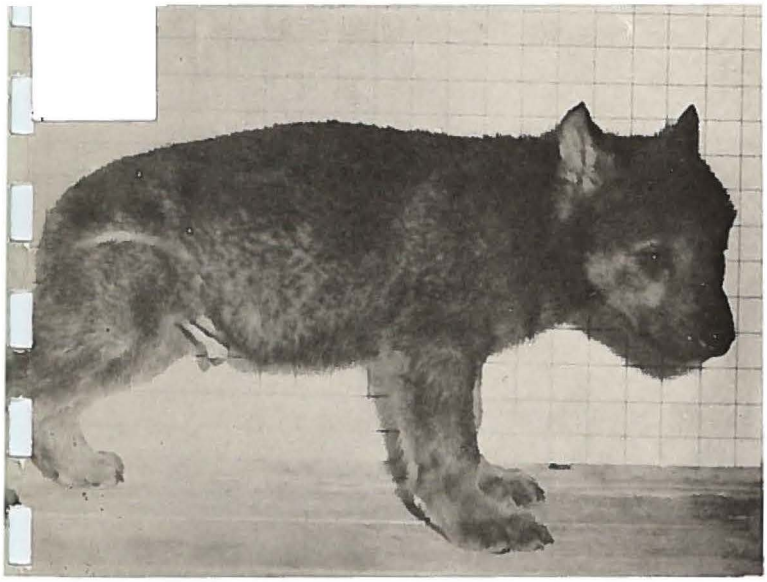
ALASKA DEPARTMENT OF FISH & GAME

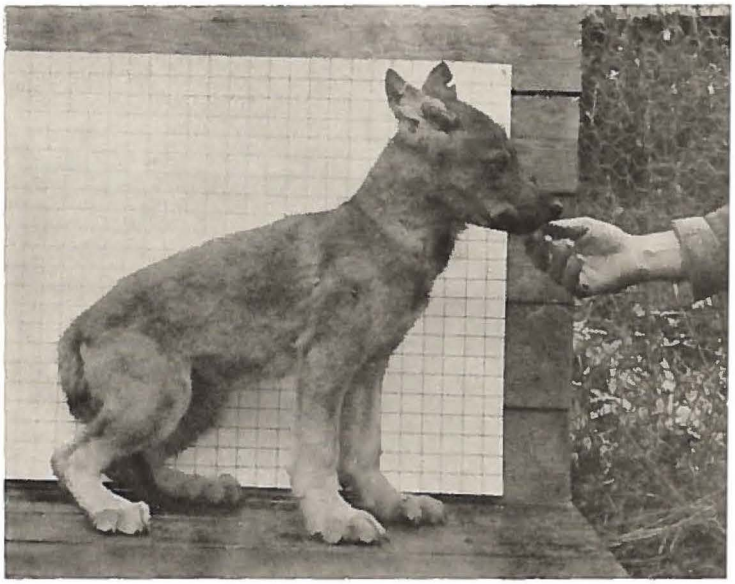
1960-61 Pittman-Robertson Project Report

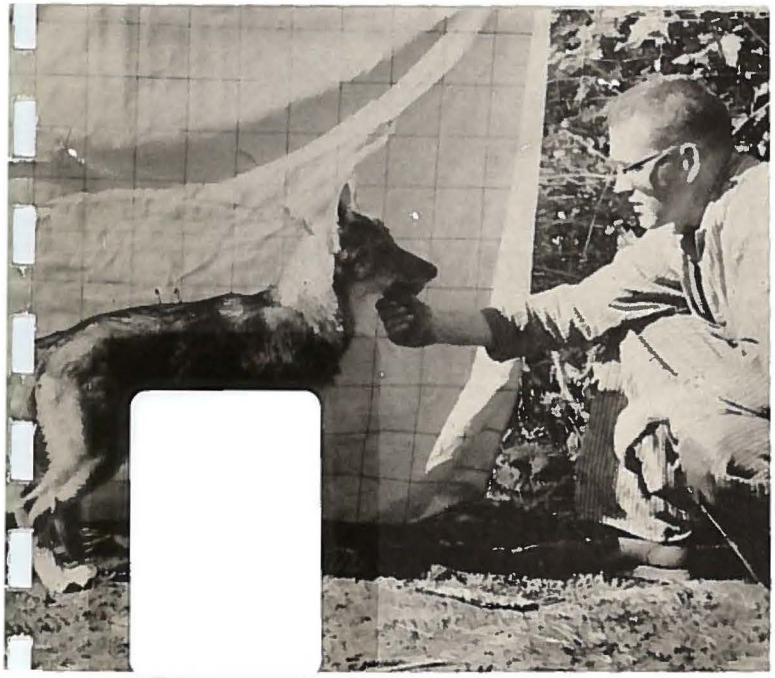
DIVISION OF GAME VOLUME II, NO.10

Wolf Management Investigations

Work Plan K







Juneau, Alaska

WOLF MANAGEMENT INVESTIGATIONS

These series of photographs depict growth of wolves captured as pups and raised in captivity.

Top Left:	Pup approximately 8-9 weeks old. (Photo by Dave Klein)
Top Right:	Pup approximately 13-14 weeks old. (Photo by Dave Klein)
Bottom Left:	Juvenile approximately 4 months old. (Photo by Dave Klein)
Botton Right:	Adult wolf. (Photo by Harry Merriam)

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Reports of Investigations

Volume II, Number 10 1960-1961

ANNUAL REPORT OF PROGRESS, 1960-1961

FEDERAL AID IN WILDLIFE RESTORATION PROJECT W-6-R-2

GAME INVESTIGATIONS OF ALASKA

STATE OF ALASKA

William A. Egan, Governor

Alaska Department of Fish and Game

Clarence L. Anderson, Commissioner

Division of Game

James W. Brooks, Director
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Volume 2 Report No. K-1

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-61 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: K Wolf Management Studies

Job No: 1 Title: Wolf Predation on Sitka Black-Tailed Deer

PERIOD COVERED: July 1, 1960, to June 30, 1961

ABSTRACT:

Age analysis of 69 wolf skulls collected during the period from December 1956 through April 1961 show that 66 per cent were juveniles less than one year old, 16 per cent were between one and two years, 13 per cent were between two and three years, and less than 5 per cent were over three years old. Weights of the bacula in males were shown to be of value in age determination of males with no apparent error between the first three years of life.

Four wolves, part of a litter of seven, raised in captivity from the time of their capture in May 1959 were released in the wild during October of 1960. At least two and possibly all four wolves made a successful adjustment to a wild existance.

Two captive male wolves, brothers to the wolves released, were killed and an autopsy by Kenneth Neiland, Alaska Department of Fish and Game Parasitologist, revealed no internal parasites. It is probable that the released wolves were also free from parasites. Autopsy of nine wolves from Kupreanof

and Kuiu Islands revealed that one had Echinococcus granulosus and six had Taenia hydatigena, these were the adult forms of tapeworms. Immobilization and tranquilizing drugs were tested on captive wolves. Two wolves died as a result of these experiments.

OBJECTIVES:

To continue the collection of biological data from wolves with emphasis on morphological features, reproduction, and age determination studies. To determine the ecological relationships resulting from wolf predation on the Sitka black-tailed deer.

TECHNIQUES:

Wolf carcasses obtained from trappers and bounty hunters provide measurements for growth and related morphological features of wolves in Southeastern Alaska. The skulls and the bacula of males are used for age determination studies. When sufficient material becomes available, the gross and histological examination of reproductive organs provide information on the chronology and sequence of events in the reproductive cycle and the number of young born. Wolves are examined for incidence of parasitism whenever practicable.

Two pair of wolves from a single litter captured as pups in May 1959 and raised in captivity were released on Coronation Island following studies of the endemic deer population under project W-6-R-1, A-1f and W-6-R-2, A-1f.

FINDINGS:

Age Studies

Carcasses of 8 female and 13 male wolves were acquired during the year. Measurements of 17 of these are listed in Table 1. Skulls of wolves acquired during the year as well as those of 18 wolves taken in predator control operations during the winter of 1956-57 were cleaned and used for age determination. Sixty-nine wolf skulls were aged or re-aged by criteria listed in Table 2 in combination with the degree of tooth wear. The assigned ages are shown in Table 3. For males, bacula weights were plotted against the ages assigned to the skulls as is shown in Figure 1. The data

Table 1. Measurements of wolves killed in Southeast Alaska.*

Spec. #	Location	Date	Sex	Weight	Total Length	Tail Length	Hind Foot	Chest Girth	Height at Shoulder	Color
PG-32-60	Mainland	9/60	F	83	62-1/2	17	11-1/2	27-1/2	29-1/4	Grey
PG-33-60	Kupreanof I.	11/60	F	93	60-1/2	17	10-3/4	31-3/4	29	Lt. Grey
PG-35-61	Kupreanof I.	1/61	F	66	58-1/2	17	10-3/4	26	29	Grey
PG-36-61	Kupreanof I.	1/61	M	93		18	11-1/2	27	32	Black
PG-37-61	Kupreanof I.	1/61	M	97	65	18	11-1/4	28-1/2	30	Grey
PG-38-61	Kupreanof I.	1/61	M							Grey
PG-39-61	Kupreanof I.	2/61	M	81	65	18-3/4	11	25-1/2	31	Grey
PG-41-61	Kupreanof I.	3/61	F	70	64	18-1/2	10-3/4	27-1/2	30	Grey
PG-43-61	Kupreanof I.	3/61	M	72	63-1/2	17-1/4	11	26	30	Grey
PG-44-61	Mitkof I.	3/61	M	106	66	18	11-3/4	28	34-1/2	Dk. Grey
PG-45-61	Mitkof I.	3/61	F	68	62	17	10-3/4		29-1/2	Black
PG-46-61	Kupreanof I.	4/61	M	85	64	18-1/2	11-1/4	26	32	Grey
PG-47-61	Kupreanof I.	4/61	M	80	66	20	11	26	31-1/2	Grey
PG-48-61	Kupreanof I.	4/61	F	61	62	19-1/2	10-3/4	24	30	Grey
PG-49-61	Mitkof I.	4/61	F(Preg)	92	61	16	11	28-1/2	30	Black
PG-51-61	Mitkof I.	4/61	F	66	61-1/2	18	11	25-1/2	30-1/2	Grey
PG-52-61	Kupreanof I.	6/61	M	90	68	20-1/2	11	28-1/2	31	Grey

* Measurements are in inches and weights are in pounds.

Table 2. Skull characteristics used to age wolves listed in Table 3.

Ages	Ossification of Sutures Scale of 4	Type
Under one year	Nasal bones gaping and sutures not well ossified	1
Around one year	Slightly advanced over type 1	2
Over one year	Sutures well ossified	3
Over four years	Sutures closed and not easily discernable	4
	Sagital Crest Scale of 4	
Under one year	Very little development	1
Around one year	Development incomplete anteriorly	2
Over one year	Development more complete anteriorly	3
Over three years	Gaining in breadth dorso-posteriorly forming a T in cross section	4
	Angle of the Ramus Scale of 3	
Under one year	A porous, blunt knob	1
Around one year	Starting to form a hook posteriorly but development incomplete	2
Over one year	Fully developed hook posteriorly, non-porous, sharply defined edges	3

Table 3. Estimated ages of wolves using skull characteristics.

Specimen #	Sex	Ossification of Sutures	Sagital Crest	Angle of Ramus	Tooth Wear	Bacula Weight grams	Bacula Length mm	Estimated Age
PG-1-57	M	1	1	1	nil	0.9	86	7 months
PG-3-58	M	2+	3	3	slight	4.0	122	21 months
000165	M	1	1	1		0.7	77	6 months
PG-4-59	F	4	4	3	heavy			+72 months
PG-5-59	M	3	3	3	slight	3.9	118	22 months
PG-6-59	F	3	3+	3	medium			34 months
PG-7-59	M	3	3	3	slight	3.9	108	22 months
PG-8-59	M	1	1	1	slight	1.5	92	10 months
PG-9-59	F	1	2	1+	slight			11 months
PG-10-59	M	1	1+			2.2	104	9 months
PG-11-59	F	1	1	1				9 months
PG-12-59	F	3		3				22 months
PG-13-59	M	3	3+	3	medium	5.9	124	35 months
PG-14-59	M	2+	2+	2+		3.8	115	23 months
PG-15-59	F	2+	2	2	slight			12 months
PG-16-59	M	3		3		4.8	118	36 months
PG-17-59	M	3	2+	2+	slight	4.3	110	24 months
PG-18-59	M	2+	3	2	slight	2.3	108	12 months
PG-19-59	F	3	3	3	well worn			48 months
PG-20-59	M	2	2	2	nil	2.3	108	12 months
PG-21-59	F	3	2	3	slight			18 months
PG-22-59	F	1	1	1	nil			7 months
PG-23-59	F	1	1	1	nil			7 months
PG-24-59	?	1	1	1	nil			7 months
PG-25-59	F	2+	2	2	slight			19 months
PG-26-59	F	1		1	nil			8 months
PG-27-59	M	1	1	1	nil	1.3	85	8 months
PG-28-60	F	2+	2	3				22 months
HZ-1-58	F	1	1	1	nil			9 months

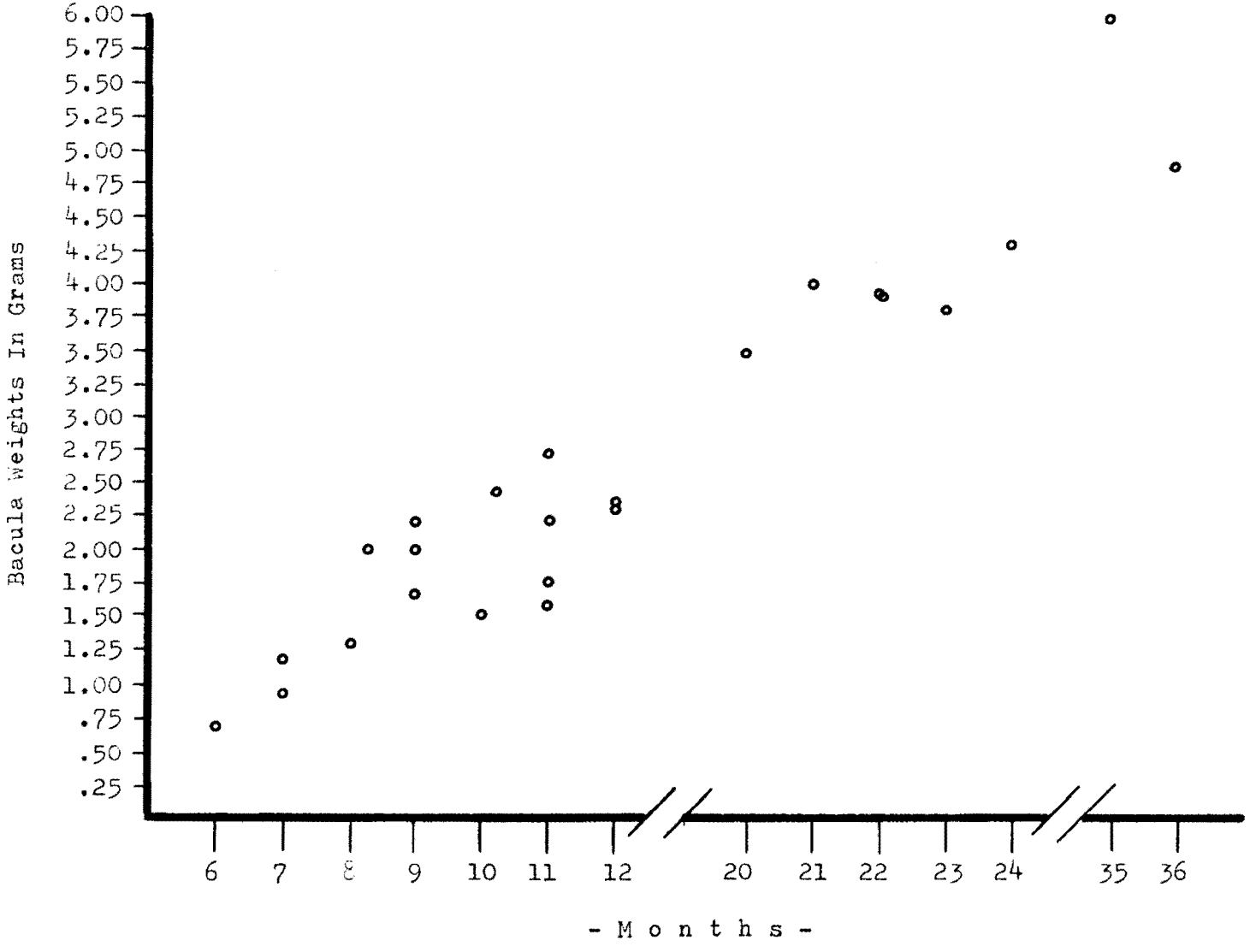
Table 3 (cont.) Estimated ages of wolves using skull characteristics.

Specimen #	Sex	Ossification of Sutures	Sagital Crest	Angle of Ramus	Tooth Wear	Bacula Weight grams	Bacula Length mm	Estimated Age
40-59	M	3	4	3	well worn			29 months
PG-29-60	F			1+				11 months
PG-30-60	F		2	1				11 months
PG-31-60	?	2	2	2	nil			11 months
FPC-1-57	M	1	1+	1	nil			9 months
FPC-2-57	M	1	2	1	nil			9 months
FPC-3-57	M	1	1+	1	nil			9 months
FPC-4-56	M	3	4	3	slight			32 months
FPC-5-56	F	1	1	1	nil			8 months
FPC-6-57	F	3	3	3	slight			32 months
FPC-7-57	F	3+	4	3	heavy			56 months
FPC-8-57	F	1	1	1	nil			8 months
FPC-9-57	F	1	1	1	nil			8 months
FPC-10-56	?	1	1	1	nil			7 months
FPC-11-57	F	1	1	1	nil			9 months
FPC-12-57	?	1	1	1	nil			9 months
FPC-13-57	?	1	1	1	nil			9 months
FPC-14-57	?	1	1	1	nil			9 months
FPC-15-57	F	1	1	1	nil			9 months
FPC-16-57	M	2	3	3	slight+			33 months
FPC-17-57	M	1	1	1	nil			9 months
FPC-18-57	F	1	1	1	nil			9 months
PG-32-60	F	2	2+	2+	slight			17 months
PG-33-60	F	3	4	3	slight			31 months
PG-34-60	M	3	2+	2+	medium+	3.9	116	17 mos.known age
PG-35-61	F	1	1	1	slight			9 months
PG-36-61	M	3	3	3	slight	3.5	111	20 months
PG-37-61	M	1	1	1	nil	2.05	98	8-1/2 months

Table 3 (cont.) Estimated ages of wolves using skull characteristics.

Specimen #	Sex	Ossification of Sutures	Sagital Crest	Angle of Ramus	Tooth Wear	Bacula Weight grams	Bacula Length mm	Estimated Age
PG-38-61	M	1	1	1	nil	2.0	99	9 months
PG-39-61	M	1	1	1	nil	1.7	93	9 months
PG-40-60	M	1	1	1	nil	1.2		7 months
PG-41-61	F	1	1	2	nil			10 months
PG-42-61	M	2	2	1	nil	2.4	104	10-1/2 months
PG-43-61	M	1	2	2	slight	2.2	103	11 months
PG-44-61	M	1	2	2	nil	2.7	104	11 months
PG-45-61	F	1	2	1	nil			11 months
PG-46-61	M	1	2	1+	nil	1.75	98	11 months
PG-47-61	M	1	1	2	slight	1.6	95	11 months
PG-48-61	F	1	1+	2	slight			11 months
PG-49-61	F	2	2	2+	slight+			35 months
PG-50-61	M	2	3+	3	medium+	4.9	115	22 mos.known age
PG-51-61	F	2	2+	2	slight			12 months

Figure 1. Bacula weights of wild wolves plotted against assigned ages as determined by skull characteristics.



show that the baculum continues to grow during the first three years of life and that no overlap of bacula weights occurs between year classes of wild wolves.

Table 4 lists the ages of wolves taken during the period from December 1956 through April 1961 by hunters, trappers, and through the use of strychnine lethal baits in the course of predator control operations.

Reproduction

Wolves theoretically have a greater reproductive potential than deer but their numbers never approach those of deer. Wolves are sexually mature at 22 months of age and litters average seven or eight pups. Thus, in a theoretical population composed of equal numbers of both sexes, there would be one adult over two years old for approximately every four juveniles under a year old. In our aged sample numbers of males and females are substantially equal. There are 3.8 juveniles under a year of age to every adult over two years old. If our sample is closely representative of the population in Southeastern Alaska, it shows that less than 25 per cent of the population lives to attain sexual maturity and less than 5 per cent live through more than one breeding season.

Reproductive tracts have been collected from 21 males and 17 females but analysis of these is not complete.

Parasites

Nine wolves were examined for parasites by Alaska Department of Fish and Game Parasitologist Kenneth Neiland. One wolf from Kupreanof Island was infected with Echinococcus granulosus and six from Kupreanof and Kuis Islands harbored Taenia hydatigena.

Captive wolves with tag numbers 3 and 13 were killed. They were autopsied by Neiland and found to be free of parasites.

Release of Captive Wolves

Two male and two female captive wolves, tag numbers 2, 5, 11 and 12, respectively, were released on Coronation

Table 4. Ages of wolves killed in Southeast Alaska during December 1956 through April 1961.

Method	Under 13 mo.	13 mo. to 24 mo.	25 mo. to 36 mo.	37 mo. to 48 mo.	49 mo. to 60 mo.	Over 60 mo.
Strychine	20	4	4		1	1
Trapped	20	4	2			
Shot	6	3	3		1	
Totals	46	11	9	0	2	1

Island during October 1960 following studies of Coronation's deer population under project W-6-R-1, A-1f and W-6-R-2, A-1f. Wolves were transported in 50 gallon drums lengthened by welding on an additional half of drum. The wolves were confined to the drums for four days during transporting and were fed chunks of raw meat. Upon their release all wolves appeared to have survived the confinement with no ill effects.

In May 1961 observations on Coronation Island showed that the wolves had survived the winter. Tracks on beaches indicated that at least one male and one female were present but actual numbers could not be determined from tracks.

Evidence from scats and the remains of several deer apparently killed by the wolves indicates that the wolves made a successful adjustment to life in the wild.

Reactions to Drugs

Captive wolves were subjected to experiments with tranquilizers and immobilization drugs. The following is a summary of the results:

1. September 27, 1960
   Captive female ear tag # 11
   Approximate weight: 80 lbs
   Drug: Succinylcholine chloride
   Dose: 0.5 cc of 50 mg/cc concentration = 25 mg
   Dose per pound body weight: 0.31 mg
   Second drug: Pentobarbital sodium
   Dose: 16.0 cc of 1 grain/cc= 16 grains
   Dose per pound body weight: 1 grain/5 lbs
   Notes: Shot above the heel of the right hind leg; down in 3 to 4 minutes; leg wound bleeding; shot interperitoneally with pentobarbital sodium. Aroused 12 minutes following immobilization induced by succinylcholine chloride and 8 minutes following injection of pentobarbital sodium. Drowsy when aroused. Pentobarbital sodium had little or no apparent effect.

2. September 29, 1960
Captive male ear tag # 13
Approximate weight: 105 lbs
Drug: Succinylcholine chloride
Dose: 0.7 cc of 50 mg/cc concentration = 35 mg
Dose per pound body weight: 0.28 mg
Second drug: Pentobarbital sodium
Dose: 20.0 cc of 1 grain/cc = 20 grains
Dose per pound body weight: 1 grain/5 lbs
Notes: Shot above the heel inside the hind leg; down in four minutes; leg wound bleeding. Shot interperitoneally with pentobarbital sodium six minutes following shot of succinylcholine chloride. Preventative artificial respiration given for several minutes. Heart beat strong but irregular; 90 beats per minute and coinciding with breathing. Aroused for brief duration one hour and 56 minutes following initial anesthesia. Trying to rise after 3 hours and 30 minutes. Unsteady forelegs. Hind legs appear to be paralized. 5-1/2 hours to recovery. Still unsteady and drowsy but active.

3. September 29, 1960
Captive male ear tag # 3
Approximate weight: 95 lbs
Drug: Succinylcholine chloride
Dose: 0.65 cc of 50 mg/cc concentration = 32.5 mg
Dose per pound body weight: 0.34 mg
Second drug: Pentobarbital sodium
Dose: 20 cc of 1 grain/cc = 20 grains
Dose per pound body weight = 1 grain/5 lbs
Notes: Shot in the ham of the hind leg. Down in 30 seconds. Immobilized in one minute. No bleeding from wound. Shot interperitoneally with pentobarbital sodium. Death followed 16-1/2 minutes after initial immobilization and 10-1/2 minutes following administration of pentobarbital.

4. March 1, 1961
Captive male wolves ear tag numbers 13 and 15

Approximate weights: 100 lbs each
Drug: Sleeping pills, containing Amobarbital sodium and Secobarbital sodium, 3 gr or 0.2 gm
Dose: 5 tablets per wolf
Notes: No noticeable effect

5. March 2, 1961
Captive males ear tag numbers 13 and 15
Approximate weights: 100 lbs each
Drug: Tranquilizer; Diquel; contains Ethy Isobutrazine, (2 ethyl - 3' dimethylamino - 2 proyl), 10 phenothiazine hydrochloride Tablet form, 50 mg/tablet.
Dose: 5 tablets or 250 mg to each wolf
Dose per pound body weight: 2.5 mg
Notes: No definite effect to either wolf seen in 2 hours of observation time.

6. March 2, 1961
Captive male ear tag # 15
Approximate weight: 100 lbs
Drug: Succinylcholine chloride
Dose: 0.5 cc of 50 mg/cc concentration = 25 mg
Dose per pound body weight: (3 doses - only one dose believed to have been successfully administered) 0.25 mg.
Notes: Wolf went down in three minutes following the third shot. Required artificial respiration for one hour and ten minutes. Recovery was complete in one hour and 30 minutes.

7. March 3, 1961
Captive male ear tag # 13
Approximate weight: 100 lbs
Drug: Tranquilizer; Diquel
Dose: Ten tablets - 50 mg/tablet = 500 mg
Dose per pound body weight: 5.0 mg
Notes: Wolf was tranquilized in one hour and 15 minutes.

8. March 3, 1961 (following above tranquilization)
Captive male ear tag # 13
Approximate weight: 100 lbs
Drug: Succinylcholine chloride
Dose: 0.5 cc concentration 50 mg/cc = 25 mg
Dose per pound body weight: 0.25 mg
Notes: Down in five minutes. Immobilized in six minutes. Breathing loud and "pantlike" approaching nearly 100 breaths/minute. Recovery in 10 minutes.

9. Same as above.
Shot twice more same day.
First Dose: 1/4 cc = 12.5 mg
Notes: Wolf groggy; not immobilized
Second Dose: 1/2 cc = 25 mg
Notes: Wolf died 50 minutes following last shot. Artificial respiration administered for 45 minutes of life.

10. March 6, 1961
Captive male ear tag # 15
Approximate weight: 100 lbs
Drug: Succinylcholine chloride
Dose: 0.4 cc concentration of 50 mg/cc = 20 mg
Dose per pound body weight: 0.2 mg
Notes: Immobilized in four minutes. Heart: 50-60 beats/minute 12 minutes after becoming immobilized. Complete recovery from time of immobilization was 38 minutes.

11. March 13, 1961
Captive male ear tag # 15
Approximate weight: 100 lbs
Drug: Tranquilizer; Diquel
Dose: 5 tablets of 50 mg each = 250 mg
Dose per pound body weight: 2.5 mg
Notes: Tranquilized in one hour and 30 minutes

12. March 13, 1961
Captive male ear tag # 15
Approximate weight: 100 lbs
Drug: Succinylcholine chloride
Dose: 0.3 cc - concentration of 50 mg/cc = 15 mg
Dose per pound body weight: 0.15 mg
Notes: No noticeable effect.

In excess of 0.15 mg of succinylcholine per pound of body weight was required to immobilize a wolf.

The reaction of captive wolves to drugs may not be identical to that of wild wolves. The wear on the teeth of the captive wolves is excessive as compared to wild wolves of the same age and the bacula from two captive males does not fit the curve in Figure 1. The weight of baculum as plotted in Figure 1 indicates possible error in the age classification of the three year old specimen as determined from skull characteristics.

RECOMMENDATIONS:

The collection of biological data and reproductive material from carcasses of bountied wolves should be continued.

Wolf food habit studies should start in the spring of 1961 on Coronation Island.

Permanent vegetation plots should be established on Coronation Island to provide comparisons of deer range condition changes.

SUBMITTED

Paul Garceau
Game Biologist
June 30, 1961

APPROVED BY:

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James W. Brooks, Director
Division of Game

Volume 2 Report No. K-2

ANNUAL REPORT OF PROGRESS
INVESTIGATIONS PROJECT
COMPLETION OF 1960-1961 SEGMENT

State: Alaska

Project No: W-6-R-2 Name: Alaska Wildlife Investigations

Work Plan: K Wolf Management Studies

Job No: 2 Title: Ecology of the Wolf in South Central Alaska

PERIOD COVERED: March 6, 1961 through March 10, 1961

ABSTRACT:

From March 6, 1961 through March 10, 1961, 38.1 hours were flown by 2 pilots and 2 observers in an attempt to census the wolves in the Nelchina Wolf Study area. Tracking and sighting conditions were poor and only 18 wolves were observed. Seventy wolves were represented by 16 track sightings of from 1 to 11 animals each, averaging 4.8 wolves per sighting. Coupling the number of wolves actually observed with those represented by tracks, a minimal figure of 79 was obtained; this then in terms of total hours flown represented 2.1 wolves per hour. The total wolf population was estimated to be between 100 and 125 animals. Of the 15 animals observed to have been fed upon by wolves, 9 were moose, 3 were caribou, and 3 were not identified. Wolf sign was most plentiful in the interior of Unit 13 rather than being evenly distributed throughout the study area. Animals observed in addition to wolves, other than caribou, included 408 moose, 7 wolverine, 1 coyote and 8 fox.

OBJECTIVES: Primary

To determine the number of wolves in the Nelchina Wolf Study Area, located in Game Management Units 13 and 14.

Secondary

To record pack sizes and color combinations.

To record numbers and kinds of prey and carrion species.

To record areas in which wolves were active.

To acquire a cumulative list of species and numbers of other animals observed incidental to the census.

TECHNIQUES:

Because the Fish and Wildlife Service and the Alaska Department of Fish and Game were concurrently engaged in this census, it was thought desirable to amalgamate personnel and equipment in order to avoid unnecessary and costly duplication of effort. Bob Burkholder, Branch of Predator Control, Fish and Wildlife Service, and Buck Stewart, Conservation Officer, Alaska Department of Fish and Game, participated as pilots. Ron Skoog, Research Biologist, Alaska Department of Fish and Game, and Gerry Atwell, Game Management Biologist, Alaska Department of Fish and Game, acted as observers.

Two 150 horsepower Supercubs afforded transportation and a feasible means to track wolves. Other than emergency gear and winter clothing no specialized equipment or materials were utilized.

Tazlina Lodge (mile 157, Glenn Highway) was selected as the base of operations because of its location and facilities.

The study area (Unit 13 and Unit 14 north of the Kashwitna River) was censused by drainages roughly in a west to east coverage, the 2 aircraft being flown at approximately 300 feet in an attempt to locate all wolf tracks. Various predetermined areas, necessitating 3 to slightly over 6 hours flying time, were assigned daily to each crew. Flight plans were filed with the FAA as a safety measure.

When wolf tracks were observed they were either followed until the animals were located or the tracks were lost. When the latter occurred, backtracking was done until the tracks fanned out and a count could be made. The figure obtained in this manner was a minimum because without ground examination the observer could not be assured that more than one wolf was represented by each set of tracks.

When feasible, landings were made to determine the age, sex, condition, and cause of death of the moose and caribou fed upon by the wolves; however, in most instances there was a lack of suitable areas in which to land and the inspections were aerial only.

Sightings of wolves, their tracks, and animals fed on by wolves were noted as to specific locality, these localities being entered daily upon a 1/250,000 scale map of the area.

An accumulative list of animals observed incidental to the census was maintained.

FINDINGS:

This census commenced on March 6, 1961 and terminated 4 days later on the 10th when it was realized that data obtained up to that time were insufficient to justify further efforts.

Tracking and sighting conditions were poor. Existing snow depths were far below normal, 2 feet being near the maximum on the flats and river bottoms; the surface snow was old permitting the accumulation of all

manner of tracks; the brush and trees supported no snow; the sun was bright each day, casting shadows so that even a moose was difficult to spot; and some areas, particularly the north-northeastern sector, were wind blown to the degree that no tracks existed.

Sixteen man days of effort in the field represented by 38.1 hours of flying (Table I) were expended during the 5 day operation.

TABLE I

HOURS FLOWN DAILY

	FWS Super Cub	ADFG Super Cub	Totals
Monday	6 hrs. 18 min.	-- --	6 hrs. 18 min.
Tuesday	5 hrs. 15 min.	3 hrs. 19 min.	8 hrs. 34 min.
Wednesday	5 hrs. 6 min.	2 hrs. 55 min.	8 hrs. 1 min.
Thursday	5 hrs. 48 min.	4 hrs. 14 min.	10 hrs. 2 min.
Friday	2 hrs. 35 min.	2 hrs. 37 min.	5 hrs. 12 min.
Totals	25 hrs. 2 min.	13 hrs. 5 min.	38 hrs. 7 min.

GRAND TOTAL 38 hrs. 7 min.

The tracking and sighting conditions were such that only 18 different wolves were observed within the 18,000 square miles of the study area during this survey (Table II). Of 4 sightings, exclusive of 1 duplication, the average number of wolves per sighting was 4.5. However, when it is taken into consideration that the 2 wolves located on 3/6/61 may have been the remnants of a pack of 7 shot up by bounty hunters, (signs of which appeared in the snow) and that in addition the 3 animals observed in a thickly timbered draw on 3/7/61 were part of a pack of 11 (as evidenced by tracks), the average number at each sighting was

increased to 7.5. The black color phase outnumbered the gray 11-7.

Sixteen non-duplicated track sightings (Table III) offer the best source of information. The pack sizes ranged from 1 to 11 wolves, averaging 4.8, and totalling 70. Four sightings of 1 track each undoubtedly lowered the average considerably, although the 4.8 did closely conform to the 4.5 average of packs actually seen.

When the locations of the 18 wolves observed (Table II) were checked against the locations of the track sightings (Table III), 9 of the 18 wolves seen were believed to be duplicated by tracks. This left 9 wolves not duplicated by track sightings and these 9, when added to the 70 animals represented by tracks, total 79, a minimum population figure for the study area. Projecting this minimum figure an estimate of the total wolf population on the study area would be between 100 and 125 animals.

Seventy-nine wolves or 2.1 wolves per hour were accounted for during 38.1 hours of flying.

During the survey the remains of 15 animals fed upon by wolves were found (Table IV). Only at 2 carcasses were landings practical; both animals observed were moose calves. Because of the scanty remains it was impossible to determine the cause of death. All of the 15 carcasses used by wolves (9 moose, 3 caribou, and 3 unknown) may not represent animals killed by them. R. O. Skoog (viva voce) estimates that 10 per cent of all caribou carcasses found and examined by him in the field within the past 10 years were the result of innate mortality. In addition hunter kills not salvaged during the late fall hunting season may attract wolves in mid-winter.

When a pack of 10 wolves was closely observed from March 11 through April 22, 1958 (Burkholder, 1959), in the same area where carcasses were most frequently located during this census, 22 kills were found. Of these 22

TABLE II

WOLVES OBSERVED

No.	Color Black	Color Gray	Date	Location
2	1	1	3/ 6/61	Oshetna River 4 miles SW of Little Oshetna.
1*	1		3/ 7/61	Oshetna River 1-1/2 miles NE of Granite Creek.
3	1	2	3/ 7/61	1/2 mile up draw on South side of Susitna River between Susitna and Clarence Lake.
7	6	1	3/ 7/61	On West Fork of Gulkana River 7-1/2 miles west of Moose Creek.
6	3	3	3/10/61	1/2 mile up Billy Creek from Caribou Creek.
19	12	7		

19 Total wolves counted
- 1* Black of 3/7/61 same as black of 3/6/61.

18 Wolves observed once each.

TABLE III

WOLF TRACK SIGHTINGS

No. Animals Represented by Tracks	Date Sighted	Age of Tracks	Direction taken by Animals	Location
1	3/6/61	Old*	?	Iron Creek 1-1/2 miles west of Middle Fork.
5	3/6/61	Fresh**	S	Talkeetna River 7 miles SE of Prairie Creek.
7	3/6/61	Old	S	Oshetna River 4 miles below Little Oshetna River.
9	3/6/61	Old	SE	Mendeltna Creek 2 miles south of Old Man Lake.
6/	3/7/61	?	ENE	4 miles up Alfred Creek from mouth.
1	3/8/61	?	SW	6 miles northeast of mouth of Watana Creek.

* Old - Tracks made three or more days prior to observation.

** Fresh - Tracks made less than three days prior to observation.

/ Probably same pack seen on Billy Creek. Included in figuring size of average pack through track sightings but not included in determining total number of animals in area.

TABLE III (continued)

WOLF TRACK SIGHTINGS

No. Animals Represented by Tracks	Date Sighted	Age of Tracks	Direction taken by Animals	Location
6	3/8/61	Old	NE	On Jay Creek 5 miles from mouth.
11	3/8/61	Old	S	On Susitna River 2 miles north of Tyone River.
11*	3/8/61	Fresh (last night)	NNW	4 miles north northeast from east end of Clarence Lake.
6	3/8/61	Fresh	N then W	4 miles north of mouth of Raft Creek and Susitna River.
1	3/8/61	Fresh	E	Narrow Lake 4 miles west of headwaters of Moose Creek of West Fork of Gulkana River.
2	3/8/61	?	N	On Chistochina River 9 miles north of Chistochina.

* Not included in totals because this pack same as pack of 11 whose tracks sighted 3/8/61.

TABLE III (continued)

WOLF TRACK SIGHTINGS

No. Animals Represented by Tracks	Date Sighted	Age of Tracks	Direction taken by Animals	Location
8	3/9/61	?	S then W	Moose Creek of Yanert Fork, 6 miles east of confluence of Moose Creek and Yanert Fork.
2	3/9/61	?	NNW	4 miles NNW of confluence of Susitna River and Valdez Creek.
7	3/9/61	Fresh	E	West Fork of Gulkana 4 miles East of Keg Creek.
3	3/9/61	?	ENE	9 miles east of Tyone Lake.
1	3/10/61	Fresh	E	North Shore Klutina Lake.

87 = Total tracks counted.
-17 = Duplication of tracks by repeated sightings.
70 = Total tracks representing one sighting of each.
+ 9 = Wolves sighted and not duplicated by track counts.
79 = Total wolves accounted for in the study area.

TABLE IV

KILLS

Date Located	Species*	Age	Utilization of Kill	No. Wolves which had been at Kill Site	Checked by Landing	Location
3/6/61	M	Calf	Complete except for jaw	5	Yes	Talkeetna River 7-1/2 miles east of Prairie Creek.
3/6/61	C	?	Small piece of hide remaining	6 or 7	No	5-1/2 miles up Black River from mouth.
3/7/61	C	?	Piece of hide left	6	No	On Crooked Creek 3-1/2 miles from mouth.
3/7/61	?	?	Complete	?	No	Tyone Creek 7 miles southwest of Tyone River.
3/7/61	C	?	Portion of hide left	?	No	Tyone Creek 6 miles southwest of Tyone River.
3/7/61	M	?	Portions of viscera and hide left	11	No	1-1/2 miles up Goose Creek from its mouth.

* Species - M= moose, C= caribou, ?= unknown

TABLE IV (continued)

KILLS

Date Located	Species*	Age	Utilization of Kill	No. wolves which had been at Kill Site	Checked by Landing	Location
3/7/61	M	?	Stomach contents & hide left	11	No	2-1/2 miles up Goose Creek from its mouth.
3/7/61	M	?	Utilization complete except for a few scattered clumps of hair	8	No	7 miles west of Oshetna River on Susitna River.
3/7/61	M	?	Moose 2/3 whole, wolves at kill	8	No	4 miles northwest of Clarence Lake.
3/8/61	M	Calf	Bones & skin of right half still in place	11	Yes	On Susitna River 4 miles north of Tyone River.
3/8/61	M	?	Hair & part of hide remaining	7	No	On West Fork of Gulkana River 3 miles west of Moose Creek.

* Species - M= moose, C= caribou, ?= unknown

TABLE IV (continued)

KILLS

Date Located	Species*	Age	Utilization of Kill	No. Wolves which had been at Kill Site	Checked by Landing	Location
3/8/61	?	?	Assorted pieces of viscera remaining	9	No	East shore of Old Man Lake.
3/9/61	?	?	Complete	8	No	12 miles up Moose Creek of Yanert River.
3/9/61	M	?	Hair & part of hide left	7	No	3-1/2 miles east of Keg Creek on West Fork of Gulkana River.
3/10/61	M	?	Stomach contents & viscera remaining	6	No	1/2 mile up Billy Creek from Caribou Creek.

Moose = 9
Caribou = 3
Unknown = 3
15

* Species - M= moose, C= caribou, ?= unknown

animals 14 were caribou and 8 were moose, a breakdown which does not follow the results of this census; however, the then deeper snow and possibly larger concentration of caribou in the area might explain the inconsistency. Many carcasses were undoubtedly not located this year because of the poor sighting conditions; thus, the 15 we observed represents a minimum figure.

Wolf activity (Tables II, III, and IV), although dispersed throughout Unit 13, was noticeably prevalent in the more remote interior sections. The drainages of the Oshetna River, the upper West Fork of the Gulkana River, and the Susitna River between its confluences with Kosina Creek and the MacLaren River all rendered evidence of use by wolves.

Portions of the study area not covered by this census include: that area west of the Alaska Railroad, the northeast section east of Haggard on the Richardson Highway, and that part southeast of Klutina Lake.

Species tallied other than wolves and caribou (Table V) were: 408 moose, 7 wolverine, 1 coyote, and 8 fox (5 red, 1 cross, 1 silver, and 1 unknown). Because of the wide dispersal of the caribou it was impossible to maintain an accurate count without expending a major effort; thus they were omitted.

When sighting conditions are adequate the methods utilized in this census would very likely prove effective in acquiring an accurate estimate of the study area wolf population.

RECOMMENDATIONS:

Any wolf census designed to encompass large tracts of land should be loosely scheduled so that the maximum advantage might be realized from the optimum sighting conditions whenever they might exist.

If the area to be covered requires more flying than 15 hours 2 aircraft should be assigned to the task in

TABLE V

ANIMALS OBSERVED OTHER THAN WOLVES AND CARIBOU

Date	Moose	Wolverine	Coyote	Fox			
				Red	Cross	Silver	Unknown
3/ 6/61	108	1			1		
3/ 7/61	97	3		2			
3/ 8/61	65		1	1			
3/ 9/61	112	2		2		1	1
3/10/61	26	1					
Totals	408	7	1	5	1	1	1

order to minimize the distance wolves could travel during the census. This would decrease the possibility of duplicate track counts.

At least one individual in each aircraft, preferably the pilot, should be experienced in tracking wolves from the air.

Literature Cited:

Burkholder, Bob L. 1959. Movements and Behavior of a Wolf Pack in Alaska. J. Wildl. Mgmt., 23 (1): p. 1-11.

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