of individuals engaged in harvesting pups at Tugidak Island and on the Alaska Peninsula has dropped from 22 in 1965 to 11 in 1968. A yearly comparison of the seal pup harvest as obtained from hunters in the field at Tugidak Island and the Alaska Peninsula is shown in Table 2.

Table 2. Harbor Seal Pup Harvest

Date	Tugidak Island	Port Heiden	Port Moller
1965	4,100	4,000 (Includes Port Moller)	
1966	2,200	3,100	2,300
1967	700	2,278	1,435
1968	800	2,180	1,091

Specimen Collection

Measurements, reproductive organs, and teeth have been collected each June and July since 1966 at Tugidak Island and to a lesser degree at Port Heiden. This material is not available in sufficient quantity to draw definite conclusions on reproduction and age classification at this time. Therefore information on specimens is presented in tabular form.

Presented in Table 3, Appendix I, are detailed measurements from 106 seals collected at Tugidak Island and Port Heiden. Measurements are from Scheffer, V.B., Standard measurements of seals, J. of Mamm., 48(3):459-462.

Table 4, Appendix I, gives by age group, testes weight, weight for the group, baculum weight, and baculum length. Testes weight is without the epididymus attached. All males over 5 years of age, collected in June and July, contained sperm in the epididymus. Bacula were cleaned in detergent and oven-dried for two weeks before being weighed and measured. Ovary weights, with and without corpus luteum, are presented in Table 5, Appendix 1.

Population Numbers

Five aerial surveys were conducted on Tugidak Island from March 29 to October 15. Additonal surveys were not made due to weather and inavailability of aircraft. Results of these counts and surveys in 1965, 1966, 1967, and 1968 are presented in Table 6.

Table 6. Tugidak Island Aerial Seal Surveys

DATE	1965	1966	1967	1968
March 29				1,600
May 15				800
May 28		500		
May 30	300			
June 12				3,200
June 14	1,000			
June 15		3,000		
June 17	8,900	100		
June 18			3,400	4,500
June 21		1,100		
June 22	3,500			
June 25	6,650			
June 26		1,300		
June 29			5,100	
July 9		3,400		
July 19		1,400		
October 15				1,500

Table 7. Aerial Surveys on the North Side of the Alaska Peninsula

DATE	PORT HEIDEN	PORT MOLLER	SEAL ISLANDS	CINDER RIVER
1965				
May 19	2,500-3,000	2,500-3,000	-	1,000
July 1	8,000-10,000	-	-	-
August 1	2,500-3,000	-	-	-
1966				
May 31	850	150	-	-
June 7	800	200	1,000	-
June 13	-	1,600	1,000	1,500
June 24	1,500	1,000	500	1,000
June 30	2,500	1,000	1,100	-
July 4	1,600	-	400	-
July 6	2,500	5,000	700	950
July 17	1,200	400	-	-
July 22	650	450	150	-
August 2	750	-	250	2,000
August 5	-	-	-	2,000
1967				
May 5	800	2,400	200	50
June 1	350	210	330	-
July 18	2,300	2,200	500	3,000
1968				
July 2	1,200	800	300	600
July 10	2,500	1,250	350	800
July 17	3,000	1,500	300	700
July 23	3,000	2,500	400	800
July 31	1,000	1,250	400	200
August 4	800	1,750	450	250

Surveys conducted in 1965 and 1966 were greatly influenced by hunter activity that caused seals to leave the beaches. Once the animals entered the water they were difficult to count or missed entirely. The aerial estimates for 1965 and 1966 reflect hunter disturbance, while in 1967 and 1968 seals could be found hauled-out in almost any suitable area of the island. Therefore, a yearly comparison of aerial estimates is not accurate for determining population trends. However, aerial surveys are necessary to determine numbers, distribution, and movements during the pupping season. When seasons are opened and closed by field announcement, counts of total numbers should be made as often and as accurately as possible.

Aerial surveys were flown on the Alaska Peninsula from July 2 to August 4. Results of these counts and surveys conducted in 1965, 1966, 1967, and 1968 are presented in Table 7.

Several ground counts were made of hauled-out animals to determine the pup/adult ratio after the peak of pupping had occurred. In 1967 these counts revealed a ratio of 53 pups to 100 adults. In 1968 the ratio was 50.8 pups for 100 adults. These herd counts should be continued to determine if the pup-adult ratio is consistant from year to year and whether or not the ratios can be used in conjunction with aerial surveys to determine the total pup population of the island.

Commercial Seal Harvest

In April of 1967 the legislature of the State of Alaska removed the $3.00 bounty on all seals south of Bristol Bay. Removal of the bounty and fluctuations within the fur industry brought prices for seal skins down to low levels. Consequently, the annual harvest of harbor seal from Southcentral Alaska (Judicial District III) and Southeastern Alaska (Judicial District 1) has steadily declined. The 1965 harvest in these areas exceeded 50,000 animals, in 1966 about 27,000 were taken, and in 1967 between 15 and 20,000 were harvested.

Although bounty claims did not give total harvest, they did indicate trends and provided a basis for estimating yearly take. The extent of the 1968 seal harvest can only be estimated from data obtained from buying stations and hunter interviews. During calendar 1968, buyers purchased over 10,000 seal skins and hunters reported over 2,000 skins that did not enter the commercial market. Therefore, the estimated 1968 seal harvest in Southeastern and Southcentral Alaska was about 15,000 animals.

A mail-in hunter report system that includes seals has been designed and will be submitted to the Alaska Board of Fish and Game for their approval. If this system is implimented we will again receive data necessary for estimating the annual harvest.

Table 3. Measurements from 106 Seals from Tugidak Island and the Alaska Peninsula

AGE	SEX	STANDARD LENGTH (cm)	CURVILINEAR LENGTH (cm)	GIRTH (cm)	NAVAL TO ANUS (cm)	FOREFLIPPER LENGTH (cm)	HINDFLIPPER LENGTH (cm)	WEIGHT (lbs.)	CANINE LENGTH (cm)	CANINE WIDTH (cm)
Term Fetus	♂	-	83	-	-	-	-	30	-	-
"	♀	-	57	49	20	-	-	-	-	-
8 mo.	♂	-	110	78	-	-	-	70	3.24	.81
1.5	♀	-	125	80	-	-	-	82	3.15	.85
3	♀	-	142	96	39	-	-	-	-	-
	♂	-	122	87	30	-	-	-	3.17	-
	♀	124	130	86	-	-	26	112	-	-
4	♂	-	160	92	44	-	-	-	-	-
	♀	-	145	89	32	-	-	-	3.08	.84
	♀	128	140	86	-	20	26	-	3.26	.85
5	♀	-	152	94	38	-	-	-	3.34	-
	♀	-	150	84	30	-	-	-	2.98	.83
	♀	-	133	83	33	-	-	-	3.07	.89
	♂	147	158	91	-	22	28	-	3.20	.99
6	♂	-	145	94	39	-	-	-	3.43	.99
	♂	141	151	97	-	24	28	-	3.44	.89
	♀	-	149	84	35	-	-	-	-	-
7	♀	-	141	90	39	-	-	-	-	-
	♂	-	164	95	44	-	-	-	3.46	-
	♀	-	147	85	35	-	-	-	2.84	.83
	♀	-	155	99	39	-	-	-	3.12	.95
	♀	138	143	85	-	-	24	-	3.38	.89
	♂	156	167	101	-	25	31	-	3.21	.94
	♂	143	152	97	-	25	27	-	3.29	.86
8	♀	-	148	86	13	-	-	-	3.19	.98
9	♂	-	166	97	42	-	-	-	3.66	-
	♀	-	144	84	38	-	-	-	2.71	.88
	♀	-	136	84	34	-	-	-	3.20	.94
	♀	143	148	100	-	-	31	-	-	-
10	♀	-	143	86	35	-	-	-	3.25	.87
	♀	121	148	82	-	22	27	-	3.34	.96
	♂	-	163	107	42	-	-	-	-	-
	♀	-	161	91	40	-	-	-	-	-
11	♂	-	171	119	43	-	-	-	3.60	1.10
	♀	-	155	94	44	-	-	-	3.19	.91
	♀	-	162	92	47	-	-	-	3.57	1.02
	♂	156	166	109	-	28	31	-	3.46	1.01
	♀	143	158	97	-	24	24	-	3.37	.94
	♂	141	161	104	-	24	28	-	3.34	.93
12	♀	-	166	97	-	-	-	-	2.86	-
	♂	-	180	117	43	-	-	-	-	-
	♀	-	144	139	36	-	-	-	3.35	.97
	♀	-	161	100	38	-	-	-	3.27	.90
	♀	-	150	94	40	-	-	-	3.26	.89
	♂	154	162	102	-	21	29	-	3.33	.96

AGE	SEX	STANDARD LENGTH (cm)	CURVILINEAR LENGTH (cm)	GIRTH (cm)	NAVAL TO ANUS (cm)	FOREFLIPPER LENGTH (cm)	HINDFLIPPER LENGTH (cm)	WEIGHT (lbs.)	CANINE LENGTH (cm)	CANINE WIDTH (cm)
13	♀	-	163	103	-	-	-	-	3.52	-
	♀	-	167	99	45	-	-	-	-	-
	♀	-	158	-	-	-	-	-	-	-
	♀	-	144	99	37	-	-	-	-	-
	♂	169	176	107	-	16	31	-	-	-
	♀	-	162	103	37	-	-	-	2.06	.94
14	♀	-	161	100	-	-	-	-	3.01	-
	♀	-	-	99	37	-	-	-	3.07	.92
	♂	-	164	119	51	-	-	-	3.72	1.15
	♀	152	168	98	-	-	26	-	3.27	.89
	♂	159	174	111	-	28	31	-	3.40	.99
	♀	149	161	89	-	23	29	-	3.46	.95
	♂	152	162	98	-	24	29	-	3.59	.96
15	♀	-	162	104	42	-	-	-	-	-
	♀	-	161	103	42	-	-	-	-	-
	♀	-	163	94	41	-	-	-	-	-
	♂	-	163	103	41	-	-	-	3.29	1.03
	♂	-	167	107	47	-	-	-	3.90	1.08
	♂	155	160	102	-	25	28	-	3.47	.94
	♂	165	173	107	-	23	28	-	3.69	1.08
	♀	-	163	106	41	-	-	-	-	-
16	♀	-	155	95	39	-	-	-	-	-
	♀	-	165	110	41	-	-	-	3.14	1.00
	♂	162	182	111	-	24	28	-	3.95	1.18
	♂	-	166	110	-	-	-	-	3.42	.87
	♂	-	170	112	-	-	-	-	3.55	.98
	♂	153	167	102	-	26	27	-	-	-
17	♀	-	160	106	-	-	-	-	3.19	-
	♀	-	156	91	38	-	-	-	2.99	.96
	♀	-	154	91	30	-	-	-	2.50	1.03
	♂	166	177	107	26	31	-	-	3.89	1.17
	♀	140	156	91	-	20	31	-	-	-
18	♀	-	168	-	-	-	-	-	-	-
	♀	-	150	98	39	-	-	-	2.83	-
	♀	-	161	99	14	-	-	-	3.08	.96
	♂	-	161	107	40	-	-	-	3.39	1.02
19	♀	-	152	103	-	-	-	-	3.00	-
	♂	-	164	102	-	-	-	-	-	-
	♀	-	158	111	39	-	-	-	2.82	.98
	♀	-	159	100	39	-	-	-	2.82	1.08
	♀	-	170	139	43	-	-	-	3.02	1.19
	♂	141	160	115	-	25	27	-	3.02	1.12

AGE	SEX	STANDARD LENGTH (cm)	CURVILINEAR LENGTH (cm)	GIRTH (cm)	NAVAL TO ANUS (cm)	FOREFLIPPER LENGTH (cm)	HINDFLIPPER LENGTH (cm)	WEIGHT (lbs.)	CANINE LENGTH (cm)	CANINE WIDTH (cm)
20	♀	-	153	91	39	-	-	-	2.82	1.00
	♀	-	158	91	42	-	-	-	-	-
	♀	-	168	-	-	-	-	-	-	-
	♀	150	160	83	-	23	26	-	2.88	1.07
	♂	165	184	106	-	28	31	-	2.90	1.07
21	♀	-	165	91	33	-	-	-	3.39	.90
	♀	-	155	95	37	-	-	-	3.21	.91
	♀	-	161	108	44	-	-	-	2.90	.92
	♀	152	163	101	-	27	39	-	-	-
22	♀	-	159	95	33	-	-	-	3.14	.93
	♀	-	157	102	-	-	-	-	3.32	.94
	♀	-	158	109	-	-	-	-	2.93	-
23	♀	-	171	106	41	-	-	-	2.61	-
	♀	-	148	97	36	-	-	-	2.55	-
	♂	154	167	104	-	25	28	-	2.93	1.07
24	♀	-	162	106	39	-	-	-	2.61	.90
	♀	-	155	92	41	-	-	-	-	-
	♀	150	164	85	-	24	28	-	3.04	.96
24+	♀	-	167	109	-	-	-	-	3.39	-

Table 4. Testes and Baculum Weights from Seals Collected at Tugidak Island.

AGE IN YEARS	TESTES WEIGHT (grams)	AVERAGE WEIGHT FOR AGE GROUP (grams)	BACULUM WEIGHT (grams)	BACULUM LENGTH (mm)
5	15.0	14.5	-	-
	14.0			
6	19.1	20.6	95.4	53.5
	18.7			
	22.3		-	-
	22.4			
7	37.6	36.6	110.4	72.8
	44.5			
	32.3		135.0	192.7
	32.3			
11	32.9	40.9	-	-
	36.0			
	42.9		135.4	189.3
	44.4			
	44.4		-	-
	45.1			
12	29.8	29.6	133.6	181.5
	29.4			
14	39.9	42.6	124.3	137.4
	39.0			
	36.4		125.6	137.7
	36.3			
	53.9		-	-
	50.1			
15	39.5	39.0	131.5	228.4
	38.9			
	29.3		134.1	229.6
	43.3			
	41.6		-	-
	41.4			
16	44.4	46.0	-	-
	44.2			
	48.0		115.9	97.9
	47.6			

AGE IN YEARS	TESTES WEIGHT (grams)	AVERAGE WEIGHT FOR AGE GROUP (grams)	BACULUM WEIGHT (grams)	BACULUM LENGTH (mm)
17	34.1	34.1	135.4	197.4
18	36.1 39.9	38.0	-	-
19	25.2 31.0	28.1	145.1	195.7
20	38.4 38.6 40.6 34.9	38.1	123.5 -	134.3 -
23	28.3 29.0	28.6	136.1	173.2

Table 5. Ovary Weights from Seals Collected at Tugidak Island.

AGE IN YEARS	OVARY WEIGHT WITH CORPUS LUTEUM (grams)	DIAMETER OF CORPUS LUTEUM IN SECTION (mm)	OVARY WEIGHT WITHOUT CORPUS LUTEUM (grams)
3	2.0	NONE	2.6
	1.6	NONE	3.7
4	2.6	NONE	5.3
5	3.5	NONE	2.2
	6.2	14x9	5.2
7	7.8	20x17	5.5
	7.0	16x15	4.9
	5.2	14x12	4.7
8	8.2	16x13	5.9
	5.5	12x10	6.8
9	3.5	11x11	5.2
10	6.5	12x9	6.7
	8.0	15x11	5.0
11	4.2	13x7	6.4
	6.1	18x10	5.7
	9.7	19x15	9.7
	7.0	14x10	6.6
12	7.2	18x16	6.6
	5.8	17x14	4.9
	6.9	11x9	6.3
13	5.5	15x15	6.0
	5.4	13x10	4.6
	4.4	9x5	7.5
14	5.6	10x12	4.6
	5.9	14x10	5.6
	10.4	25x15	6.6
	3.1	9x8	3.6
15	6.4	15x11	5.7
	5.3	17x13	4.5
16	4.4	16x11	3.1

AGE IN YEARS	OVARY WEIGHT WITH CORPUS LUTEUM (grams)	DIAMETER OF CORPUS LUTEUM IN SECTION (mm)	OVARY WEIGHT WITHOUT CORPUS LUTEUM (grams)
17	5.2	14x10	4.3
	5.8	16x11	5.0
18	8.0	17x12	6.6
	4.5	13x11	3.9
	9.9	20x15	7.1
19	4.5	11x9	4.6
	13.1	25x19	5.3
	5.6	15x10	5.8
	8.7	13x11	10.4
20	5.4	16x13	4.4
	6.2	16x12	4.1
	5.4	11x9	6.6
21	7.1	17x13	5.5
	8.4	18x14	8.0
	6.2	18x15	7.3
22	11.0	18x10	6.4
23	4.0	7x6	3.7
24	4.7	14x13	3.4
	5.6	11x7	8.0
	6.3	14x10	7.7

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APPROVED BY:

Director, Division of Game

SUBMITTED BY:

John Vania
Study Leader

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-14-R-3 and W-17-1 TITLE: Marine Mammal Investigations

WORK PLAN: G TITLE: Sea Lions, Sea Otter, Harbor Seals, and Beluga Whales

JOB NO: 4 TITLE: Beluga Whales

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To study the reaction of belugas to various types of underwater sound transmissions and to gather basic life history data.

TECHNIQUES

Tape recorded sounds of killer whales (Orcinus orca) and a recording of popular type music was intermittently transmitted under water in the Kvichak River of Bristol Bay during the period of May 29 to June 12, 1968. As in 1967 the transmitting equipment consisted of an A.R.C. 880 auto stereo tape deck player slightly modified to accommodate a hydrophone projector which had an output impedence of 600 ohms. The tape player, utilizing a continuous play cartridge, was capable of 10 watts of power per channel and was powered by a standard 12 volt auto battery. Two Hydro Products, model DEA-7 hydrophones were again used for transmitting the sounds. The hydrophone is capable of handling slightly more than 10 watts of power and will transmit frequencies above KH_Z.

One of the tape players and one of the hydrophones were newly purchased items of equipment. The new hydrophone had 150 feet of lead in cable which was later cut in length to 50 feet after it was learned that the added length significantly reduced the strength of the signal coming from the head.

The tape recording of the killer whale sounds were re-recorded from a tape made by the U.S. Navy in Dabob Bay, Washington in October 1960. The killer whale tape cartridge used during the 1967 experiments, and made from the Dabob Bay tape, was lost during the year with the result that all the 1968 experiments were carried out with new recordings. The transfer of sounds from the Navy tape to the tape deck player cartridge was done by a local recording firm.

FINDINGS

The Nakeen cannery dock located on the Kvichak River was again used as the site for conducting the 1968 beluga sound experiments. The location was used for similar experiments in 1967 and were reported on in the 1967 Work Plan Segment Report W-14-R-1 and 2, Job 4.

The Kvichak River including Illiamna Lake is the world's largest producer of red salmon having runs which may exceed 40 million fish. The river at the transmitting site is approximately 3/4 mile wide and of variable depth depending on the stage of the tide. Tides of 25 feet flow into the river at this point and greatly affect stream flow, turbidity, temperature, depth and other factors.

After the ice leaves the Kvichak River in spring it is normal for belugas to ascend it. If not disturbed they will generally enter the river one-half to two hours after the tide begins to flood and may move as far as 30 miles up stream. They remain in the river only as long as the tide is flooding, moving out again when it ebbs. The whales will utilize the river until the red salmon smolt migration is completed which is generally around the middle of June. During the remainder of the summer and fall months they are usually found along the north shore of Bristol Bay.

The transmitting equipment which consisted of a newly purchased tape deck player and hydrophone was installed and placed into operation on May 29 by an employee not completely familiar with the gear. A tape of killer whale sounds was utilized for the experiment. Observations of beluga movements were made until May 31. During this period the whales entered the river system and passed by the activated transmitter without any visible signs of being disturbed. It was learned later that the long cable of the new hydrophone had too much resistence for the power source with the result that the signals transmitted were very weak. The new tape deck player was also found to be defective and had to be sent to Anchorage for repairs. No observations were made during the period June 1 to June 4.

On June 4, I arrived at Nakeen and installed the tape deck player and hydrophone used during the 1967 experiments. Killer whale sounds were again used for the experiment. At 7:30 p.m. a small group of approximately 8 whales was observed ascending the river. About one mile below the transmitting site the whales crossed to the opposite side of the river and proceeded upstream passing the cannery dock. Although the main channel which they had been previously using passed directly in front of the dock the whales now choose a secondary channel which ran along the opposite bank as a means of getting upstream. The whales continued to move in this manner whenever a single transmitter was turned on and operated at the cannery dock.

To test whether or not it was the sound transmission that was causing the whales to alter their movements the transmitter was turned off on two occasions, just prior to the time when the whales normally enter the river. On both occasions most of the whales followed the main channel, some passing within 60 yards of the cannery dock. A few whales continued to use the far channel.

Two experimental transmissions were made, substituting the killer whale sound tape with a commercial recording of pop music. The experiments were conducted to test whether the whales simply avoid any unusual sound source. In both instances the whales reacted to the sound in the same manner as when the killer whales sounds were being transmitted. All the whales used the secondary channel on the opposite side of the river in passing upstream.

On June 5 an attempt was made to transmit the various noises from a boat anchored in the main channel about 1/2 mile downstream from the cannery dock. Rough water, failing light and the lack of an elevated observation platform made it difficult to determine the pattern of movement of the whales. A few whales were observed swimming upstream while some, it appeared, had turned and returned to the bay. Poor water conditions did not permit another experiment from the boat until June 9.

On June 9 the repaired tape deck player arrived. Two transmitters were then placed in operation, one on the cannery dock and one on a boat anchored in midstream. Whales were sighted entering the river system on June 9 and 10 but they only advanced to within one mile downstream of the transmitters. None passed the transmitting site.

On June 11 the transmitters were not turned on and a small group of whales passed above the cannery site utilizing the secondary channel across the river.

No whales were sighted in the river on June 12 and the experiments were terminated. A red salmon smolt index site operated by the Division of Commercial Fisheries on the Kvichak River indicated the migration of young salmon was about completed by this date.

The 1968 beluga experiments elicited somewhat of a different response by the whales than the 1967 experiments and the reasons are not fully understood. In 1967 a single transmitter placed on the Nakeen cannery dock appeared to have prevented all belugas from traveling upstream beyond Telephone Point which is located one mile downstream from the dock. In 1968 it took two transmitters to affect the same type of response. Differences such as changes in salinity, tape recordings, transmitter signals, and smolt abundance may singlely or in combination have caused the varied reaction. More experimentation is obviously needed to determine cause and effect relationships.

One conclusion drawn from the results of all the experiments conducted to date is that changes in the transmitting equipment is now necessary. The present gear which is capable of handling only 10 watts of power is not adequate for the Kvichak River system. It is suggested that a transmitter and sound projector capable of handling up to 200 watts of power be purchased. Although it would be desirable for the equipment to have a frequency response to 50 KH_Z or higher the cost of such equipment does not appear to be justified at this time. Also, it may not be necessary. A small projector with a frequency response to 10 KH_Z or 15 KH_Z appears to be the best choice.

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