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NORTH SLOPE Grizzly bear studies

BY

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VOLUME II

Project Progress Report Federal Aid in Wildlife Restoration Project W-21-1, Job 4.14R

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JOB PROGRESS REPORT (RESEARCH)

State:

<u>Alaska</u>

Cooperators: Harry V. Reynolds and John Hechtel

Project No.:

Job. No.:

<u>W-21-1</u>	Project Title:	Big Game Investigations
<u>4.14R</u>	Job Title:	Structure, Status, Reproductive Biology, Movement, Distribution, and Habitat Utilization of a Grizzly Bear Population

Period Covered: July 1, 1979 through June 30, 1980

SUMMARY

During 1980 specific aspects of grizzly bear population biology in the western Brooks Range were studied. These included age at first production of offspring, length of reproductive life, litter size, reproductive interval, and mortality of young. Thirty bears were captured; of these, 17 were recaptures, 5 were offspring of marked females, and 8 were previously unmarked adults or their offspring. Radio collars of 11 bears were replaced so subsequent reproductive behavior of these grizzlies could be observed.

Of bears captured during 1977-80, females comprised 63 percent of the first three age classes of bears (cubs, yearlings, and 2-year-olds; n=35), a characteristic which apparently persists to a lesser degree in those bears older than 2 years of age (36 of 66 bears, 55% females). Contingent upon collection of additional data, the mean age at first production of young for western Brooks Range grizzlies was calculated at 8.1 years and mean litter size was calculated at 1.93 offspring/litter. Nineteen offspring which accompanied their mothers died during the 1977-80 period. Mortality rates for offspring of marked females were: cubs, 48 percent; yearlings, 13 percent; and 2-year-olds, 18 percent.

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BACKGROUND

Of all the brown/grizzly bear (Ursus arctos) populations in Alaska, those inhabiting the mountains and foothills of the Brooks Range are most susceptible to impacts of increased human population and development and to overexploitation by In this region, the grizzly is at the northern hunting. extent of its range; the period of food availability during the summer season is short, reproductive potential is low, the area required for individual home ranges is large, and the stunted vegetation of the region provides little cover (Crook 1971, 1972; Reynolds 1974, 1976, 1980; Reynolds et The exponential rate of increase of exploration al. 1976). and exploitation for oil and mineral resources can only be expected to continue its present pace. Improved access to the area provided by such development will probably be followed by increased bear-human contact and conflict. Confrontations could result in depletion of grizzly populations unless the baseline population information necessary for wise management is gathered.

Investigations of grizzly bears conducted in the central Brooks Range have included those by Rausch (1969) on dentition; Crook (1971, 1972) on survey techniques, distribution, and abundance; and in the eastern Brooks Range by Quimby (1974), Quimby and Snarski (1974), Reynolds (1974, 1976), and Reynolds et al. (1976) on survey techniques, population discreteness, denning characteristics, movement, and population characteristics.

In the western Brooks Range, intensive studies designed to provide baseline information on grizzly bear population structure, reproductive biology, movement characteristics, and habitat utilization were conducted in 1977 and 1978

(Reynolds 1978). In 1979 these studies continued on a much reduced scale and included investigations of grizzly bear predation on caribou (*Rangifer tarandus*) (Reynolds 1980). These past and present studies have addressed many of the informational gaps in the knowledge of grizzly bear ecology in the Brooks Range.

Other questions need additional study. Those aspects which require additional collection of data include: mean age at first production of young, reproductive interval, causes of mortality of cubs-of-the-year, survival rates and emigration of young-age bears, and impacts of human disturbance including gas and oil exploration and development. Because the population size has been established and the majority of bears in the study area are marked, much of these additional data can be collected with minimum effort and expense. However, in order to provide continuity of data collection, some of the radio collars of bears must be replaced before their batteries fail. In addition, the effects of aerial harassment on bears during summer and of disturbance by seismic trains on denning bears during winter can be monitored by transmitters implanted in bears captured for replacement of collars. Other unanswered questions exist regarding the effects of the availability and accessibility of food, both vegetational forage and meat acquired by predation or scavenging, on the reproductive capacity of bears and, in the case of caribou, what effects grizzlies have on prey populations. In the western Brooks Range, Reynolds (1978, 1980) reported that the density of grizzly bears in the vicinity of the calving grounds of the Western Arctic Caribou Herd was twice as high as the density of grizzlies in the eastern Brooks Range in an area of similar habitat and latitude. In addition, the litter size of grizzlies in the western Brooks Range was larger, and the reproductive interval was apparently shorter, than in the eastern Brooks Range. Reynolds (1978, 1980) theorized that both differences were responses to the availability of food in the form of caribou calves as prey and calves and adults Data should be obtained to determine the as carrion. validity of these preliminary indications.

OBJECTIVES

To determine the movement patterns, structure, size, status, reproductive biology, denning characteristics, and mortality rates of the grizzly bear population, and to assess potential effects of human disturbance on grizzlies of the western Brooks Range.

PROCEDURES

During 1977 through 1980, intensive studies were carried out in a 5,200 km^2 (2,000 mi²) area in the mountains and foothills of the western Brooks Range. The boundaries of the

study area were roughly: Archimedes Ridge (69°10'N latitude) on the north, the Kokolik River on the west, the crest of the Brooks Range on the south, and a line running from Thunder Mountain to the Utukok River (160°15'W longitude) on the east (Fig. 1).

Field work was carried out from a tent camp at Driftwood Creek airstrip on the Utukok River (68°55'N latitude, 152° 05'W longitude) from 1 May to 2 November 1977, from 12 May to 16 October 1978, from 4 May to 26 October 1979, and from 3 May to 19 August 1980.

Bears were captured with the use of a Bell 206B helicopter from 22 May to 7 July and 8 to 10 August 1977, from 7 June 3 July 1978, from 26 June to 1 July and 13 to 18 to September 1979, and from 5 to 13 July and from 15 to 18 August 1980. During the period that bears were captured, a Piper Super Cub (PA-18-150) aircraft was used to locate grizzlies and to direct the helicopter with the immobilization crew to the site. In addition, the Super Cub was used to conduct surveys or make observations and to locate bears fitted with radio transmitters.

Capture procedures followed standard helicopter immobilization techniques used on grizzly bears in the eastern Brooks Range (Reynolds 1974, 1976). Bears were immobilized with Sernylan (phencyclidine hydrochloride, Bio-Ceutic Laboratories, St. Joseph, MO) and acepromazine maleate (Ayerst Labs, New York, NY) injected into the rump using Cap-Chur equipment (Palmer Chemical and Equipment Co., Douglasville, All animals were measured, weighed (Appendix I), GA). for permanent identification, ear-tagged, and tattooed marked with individually coded visual identification collars or ear flags as described by Reynolds (1974) (Appendix II). In addition, 38 bears were fitted with collars containing radio transmitters; collars of five bears instrumented in 1977 and 1978 were replaced in 1978 and 1979, respectively, and 11 collars were replaced on bears in 1980.

A first premolar tooth was extracted for determination of age based on cementum layering (Mundy and Fuller 1964, Stoneburg and Jonkel 1966, Craighead et al. 1970). The techniques used to section, stain, and mount teeth for age determination were described by Glenn (1972). Whole blood was collected from femoral arteries using donor tubes and 150-cc vacuum plasma collection units (Travenol Laboratories, Forest Grove, IL) or 10-cc Vacutainers (Bection-Dickinson, Rutherford, NJ). Blood was centrifuged at the field station and sera were frozen for determination of the presence of *Brucella* antibodies as well as for blood chemistry studies being conducted by Dr. M. Philo, Saliva swabs were collected from University of Alaska. bears in August 1980 for identification of aerobic and anaerobic bacteria present in bear mouths. Richard G. Parry,



Figure 1. Grizzly bear study area in the western Brooks Range.

M.D., of the Eye, Ear, Nose, and Throat Clinic in Fairbanks, is analyzing the results from these collections to facilitate treatment for bear attacks on humans. Fecal samples were collected to aid in determining seasonal food habits and are being analyzed in detail by John Hechtel as part of a M.S. thesis.

Information on breeding biology was obtained by: 1) recording data on the size, coloration, and lactating condition of the mammae, condition of the vulva, baculum size, and position of the testes; 2) observing male-female pairing; and 3) recording the number of cubs and age structure of all family groups.

Movements and home range sizes were determined from resightings of marked grizzlies during aerial surveys, and from frequently relocating 38 animals fitted with radio transmitters (Telonics, Inc., Mesa, AZ). Radio-collared bears were relocated using a Super Cub aircraft equipped with a radio receiver-scanner and four-element, high-gain Yagi antennas mounted to the wing struts. Transmitter signals were received at distances up to 48 km (30 mi) under optimum conditions when the aircraft was at 1,500 m (5,000 ft) above ground level (AGL). Flight altitude was frequently 300 m (1,000 ft) AGL, and signals were received from 13-23 km (8-20 mi) distance.

Radio locations were plotted on 1:250,000 scale topographic maps, and relevant information was recorded. When possible, locations were determined visually every 4 or 5 days in 1977, every 7 days in 1978 and 1979, and on an opportunistic basis from 9 June to 19 July and from 13 to 19 August in During 1977-79 other commitments or long periods of 1980. inclement weather sometimes increased intervals between When radio-collared bears were not visually sightings. of during flights because adverse weather located conditions, cover, or terrain, "fixes" were then determined by triangulation or by abrupt changes in radio signal strength.

FINDINGS AND DISCUSSION

During 1977-79 baseline data were collected on population size, structure, movement patterns, habitat utilization, and denning characteristics. But because Brooks Range grizzlies are potentially long-lived and have low reproductive rates, population knowledge of biology а working requires study. Parameters describing productivity, longer-term especially reproductive interval and survival of young, must be recorded over a 5- to 10-year period in order to be accurate. Field investigations during 1980 were oriented toward studying these long-term aspects of reproductive data were collected regarding biology. In addition, migration, changes in movement and home range use, as well

as fidelity to areas used in denning. Since baseline information for the study population was described previously (Reynolds 1978, 1980), this report will contain only data gathered in 1980 or, where appropriate, information which substantially affects previous calculations.

During 1980, 30 grizzlies were captured and marked. This included 10 females and 7 males which had been captured before, 5 offspring of previously marked females, 2 unmarked females and their 3 offspring, and 2 adult females and 1 adult male which had not been captured previously.

Population Size

No observations made during 1980 indicate that bear numbers in the area have changed. The minimum population of 119 bears which was observed in 1979 for the 5,200 km² (2,000 mi²) study area, resulted in a calculated density of 1 bear/ 43.7 km² (1/16.9 mi²) (Reynolds 1980).

Sex and Age Composition

Forty-two males (41.6%) and 59 females (58.4%) were captured during this study. These figures probably reflect the proportions in which the two sexes exist in nonhunted areas of the Brooks Range; during tagging operations, animals were captured as they were encountered and no effort was made to specifically capture either sex. Sport hunting pressure, a factor which may alter sex ratios, is apparently negligible. For example, only two bears have been reported taken from the study area in the last 25 years (ADF&G files 1980).

Of bears younger than 3 years, 12 (34.3%) were males and 23 (65.7%) were females; this pattern was the same for each of the three age classes (cubs, yearlings, and 2-year-olds). The reason for the departure from an equal sex ratio is unclear. Since the ratio did not shift between successive age classes, such an imbalance suggests that either the ratio is an accurate reflection of sex at birth or that more males than females died prior to their emergence from the maternal den. It is unlikely that a substantial shift in the sex ratio occurs between the time offspring emerge from dens and when they are captured; most mortality of young occurs to entire litters rather than to only one or two siblings.

The sex and age distribution of marked and unmarked bears in the study area in 1978 is presented in Table 1. This represents a corrected version of the same table which was reported in a previous progress report (Reynolds 1980). Sex of marked bears was recorded after direct observation. All bears were assigned the ages they would have reached in 1978 to facilitate analysis for this table, regardless of their

Age by Cementum	Males	Females	Unmarked, Sex Unknown	Total Known in Age Class*
0.5 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5 10.5 11.5 12.5 13.5 14.5 15.5 14.5 15.5 16.5 17.5 18.5 19.5 20.5 21.5 22.5 23.5 24.5 25.5 26.5 27.5 27.5	3 2 6 2 1 5 4 0 3 2 1 1 0 0 2 0 0 0 2 1 0 2 0 0 0 2 1 0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	1 5 7 2 2 3 4 2 3 1 1 3 0 2 1 0 1 1 1 1 0 0 1 1 0 1	15 6 5 2	19 13 18 6 3 7 7 4 5 5 2 2 2 3 0 4 1 0 3 2 1 3 1 0 0 1 1 0 0 1

Table 1. Age and sex structure of the grizzly bear population in the study area in the western Brooks Range, 1978.

* Ages were either assigned after observation of individuals as cubs, yearlings, or 2-year-olds when they were accompanied by adult females or established from premolar tooth cementum annuli. In addition, the sexes and ages of 19 unmarked bears observed in the study area were estimated but not included in this table. Based on size, pairing during the breeding season or accompaniment by offspring, the sex and age of these unmarked bears were as follows: 2 of unknown sex were 2.5-3.5 years of age, 4 from 4.5-6.5 years of age, and 10 females and 3 males were estimated older than 6.5 years of age. year of capture. Similar data were collected in 1979 and 1980 but, since the research effort was not as intense, information concerning the composition and survival of each age cohort was not as accurate as in 1978. One difference observed in 1979 which did not occur in other years was that although a minimum of 15 cubs was produced, only six were still alive by mid-July. This observed survival represents a much lower cub cohort size than was recorded for the previous 2 years; in 1980 observed cub survival was similar to that in 1977-78. Whether these differences represent a recurring situation is unclear, but without greater production and survival of cubs than occurred in 1979, the population size will decline. The age distribution indicates there are more females than males in the adult cohorts; these females appear to have a longer life expectancy than do males.

Reproductive Biology

The following must be known to determine reproductive rates for bears: age at first production of young, length of productive life of females, length of the reproductive cycle or reproductive interval, and average litter size (Craighead et al. 1974). In Alaska the age at sexual maturity for brown/grizzly bears has ranged from 3.5 to 6.5 years on the Alaska Peninsula and Kodiak Island (Hensel et al. 1969, Glenn et al. 1976) and 6.5 to 12.5 years in the eastern 1976). In southwestern Yukon Brooks Range (Reynolds Territory, Pearson (1972) concluded females are first capable of conception at 6.5 years, but in northern Yukon Territory, age at first conception was 7.5 years. In Yellowstone National Park, Craighead et al. (1969) reported females bred at 4.5 to 8.5 years of age and had their first cubs the following spring. Moreover, they observed that some 3.5-year-old females copulated but none bore cubs the following spring.

During 1980, special effort was made to monitor changes in the reproductive status of females which had previously been marked. Table 2 summarizes the reproductive history of 44 potentially productive females. Although detailed analysis should wait until additional observations are made, the data which were collected corroborate some patterns which had been reported in past reports (Reynolds 1978, 1980) but may alter others.

The average age of females at their first production of young during 1977-79 was calculated at 8.4 years based on 11 observations (Reynolds 1980). Five additional observations were made in the 1980 field season which resulted in a calculated mean age of 8.1 years. Because calculations are based on actual observations and extrapolations, the results represent minimum values.

Bear	Age in		Reproduct	ive Histor	y and Litte	er Size	
No.	1980	Offspring No.	1977	1978	1979	1980	Comments
1085	22.5		В	В	NB?	NB	offspring prior 1977
1086	19.5	1087, 1164; 2UM	2 yrlg	2 2-yr	2 3-yr/B	2 cubs	
1089	7.5	2UM	NB	В	2 cubs		no offspring prior 1977
1090	21.5	3UM	3 yrlg	3 2-yr	3 3-yr/?B		
1092	11.5	1093	l cub	l yrlg	1 2-yr	В	
1095	9.5	none	? B	?B			no offspring prior 1977
1097	11.5	2UM	В	В	2 cubs/B	2 cubs/B	no offspring príor 1977
1100	9.5	2UM	NB	В	2 cubs/B	cubs?/B	no offspring prior 1977
1102	5.5	1180, 1181	NB	NB	В	2 cubs	no offspring prior 1977
1104	12.5	1101?, 1102?; 1UM; 1177	2 2-yr?/B	l cub/B	l cub	l yrlg	1101, 1102 probable offspring
1105	10.5	1UM; 1173, 1174	В	В	l cub/B	2 cubs	no offspring prior 1977
1106	14.5	1107, 1108, 1109	3 cubs	2 yrlg	dead		mortality: 1 yrlg 1978; 1106 (& 2 2-yr?) 1979
1110	27.5	1160, 1161	В	2 cubs	2 yrlg	2 2-yr	offspring prior 1977
1111	17.5	1112, 1113; 3UM	2 4-yr/B	В	3 cubs/B		• • •
1118	20.5	2UM Í	B	2 cubs	2 yrlg		offspring prior 1977
1119	9.5		В	В			no offspring prior 1977
1121	14.5	1122, 1123	2 cubs	2 yrlg	2 - yr/B	2 cubs	
1127	29.5 ⁰		В				offspring prior 1977
1128	10.5	1129; 3UM cubs	l yrlg/B	3 cubs			
1130	24.5	2UM	2 cubs	l yrlg			mortality: 1 cub/yrlg 1977-78
1134	17.5	1135, 1136, 1137	3 yrlg	2 2-yr	2 3-yr/B?	cubs?/B?	mortality: 1 2-yr 1978
1138	26.5 ⁰	1151, 1152, 1153	2 2-yr, 1 yrlg	2 3-yr, 1 2-yr			possible adoption of young
1139	13.5	1140, 1141	B	2 cubs	2 vrlg	2 2-vr/B	2
1142	16.5	'		В			offspring prior 1978
1143	11.5	1144, 1UM	2 cubs	2 yrlg	2 2-vr		
1146	16.5	1145, 1UM	1-2 yrlg	1 2-yr	1 3-yr/B		probable yrlg mortality

Table 2. Reproductive history and litter size for female grizzlies in the western Brooks Range.^a

Table 2. Continued

Bear	Age in		Reproduc	tive Histo	ry and Litt	er Size	
No.	1980	Offspring No.	1977	1978	1979	1980	Comments
1154	14.5	1155	l cub	l yrlg	1 2-yr	1 3-yr/B	
1156	8.5	none		B			no offspring prior 1978
1158	9.5	none		В			no offspring prior 1978
1166	10.5	none			?B	В	no offspring prior 1978
1167	11.5	1168		В	l cub	В	lost cub fall 1979/spring 1980
1169	11.5	1170, 1171			В	2 cubs	
1176	18.5	none				B?	
1178	13.5	1179	В	1 - 2 cubs	1-2 yrlg	1 2-yr	
UM		2 UM	2 cubs	2 yrlg			
UM		3UM	В	3 cubs			possible mortality: l cub 1978
UM		2 UM	В	2 cubs	2 vrlg		
UM		2UM	В	2 cubs	1-2 vrlg	1 2-yr	
UM		2UM	2 cubs				
UM		1162, 1163	2 vrlg	2 2-vr/?B			
UM		3UM	3 vrlg				
UM		2UM	2 2-vr				
UM		3UM	'	В	3 cubs		
UM		2UM	В	2 cubs	2 yrlg	2 2-yr	

^a Designations are as follows: UM=unmarked; --=no data; B=bred during that season; NB=did not breed; cub, yrlg, 2-yr, 3-yr=female accompanied by cub, yearling, 2-year-old or 3-year-old young; cub/B=cubs lost prior to breeding season, subsequent breeding by female; yrlg/B, 2-yr/B, etc.=offspring weaned, then subsequent breeding by female.

^b Probably dead.

τ.

Female No. 1102, captured as a 2-year-old in 1977, bred successfully in 1979 and produced cubs as a 5-year-old. This was the youngest age at which a female was observed with cubs; two other females first produced offspring at 6 years of age but most were older. One female apparently had not produced her first litter of cubs by age 10 years.

Observations made during this study indicate that some females may remain reproductively active until death, while others may stop breeding as they become older. Among relatively old females, one bred at age 26 but was not seen the following year, one was accompanied by cubs at age 19.5, one by yearlings at age 22.5, and another by 2-year-olds at age 27.5. One female bred unsuccessfully at ages 19.5 and 20.5 but was not observed with males and apparently did not breed at ages 21.5 or 22.5.

Litter size of female grizzlies was one to three cubs. The mean litter size for 1977-79 was 2.03; however, the relatively low production of young in 1980 (14 offspring in 9 litters) resulted in a mean calculated litter size of 1.93 for the 1977-80 period (Table 3). The causes for small litters in 1980 were unknown but may have resulted from normal year-to-year variation, food- or weather-related factors, or mortality which occurred prior to the first time I observed them.

Reproductive interval is the time between breeding by a female and weaning of her offspring, regardless of whether breeding results in production of young. During 1977-79 the mean reproductive interval was 4.03 years. During 1980 the reproductive interval was also at least 4 years. Of seven females accompanied by 2- or 3-year-old offspring, only one weaned her young as 2-year-olds and then bred. In view of the fact that not all females which breed produce young, additional observations will probably show a reproductive interval in excess of 4 years.

Mortality

In 1980 only three mortalities were documented: female adult No. 1167 lost her female cub sometime between 18 September 1979 and 10 June 1980; female No. 1097 lost her two offspring between 3 May and 18 June 1980. Other mortalities may have occurred but were not verified: No. 1086, a female with two cubs, was last seen on 18 July but a search carried out in August was unsuccessful in locating Because of the intensity of the search in the home her. range which No. 1086 had occupied, and the unlikely possibility that she moved from her traditional home range, I hypothesize the family group died or was killed. Searches for three other females and one male were also unsuccessful, but their assumed deaths were very likely due to advanced Their ages when last observed were 20.5, 24.5, and age. 26.5 for the females and 20.5 for the male.

	Age of off	spring when fi	rst observed o	r captured		
Year	Cubs/litters	Ylgs/litters	2-yr/litters	3-yr/litters	<u>Total</u>	Litter <u>size</u>
1977	15/8	16/7	2/1	2/1	35/17	2.06
1978	17/8	0	0	0	17/8	2.13
1979	15/8	2/1	0	0	17/9	1.89
19 8 0	13/8	0	1/1	0	14/9	1.63
	60/32	18/8	3/2	2/1	83/43	
mean litte	er					
size	1.88	2.25	1.50	2.00	1.93	

s i g

Table 3. Litter sizes for grizzly bears in the western Brooks Range, 1977-80.

Adult Female Bear	Number of Offspring in Litter	Number of Offspring Lost	Age of Offspring Lost*	Last Date Young Observed	First Date Young Observed Missing	Comments
1097	2	2	cub	5/9/79	5/15/79	1097 observed breeding 6/7/79
1097	2	2	cub	5/3/80	6/18/80	1097 observed breeding 6/18/80
1100	2	2	cub	5/5/79	6/29/79	1100 observed breeding 6/29/79
1104	1	1	cub	5/28/78	6/8/78	Male 1099 25 yds away on 6/8; 1104 bred again in 1978
1105	1	1	cub	5/22/79	5/31/79	1105 observed breeding 5/31/79
1111	3	3	cub	5/5/79	7/11/79	llll not resighted again
UM	3	1	cub	8/11/78	9/12/78	Wolf seen harassing UM9/3 cubs; UM9/2 cubs later seen in same vicinity
1130	2	1	cub or yrlg	6/30/77	8/2/78	-4
1167	1	1	cub or yrlg	9/18/79	6/10/80	1167 observed breeding 6/22/80
1106	3	1	yrlg	4/20/78	5/20/78	Runt yearling found dead at den site
1134	3	1	yrlg or 2yr	9/16/77	5/18/78	
1146	2	1	yrlg or 2yr	7/21/77	6/6/78	
1106	2	2	2-yr-old		5/4/79	ll06 probably killed by male 1099; young not sighted again, presumed killed

Table 4. Known mortality of the offspring of female grizzly bears in the western Brooks Range, 1977-1980.

* Designations are: cub, cub of the year; yrlg, yearling; 2-yr, 2-year-old

Known mortality of offspring of female grizzlies is presented in Table 4. Most observed mortality of cubs-of-the-year occurred from 1 to 4 weeks after emergence from maternal dens. Although the highest number of cubs was lost during 1979, this same degree of cub mortality may have occurred in 1980. Adult females No. 1134, 1100, and 1166 probably bred in 1979 but were not observed with young after 9 June 1980 when observations began. Therefore, it is possible that these females produced cubs and lost them before observations began in spring 1980.

Analysis of mortality rates for cubs, yearlings, and 2-year-olds is presented in Table 5. Cubs sustain the highest mortality rate; most mortality in that age class occurs to entire litters. In yearling and 2-year-old age classes, however, mortality rates are lower and usually involve only one member of the litter.

Movement and Home Range

Movements during 1980 were plotted based on the relocations 19 radio-collared bears. Sightings of of these bears radio-collared indicated that there were no substantive movements outside the home ranges used during 1977-79 (Reynolds 1980). A home range for adult female No. 1166, calculated in 1980 for the first time, was 334 km² (129 mi^2); this is similar to the mean home range size of 344 km² for 18 other females (Reynolds 1980). The movement pattern reported for male No. 1114 between the study area and the Arctic Ocean coast was observed again in 1980.

Emigration was not observed. Two young-age females (Nos. 1087 and 1145) and one male (No. 1164) were observed within their maternal home range a year after weaning. However, a 4-year-old male, which was weaned as a yearling and recaptured as a 3-year-old in the study area, was observed at a mining camp 120 km (75 mi) southwest of the study area in 1980. It is not known whether this bear had begun to establish a home range out of the study area.

Denning

Two attempts to reach the study area to locate winter dens in 1980 were thwarted by extreme winds and poor visibility. Dens of radio-collared bears will be located during.spring 1981 prior to emergence from dens. Patterns of fidelity by grizzlies to denning areas will be discussed in future reports.

Impacts of Human Disturbance

Although human disturbance associated with gas or oil development may occur throughout the year, disturbance during the winter when grizzlies undergo long periods of winter dor-

Age Class	Young/litters in Early Spring	Young/litters in Fall	Mortality Rate of Age Class
Cubs ^a (first year)	27/16	14/9	48.1%
Yearlings ^a (second year)	23/11	20/11	13.0%
2-year-olds ^b (third year)	11/6	9/5	18.2%

Table 5. Mortality rates for age classes of offspring accompanied by marked female grizzlies, 1977-80.

^a When it was unknown whether a mortality occurred between one age class and the next (i.e. between cub and yearling age class), it was assigned to the younger age class. This included two deaths in which offspring were cubs or yearlings and two in which the offspring were yearlings or 2-year-olds.

^b Of the three young which accompanied female No. 1138 when she was captured, Nos. 1151 and 1152 were 2-year-olds and No. 1153 was a yearling. This "mixed" litter was presumably the result of an adoption by No. 1138, but which offspring were adopted is unknown. For purposes of this table, the two oldest were placed in the 2-year-old category but the youngest was not included in the yearling cohort. mancy probably has the most serious effects. During late spring, summer, and early fall, bears are mobile and can usually escape sources of disturbance. However, during the period of winter denning, disturbance serious enough to cause bears to leave dens could result in poor physical condition or death. Furthermore, since female grizzlies give birth in winter dens, disturbance could cause abandonment of dens, resulting in the death of young exposed to winter weather.

The effects of human disturbance on grizzly bears will be measured in this study primarily by monitoring changes in heart rate and secondarily by noting changes in overt behavior. In a cooperative effort with Patricia Reynolds of BLM, Erich Follmann of the University of Alaska, and Michael Terry, DVM, of the U.S. Army, heart rate transmitters were implanted in two bears during August 1980. Although some baseline data were collected in 1980, data analysis will await further observations during winter 1980-81 and summer 1981.

RECOMMENDATIONS

This study resulted in collection of baseline data important to understand grizzly bear populations in northwestern Alaska and the potential impacts of human disturbance on grizzly populations in the arctic. However, additional information is needed. A technique for comparing the known density of bears in the study area with densities throughout the Brooks Range should be developed and tested. Observation of marked bears should be continued to improve the accuracy of reproductive data, allow calculation of long-term population productivity, and better determine survival rates and causes of mortality of young-age and mature grizzlies.

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Rood piloted the Super Cub used in the study; Craig and Vern Lofstedt flew the helicopter used in capture operations.

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Bear	Date	Sex	Age ₂ Cem ² (yrs)	Measured Weight	Total Length	Shoulder Height	Hind Foot	Neck	Girth	Body Length	Head Width	Head Length	Left Upper ₃ Canine	Left Lower ₃ Canine
1081	5/24/77	М	5.5	79	170	110	28	52	95	95			3.5	3.2
	9/17/79	М	7.5	195	191	123	29	78		102	21.7	37.0	2.7	3.0
	7/7/80	М	8.5	171	180	113	30	- 73	114	121	22.4	37.6	3.8	3.5
	8/15/80	М	8.5	180	182	105	27	71		116	22.3	37.9		
1082	5/25/77	М	13.5	168	200	126	32	79	129	117	25.3	39.1	4.2	3.4
	6/13/77	М	13.5	166										
	6/25/77	М	13.5	172										
	6/27/78	М	14.5	193	202	128	35	74	133	119	25.5	39.2	4.4	3.5
	6/28/79	М	15.5	218	216	129	31	77		100	27.7	40.0	4.3	3.7
	8/17/80	М	16.5	234	205	125	32	70		105	25.4	39.3	4.0	3.8
1083	5/25/77	М	7.5	120	188	115	31	70	117	110	24.0	36.0	3.2	2.8
	7/2/78	М	8.5	163	178	119	34	68	130	116	20.5	36.5	3.4	3.0
	6/30/79	М	9.5	161	190	120	27	69	124	116	21.0	36.4	3.2	3.0
1084	5/26/77	М	7.5	100	176	105	25	68	109	101	23.0	32.0		
1085	5/27/77	F	19.5	127	190	102	27	66	119	100	21.2	35.0	2.9b	3.8
1086	5/29/77	F	16.5	93	159	101	24	61	120	98	20.1	31.4	3.2	2.4b
	6/24/77	F	16.5	107							~ -		<u>`</u>	
	8/8/77	F	16.5	120	168	104	27	61	117	101	19.5	31.6	3.1r	2.6r
	9/16/79	F	18.5	182*										
1087	5/29/77	F	1.5	14	94	48	18	35	60	53	12.5	18.5		
	6/30/79	F	3.5	77	130	95	24	56	101	86	17.1	29.0	2.7	2.9
	7/7/80	F	4.5	92	149	94	25	66	108	98	18.5	30.8	3.0	2.9
1088	5/31/77	М	4.5	122	164	110	27	62	112	100	18.5	34.0	3.5	3.4
1089	6/1/77	F	4.5	55	140	97	27	53	84	83	15.8	29.0	3.0	3.0
	6/10/77	F	4.5	57										
1090	6/1/77	F	18.5	100	169	104	29	62	109	99	19.9	33.1	3.3	2.7w
1091	6/4/77	М	19.5	159	184	117	30	75	128	105	21.6	38.0	3.9	3.9
1092	6/4/77	F	8.5	100	168	92	25	68	107	100	19.9	32.5	3.1	2.8
	8/19/80	F	11.5	144	163	99	24	63	126	88	21.5	33.1	3.1	2.7
1093	6/4/77	F	0.5	17	86	48	17	31	58	50	11.4	19.8		
1094	6/5/77	М	4.5	79	165	111	32	57	94	96	17.3	32.2	3.2	3.0
1095	6/5/77	F	6.5	91	143	98	29	63	102	93	18.6	33.3	3.1	2.8

Annendix L	Sex	200	weights	and measurements	പ	orizzly be	ears	cantured i	in	northwestern	Alaska	1977-80
"PPendin I.	oca,	~ <u>6</u> ~,	"ergneb,	and measuremenes	01	gridery be	curb	cupeureu i		norenwebeern	nication,	1)// 00.

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			Age Cem ²	Measured	Total	Shoulder	Hind			Body	Head	Head	Left Upp e r _a	Left Lower ₃
Bear	Date	Sex	(yrs)	Weight	Length	Height	Foot	Neck	Girth	Length	Width	Length	Canine	Canine
1096	6/5/77	М	7.5	147	180	108	32	71	122	103	20.5	37.2	3.5	2.9
	6/28/78	М	8.5	179	197	115	34	78	126	112	21.6	37.1	3.5	3.1
	6/28/79	М	9.5		193	114	27	75	135	107	22.5	38.0	3.3	3.1
	8/17/80	M	10.5	227	194	124	26	79		138	22.6	37.3	3.7	3.2
1097	6/6/77	F	8.5	102	163		28	68	112	110	19.7	33.6	3.2	3.0
	7/6/80	F	11.5	135	173	96	26	67	117	99	20.5	34.2	3.3	3.2
	8/16/80	F	11.5	122										
1098	6/8/77	М	3.5	49	147	94	26	47	86	77	15.0	28.2	3.1	2.9
1099	6/11/77	M	10.5	166	186	129	30	79	128	112	21.9	38.5	3.7	3.5
	6/27/78	М	11.5	204*	198	120	30	76	128	112	22.6	38.8	3.9	3.5
	6/26/79	М	12.5	205	200	124	30	79	135	126	23.4	39.4	3.8	3.3
1100	6/11/77	F	6.5	91	163	98	26	59	98	100	17.2	32.4	2.7	2.7
	6/9/78	F	7.5	109	179	103	27	58	100	93	19.0	33.2	2.8	2.6
	7/1/79	F	8.5	100	170		29	62	99	101	19.3	32.8	3.0	2.8
1101	6/12/77	М	3.5	66	138	81	23	55	89	74	15.2	27.2	2.7	2.8
1102	6/12/77	F	3.5	57	138	82	25	50	85	68	14.6	26.7	2.6	2.4
	6/18/78	F	4.5	64	136	87	26	55	99	93	15.6	27.7	2.7	2.4
	8/18/80	F	6.5	95	165	78	24	54	95	91	17.2	31.4	2.8	2.9
1103	6/12/77	М	8.5	145	187	120	33	71	117	104	20.3	37.1	3.7	3.1
	6/12/78	M	9.5		179	121	31	71	122	115	21.5	37.4	3.6	3.1
1104	6/12/77	F	9.5	98	165	97	30	61	108	88	19.0	32.9	3.3	2.7
	7/10/80	F	12.5	113	149	102	26	60	109	95	19.5	33.3	3.4	2.6b
1105	6/13/77	F	7.5	102	164	115	-32	71	104	99	19.4	32.9	3.1	2.8
	6/28/78	F	8.5	129	170	106	31	66		11/	19.9	33.8	3.4	3.0
	7/10/80	F	10.5	117	175	106	29	56	113	108	19.9	33.1	3.2	2.8
1106	6/14/77	F	11.5	95	170	99	28	63	116	108	19.2	29.0	3.0	2.8
1107	6/14/77	F	0.5	3										
1108	6/14/77	F	0.5	9	73	49	15	26	43	44	10.5	1/.0	1.2	1.2
1109	6/14///	ł	0.5	8	63	49	13	26	45	41	10.1	16.1	1.0	1.1
1110	6/15/77	H T	24.5		169	109	30	62	120	100	20.6	33.5	3.7	1.8b
	//1//8	F	25.5		174	107	30	63	108	99	20.7	33.6	3.7	1.9b
	6/30/79	F.	26.5	107	163	106	26		108	106	21.1	33.5	3.8	1.9b
$\downarrow\downarrow\downarrow\downarrow\downarrow$	6/18/77	Ľ	14.5	109	175	9/	27	59	128	103	20.0	31.5	0. ك	Z .7

Bear	Date	Sex	Age ₂ Cem ² (yrs)	Measured Weight	Total Length	Shoulder Height	Hind Foot	Neck	Girth	Body Length	Head Width	Head Length	Left Upper ₃ Canine	Left Lower Canine
1112	6/18/77	М	4.5	113	165	103	31	62	109	109	19.1	33.3	3.4	3.0
1113	6/18/77	F	4.5	68*	157	96		55		84	16.8	29.8	2.9	2.9
1114	6/19/77	М	16.5	204	191	111	29	82	136	122	24.2	37.8	4.2	3.5b
1115	6/22/77	М	5.5	79	159	102	26	58	90	100	17.2	30.5	3.5	3.3
1116	6/23/77	М	5.5	79	170	100	29	53	108	101	17.8	32.1	3.3	3.0
1117	6/23/77	М	19.5	143	195	125	29	72	127	115	23.8	36.0	4.0b	2.9b
1118	6/23/77	F	17.5	84	170	100	27	57	96	105	19.1	21.5	3.1	2.6
1119	6/24/77	F	6.5	86	158	101	23	60	102	86	18.1	30.4	2.8	2.6
1120	6/24/77	М	16.5	177	214	119	32	77	127	120	24.5	36.2	3.9	3.5
1121	6/25/77	F	11.5	111	174	102	24	65	104	122	19.5	33.2	3.0	2.7
1122	6/25/77	М	0.5	14	91	47	15	28	55	43	11.0	17.5	1.3	1.2
1123	6/25/77	F	0.5	12	85	55	16	29	47	49	11.5	16.8	1.3	1.1
1124	6/26/77	М	17.5	163	186	114	33	76	118	104	23.2	36.6	3.5	2.8b
1125	6/27/77	F	3.5	66	160	102	25	54	93	93	16.0	29.6	2.9	2.9
1126	6/28/77	М	13.5	156	181	116	33	77	128	119	24.2	36.9	3.5	3.3
1127	6/28/77	F	26.5	134	180	111	31	70	125	115	21.4	36.8	3.5	3.1
1128	6/30/77	F	7.5	109*	174	92	26	57	104	. 90	19.9	32.4	3.0	2.7
1129	6/30/77	F	1.5	41	128	79	23	43	74	75	14.2	25.1	0.6	0.9
1130	6/30/77	F	21.5	116	178	109	28	62	117	107	20.6	33.0	3.7	2.6
1131	7/1/77	М	8.5	107	176	116	28	63	105	107	19.0	33.0	3.3	3.1
1132	7/2/77	F	1.5	30	118	68	20	39	64	65	12.5	21.4	1.1	1.4
1133	7/2/77	М	1.5	36	123	77	23	43	67	74	13.7	23.7	0.9	0.5e
	6/27/79	М	4.5	68	150	94	25	48	87	84	16.1	29.3	3.0	2.8
1134	7/5/77	F	14.5*	f 104*	175	107	28	64	122	111	20.0	33.7	3.3	2.8
	7/12/80	F	17.5	128	168	100	29	57	116	99	20.3	33.5	3.3	2.5b
1135	7/5/77	М	1.5	26	100	58	19	38	70	65	12.4	21.8	e	е
1136	7/5/77	F	1.5	22	90	62	19	39	62	60	12.5	21.6	е	е
1137	7/5/77	F	1.5	26	104	52	19	36	59	65	12.8	22.6	e	е
1138	8/10/77	F	23.5	113	165	98	25	61	118	101	21.2	27.9	2.8	2.5b
	6/16/78	F	24.5	120	180	101	28	65	120	101	20.5	31.8	3.1	2.5
1139	6/7/78	F	11.5	91*	166	113	28	62	119	94	19.2	31.9	3.1	3.0
1140	6/7/78	M	0.5	10	70	46	13	28	45	42	10.5	16.0	d	d

Bear	Date	Sex	Age ₂ Cem ² (yrs)	Measured Weight	Total Length	Shoulder Height	Hind Foot	Neck	Girth	Body Length	Head Width	Head Length	Left Upper ₃ Canine ³	Left Lower ₃ Canine ³
1141	6/7/78	F	0.5	7	66	44	13	24	43	34	10.9	15.6	d	d
	7/13/80	F	2.5	74	139	98	26	51	96	87	15.3	29.0	2.8	2.8
1142	6/9/78	F	14.5	113*	174	105	29	65	112	111	20.8	34.0	3.3	2.8
1143	6/9/78	F	9.5	95	172	96	27	56	96	101	20.5	32 .6	3.2	2.7
1144	6/9/78	F	1.5	17	104	59	19	33	52	58	12.0	21.8	e	е
1145	6/9/78	F	2.5	43	141	77	22	50	77	88	14.5	26.7	2.7	2.5
1146	6/9/78	F	14.5	104*	173	87	26	57	103	110	20.6	33.6	3.2	2.6
1147	6/9/78	M	3.5	93	163	99	27	56	99	94	17.1	33.1	3.8	3.3
	7/10/80	M	5.5	137	183	110	29	63	111	102	19.7	36.9	3.7	3.2
1148	6/10/78	М	6.5	9 3	167	91	27	61	99	100	18.2	32.0	2.8	2.5
1149	6/11/78	F	4.5	8 2	160	90	26	51	91	90	17.2	30.1	2.7	2.6
1150	6/16/78	М	5.5	84	164	105	28	56	101	101	17.6	31.8	3.5	3.1
1151	6/16/78	F	3.5	51	134	75	24	46	82	73	15.0	26.7	2.8	2.8
1152	6/16/78	М	3.5	64	148	89	27	56	101	93	16.0	29.2	3.1	3.1
1153	6/16/78	F	2.5	32	124	67	21	40	71	68	14.0	23.0	0.9	2.4
1154	6/21/78	F	12.5	100	160	113	27	59	103	101	19.6	32.5	3.2	3.0
1155	6/21/78	М	1.5	34	115	77	21	39	70	67	13.3	24.1	e	d
1156	6/21/78	F	6.5	93	169	112	26	65	97	102	17.8	32.0	3.0	2.9
1157	6/24/78	М	5.5	95	165	104	30	65	99	107	18.8	33.7	3.3	3.1
	6/30/79	М	6.5	- 125	177	113	30	66	115	104	20.0	34.9	3.2	3.1
1158	6/24/78	F	7.5	82	153	103	29	53	93	94	17.7	30.8	3.1	2.8
1159	6/24/78	М	10.5	134	184	115	30	71	125	113	21.6	36.0	3.8	3.3
	8/16/80	М	12.5	·	186	116	27	72	134	114	22.4	36.4	3.7	3.4
1160	7/1/78	М	0.5	11	76	43	14	27	48	45	10.7	18.1	d	d
1161	7/1/78	М	0.5	10	76	49	15	26	41	41	10.6	17.0	d	d
1162	7/1/78	М	2.5	43	120	8 2	24	50	75	71	14.4	24.7	2.6	2.9
1163	7/3/78	М	2.5	- 42	1 26	83	21	45	81	67	14.7	25.5	2.4	2.7
1164	5/7/79	М	3.5	84	166	98	26	55	101	81	17.5	31.5	3.2	3.1
	7/6/80	М	4.5	1 22	1 68	97	28	66	113	101	19.4	34.1	3.4	3.1
1165	9/17/79	М	3.5	90*				* *						
1166	9/18/79	F	10.5	177	174	105	27	72		103	19.1	31 .6	3.1	3.0
	7/7/80	F	11.5	119	165	100	21	66	114	103	19.3	30.8	3.4	3.1
1167	9/18/79	F	7.5	112	163	96	26	59	109	95	1 8 .5	29.9	2.8	2.3

Bear	Date	Sex	Age Cem ² (yrs)	Measured Weight	Total Length	Shoulder Height	Hind Foot	Neck	Girth	Body Length	Head Width	Head Length	Left Upper ₃ Canine ³	Left Lower ₃ Canine
1168	9/18/79	F	0.5	20	107	50	18		74		11.6	20.5	d	d
1169	7/5/80	F	11.5	131	180	111	26	69	133	98	20.2	32.4	2.7	2.6
1170	7/5/80	F	0.5	15	82	53	40	31	55	47	11.3	18.0		
1171	7/5/80	М	0.5	14	84	48	12	31	54	49	11.0	20.0		
1172	7/6/80	М	11.5	162	187	105	29	71	118	135	21.0	36.2	3.4	3.3
1173	7/10/80	М	0.5	14	93	53	17	28	53	49	11.1	19.1		
1174	7/10/80	F	0.5	13	96	59	18	27	45	45	10.6	18.3		
1175	7/12/80	М	7.5	180	194	115	31	70	126	112	22.3	37.5	3.9	3.4
1176	7/13/80	F	18.5	155	185	108	29	70	122	99	20.9	31.5	3.1	2.3b
1177	7/13/80	F	1.5	41	120	74	20	45	80	73	13.2	24.4		
1178	8/18/80	F	13.5	113	164	97	29	60	114	96	19.5	31.7	3.3	3.2
1179	8/18/80	F	1.5	61	134	83	24	52	90	68	14.6	26.9	2.0e	2.5
1180	8/18/80	F	0.5	14	86	41	16	29	51	45	10.5	18.2		
1181	8/18/80	F	0.5	15	93	47	16	28	55	47	10.5	17.7		

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* Estimate after close examination.

-- No data.

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2 3

Weights in kg; measurements in cm. Age determined by cementum layering. Designations of tooth characteristics: b=broken; w=heavily worn; e=erupting; d=deciduous; r=right measured instead of left.

Bear No. and Sex	Cem. Age	Date of Capture	Bear Wt.	Location	Drug Dosage ²	Ear Tags ³	Marking ⁴
1081M	5.5	5/24/77	175	Utukok R.	2.6/H	889/890	Р/О
	7.5	9/17/79	430	N. Meat Mtn.	M/O	17827/17826	P/0
	8.5	7/7/80	380	Disappointment Cr	. 2.8	504/503	1590 P/O
		8/15/80	400	Utukok R.	3.0/L	504/503	1590 P/O
1082M	13.5	5/25/77	370	Kokolik R.	2.0/0	892/893	0/G/0 (removed)
		6/13/77	365	Kokolik R.	2.3/0	892/893	0948
		6/25/77	380	Kokolik R.	2.7/0	892/893	1077/1127
		8/10/77		Kokolik R.	2.7/L	892/893	· · ,
	14.5	6/27/78	425	Kokolík R.	2.8/L	892/893	1580/1570 Bk
		, _ , ,			/_		1640/1680
	15.5	6/28/79	480	Kokolik R.	M/0	313/312	1420/1007
	16.5	8/17/80	520	Kokolik R.	5.0/L	538/539	0998 dB/P
1083M	7 5	5/25/77	265	litukok R	2 0/0	894/895	plaque
100511	115	6/2/77		litukok R	2.6/1	894/895	N998 Bk
	85	7/2/78	360	litukok R	2.0/1	894/895	0998 Bk
	0.5	6/30/79	355	Utukok R	3 4/4	804/-	1023
108/M	75	5/26/77	220	Utukok R	M/T	807/806	D/D
100411	1.5	6/2/77	220	Driftwood Cr	14/L 2 2/T	807/806	1/1 0808 (loct) Rk/W
10855	10 5	5/27/77	280	Most Mtp	<u>2.</u> 2/Ц М/Т	800/808	1050 (105C) DK/M
1005F	19.5	5/20/77	200	Moot Mtr	$\frac{11}{2}$	205/206	1000
10001	10.5	5/29/11	203	Meat Mtr	2.0/L 1.2/I	2037200	1102/11.52
		0/24///	200	Driftwood Cr	1.3/1	203/200	
	10 5	0/0///	205 //00*	N Mont Mtn	1.9/U M/I	203/200	107/ 5/1/10
10076	1010	5/20/73	4004	N, heat htp	0 12/0	2037200	-//
1007	3 C T • D	5/29/11	170	Moot Mtn	1 1/0	2077208	-70 1480 RL/~
	5.5	0/30/79	170	Meat Mtn	1.1/0 M/0	506/505	1400 DK/ -
10000	4.J /. 5	5/21/77	203	Heat Hell	2 0/0	210/202	1440 1070K
10801	4.5	5/31/77 6/1/77	122	Advonture Cr	2.0/0 M/0	210/209	0923 (removed)
10091	4.5	6/10/77	122	Adventure Cr.	170	214/213	uyu
10005	10 E	6/10/77	120	Htype D	1.770 M/U	243/240	W/W D750
10901	10.5	6/1/11	220	ULUKOK K. Utukok D	2 0/U	213/210	0730
10910	19.5	6/4/77	220		3.0/n	21//210	0020
10921	0.0	0/4///	220	llingnorak Ridge	2.2/0	22//220	0775
10000	11.5	8/19/80	320	llingnorak Kidge	4.0	549/548	1000 0/6
10931	0.5	6/4///	38	llingnorak Kidge	0.1/0	228/229	1B/-
1094M	4.5	6/5///	1/5	Meat Mtn.	2.0/H	225/230	
1095F	6.5	6/5/77	200	N. Meat Mtn.	1.5/0	231/233	0/W
1096M	7.5	6/5/77	325	Meat Mtn.	2.6/0	236/237	0848
	8.5	6/28/78	395	Utukok R.	2.8/0	774/775	1596/1590 IB 1660/1700
	9.5	6/28/79		N. Meat Mtn.	M/H	774/775 & 893	-/1B
	10.5	8/17/80	505	Meat Mtn.	4.2/L	536/537	0973 0/1B
1097F	8.5	6/5/77	225	Meat Mtn.	1.8/0	235/234	0874
	8.5	6/19/77		Utukok R.	1.4/0	235/234	0874
	11.5	7/6/80	300	Utukok R.	1.8/0	510/511	1470 Pp/P
		8/16/80	270	Utukok R.	5.1M/L	510/511	1470/1430 Pp/P

Appendix II. Capture and marker characteristics of 101 bears in the western Brooks Range, 1977-1980.

Bear No. and Sex	Cem. Age	Date of Capture	Bear Wt.	Location	Drug Dosage ²	Ear Tags ³	Marking ⁴
1098M	3.5	6/8/77	108	Utukok R.	1.2/H	238/239	0/1B
1099M	10.5	6/11/77	365	Utukok R.	3.2/0	245/244	1023
	11.5	6/27/78	450*	Kokolik R.	2.8/0	773/772	1610/1560 1640/1680
	12.5	6/26/79	450	Utukok R.	3.0/0	773/772	1540
1100F	6.5	6/11/77	200	Meat Mtn.	2.4/0	247/246	0973
	7.5	6/9/78	240*	Utukok R.	2.5/H	247/246	0973P
	8.5	7/1/79	220	Driftwood Cr.	1.9/0	246/247	1098 P
1101M	2.5	6/12/77	145	Utukok R.	1.2/L	249/248	G/W
1102F	2.5	6/12/77	125	Utukok R.	1.2/L	251/250	W/G
	3.5	6/18/78	140	Utukok R.	1.4/0	251/250	1470
	5.5	8/18/80	210	Kokolik R.	3.0	544/545	0750 W/G
1103M	8.5	6/12/77	320	Utukok R.	2.6/H	253/252	1002 broken
110/2	9.5	6/12/78		Utukok R.	M/H	253/252	1510
1104F	9.5	6/12///	215	Utukok R.	1.6/0	255/254	0800
	10 F	6/1////		Utukok R.	1.2/L	255/254	0800 1500 D (0
11057	12.5	//10/80	250	Nimwutik Cr.	1.5/L	51//518	1520 P/G
11051	1.5	6/13///	225	Kokolik R.	1.5/0	257/256	1098
	0 5	6/26/7/	245	Tupikchak Mtn.	1.5/L	257/256	1098/1148
	8.5	6/28/78	285	Kokolik R.	1.//L	257/301	1620/1630
110/17	10.5	(10/80)	260	lligluruk Cr.	1.8/0	522/521	09/2 W/0
1106F	11.5	6/14///	210	Adventure Cr.	1.5/H	258/259	0/24
11071	0.5	0/14///	0.0	Adventure Cr.	none	none	
11001	0.5	0/14///	20	Adventure tr.	none	-/200	-/w
11095	0.5	6/14///	18	Adventure tr.	none M/II	201/-	w/ = מו/ ת/ מו
IIIOF	24.5	0/15///	245	Ilinghorak Ridge		202/203	1D/F/1D 107/ 6 JD
	23.5	(/1//8		llingnorak Ridge	1.9/L	202/203	10/4.0 db
מוווו	20.5 16 E	0/30//9 6/10/77	233	Coludillo D	1.7/n	202/203	0725
	14.5	0/10/// 6/10/77	240	Colville R.	1.7/0	209/200	dD/0
11120	4.5 / E	0/10/// 6/10/77	230 150÷	Colville R.	1.7/0	207/200	
1115F 3116M	4.5	6/10/77	450	Utukok P	1.5/0	270/271	
11140 1115M	10.5	6/22/77	430	ULUKOK R. Moot Mtp	1.//L 1.5/U	213/212	
11150	55	6/22/11	175	Heat Htn.	1.5/11	213/214	
1110H	10.5	6/23/77	315	Driftwood Cr	M/0	270/277	Pn/W/Pn
11185	19.5	6/23/77	185	Driftwood Cr.	1) 1) 2/H	281/280	W/Pn
11101	6.5	6/25/17	100	N Meat Mtn	1.7/L	282/283	n/P
1120M	16 5	6/24/77	390	N Meat Mtn	2 6/0	284/285	$P_n/1R/P_n$
1121F	10.5	6/25/77	245	Kokolik R	2.0/0 м/н	287/286	1079/1128
1122M	0.5	6/25/77	30	Kokolik R	0 12/0	-/288	-/G
1123F	0.5	6/25/77	27	Kokolik R	0.12/0	289/-	G/-
1124M	17 5	6/26/77	360	Tupikchak Mtn	2 6/0	291/290	dB/W/dB
1125F	3.5	6/27/77	145	Utukok R	1.4/H	-/292	-/W
1126M	13.5	6/28/77	345	Kokolik R	2.7/0	293/294	0/₩/0
1127F	26.5	6/28/77	295	Kokolik R	1.5/L	295/-	P/W/P
1128F	7.5	6/30/77	240*	Tupikchak Mtn.	1.8/0	297/296	P/P/P
1129F	1.5	6/30/77	90	Tupikchak Mtn.	0.5/0	299/298	P/P

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Bear No. and Sex	Cem. Age	Date of Capture	Bear Wt.	Location	Drug Dosage ²	Ear Tags ³	Marking ⁴
1130F	21.5	6/30/77	255	Elbow Cr.	1.9/0	300/900	0/0/0
1131M	8.5	7/1/77	235	Driftwood Cr.	2.5/H	3085/3086	G/0
113 2 F	2.5	7/2/77	67	Archimedes Ridge		1498/3082	1B/P
1133M	2.5	7/2/77	80	Archimedes Ridge	,	3088/1499	P/1B
	3.5	6/27/79	150	Utukok R.	1.4/0	310/309	P/1B
1134F	14.5*	7/5/77	230*	Utukok R.	2.0/L	3089/3090	0947 0
	17.5*	7/12/80	285	Utukok R.	2.8/H	526/527?	0943 Bk/G
1135M	1.5	7/5/77	57	Utukok R.		3091/3092	0/0
1136F	1.5	7/5/77	48	Utukok R.		3093/-	0/-
1137F	1.5	7/5/77	58	Utukok R.		-/3094	-/0
1138F	23.5	8/10/77	250	Kantangnak Cr.	1.9/0	none	0898 0 lost
	24.5	6/16/78	265	Kantangnak Cr.	M/L	759/758	dB/dB/dB
1139F	11.5	6/7/78	200*	Utukok R.	1.3/0	651/654	1549W
1140M	0.5	6/7/78	21	Utukok R.	none	-/655	-/0
1141F	0.5	6/7/78	16	Utukok R.	none	656/-	0/-
	2.5	7/13/80	165	Utukok R.	2.1	532/533	1490 W/O
1142F	14.5	6/9/78	250*	Utukok R.	M/H	658/657	1520 Bk
1143F	9.5	6/9/78	210*	Utukok R.	1.8/H	704/705	1B/W
1144F	1.5	6/9/78	38	Utukok R.	0.4/H	717/718	Pp/G
1145F	2.5	6/10/78	95	Elbow Cr.	1.7/H	720/719	1457 1B/G
1146F	14.5	6/10/78	230*	Elbow Cr.	2.5/H	721/722	G/1B
1147M	3.5	6/10/78	205	Utukok R.	1.3/0	723/724	P/G
	5.5	7/10/80	305	Tupikchak Cr.	2.8/H	516/515	P/dB
1148M	6.5	6/10/78	205	Utukok R.	1.3/0	725/728	dB/W
1149F	4.5	6/11/78	180	Utukok R.	1.3/0	736/733	W/dB
1150M	5.5	6/16/78	185	Utukok R.	1.2/0	751/747	Bk/P
1151F	3.5	6/16/78	112	Kantangnak Cr.		752/753	Bk/Bk
1152M	3.5	6/16/78	142	Kantangnak Cr.		754/755	1450 O/Bk
1153F	2.5	6/16/78	70	Kantangnak Cr.		756/757	Bk/0
1154F	12.5	6/21/78	220	Tupik Cr.	1.8/0	760/761	W/0/W
1155M	1.5	6/21/78	75	Tupik Cr.	0.5/0	763/762	G/W
1156F	6.5	6/21/78	205	Kogruk Cr.	2.0/0	765/764	P/Bk
1157M	5.5	6/24/78	210	Driftwood Cr.	M/H	766/767	P/G/P
	6.5	6/30/79	275	Driftwood Cr.	2.4/H	766/767	Bk/P
1158F	7.5	6/24/78	180	Elbow Cr.	1.4/0	769/768	P/W
1159M	10.5	6/24/78	295	Driftwood Cr.	1.7/0	770/771	G/P
	12.5	8/16/80		Utuko k R.	M/L	535/534	G/P
1160M	0.5	7/1/78	25	Ilingnorak Ridge	none	303/-	dB/-
1161M	0.5	7/1/78	21	Ilingnorak Ridge	none	-/302	-/dB
1162M	2.5	7/1/78	95	Iligluruk Cr.	1.1/0	304/305	1490 1B/Bk
1163M	2.5	7/3/78	92	Iligluruk Cr.	M/H	306/307	1440 Bk/1B
1164M	3.5	5/7/79	185	Meat Mtn.	1.3/0	311/308	1498 G/Bk
	4.5	7/6/80	270	Meat Mtn.	1.9/0	512/311	1450 Bk/G
1165M	3.5	9/17/79	200*	N. Meat Mtn.	M/H	318/319	G/dB
1166F	10.5	9/18/79	390	N. Meat Mtn.	M/L	284/317	08980 dB/0
-	11.5	7/7/80	265	Utukok R.	2.1/H	502/317	0772 1B/0
1167F	7.5	9/18/79	235	N. Meat Mtn.	2.8/H	271/315	1533 O/dB

Bear No.	Cem.	Date of	Bear		Drug	2	
and Sex	Age	Capture	Wt. ¹	Location	Dosage ²	Ear Tags ³	Marking ⁴
1168F	0.5	9/18/79	55	N. Meat Mtn.	.60/0	274/296	eartags
1169F	11.5	7/5/80	290	Kokolik R.	2.2/L	513/514	1073 Bk/dB
1170F	0.5	7/5/80	34	Kokolik R.	0.1	114/112	dB/-
1171M	0.5	7/5/80	32	Kokolik R.	0.1	115/113	Bk/-
1172M	11.5	7/6/80	360	Utukok R.	3.2/H	509/508	W/1B
1173M	0.5	7/10/80	32	Kokolik R.	0.14	525/101	~ /0
1174F	0.5	7/10/80	28	Kokolik R.	0.14	501/507	0/-
1175M	7.5	7/12/80	400	Iligluruk Cr.	2.6	528/529	1B/1B
1 176F	18.5	7/13/80	345	Utukok R.	2.0/0	531/530	0080 G/G
1177F	1.5	7/13/80	91	Nímwutik Cr.	0.38/L	520/519	G/G
1178F	13.5	8/18/80	250	Utukok R.	3.0	540/541	0898 1B/Bk
1179F	2.5	8/18/80	135	Utukok R.	1.4/L	542/543	1B/O
1180F	0.5	8/18/80	31	Kokolík R.	0.30/L	- /547	-/1B
1181F	0.5	8/18/80	34	Kokoli k R.	0.40/0	546/ -	1B/-

* Estimate after close examination.

 $\frac{1}{2}$ Weight in pounds.

Dosage in cc of Phencyclidine hydrochloride; M denotes multiple dosage with unknown effective dosage. Drug effects were as follows: L = light, O = optimum, H = heavy.

3 left/right

4 Marker designations:

Colors: P, pink; W, white; G, light green; O, orange; dB, dark blue; 1B, light blue; Bk, black; Pp, purple.

Marker types:

One or two color combinations were used for ear flags; e.g. 0/W is orange in left ear, white in right ear; -/G is no flag, left; green, right. Three flag combinations were used in nylon rope collars; e.g. 00W is two identical clusters of 00W flags on opposite sides of the collar. Numbers, such as 1470, designate a radio collar with a frequency of 151.470 MHz; some radio collars were also marked with a flag and some transmitted more than one frequency.