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POPULATION STRUCTURE, REPRODUCTIVE BIOLOGY, AND MOVEMENT PATTERNS OF GRIZZLY BEARS IN THE NORTHCENTRAL ALASKA RANGE

By

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Period Covered: 1 July 1983-30 June 1984

SUMMARY

In 1981 a study was begun to determine the status and reproductive biology of a grizzly bear (Ursus arctos) population in the northcentral Alaska Range. During 1981-84, 58 bears (28 males and 30 females) were captured; 48 of these bears were radio-collared. Currently, 19 bears are radio-collared (5 males, 14 females). Minimum estimated population density for the study area was 1.87 bears/100 km^2. Initial analysis of the structure of the population showed that few mature males were present, possibly as the result of hunting pressure. Evidence suggests that females have a potentially long reproductive life span; at least some females produce their 1st litter at age 6, while a 25.5-year-old female weaned her 2.5-year-old offspring and still bred. Based on 19 litters of both cub and yearling age classes, mean litter size was 1.95.

During 1981-84, 55 mortalities were recorded in the study area: 34 hunter kills, 2 nonsport kills, 6 capture-related, 11 missing offspring, and 2 adult natural mortalities. Movements ranging from 44-78 km were recorded for 3 3.5-year-old males. Six other 2.5- and 3.5-year-old bears (4 males, 2 females) remained within their maternal home ranges.

Key words: grizzly bear, harvest rates, home ranges, Interior Alaska, mortality, population biology, Ursus arctos.

CONTENTS

BACKGROUND

As problems concerning the management of Alaska's wildlife become more complex, there is a growing need for specific biological information on wild species. Human populations are rapidly increasing in Alaska; consequently, user demands on wildlife (including hunting) are increasing. Concurrently, the amount of public land available for wildlife habitat and accessible to wildlife consumers has declined due to resource development and changes in land status resulting from Alaskan lands legislation. In Alaska, because of their requirements for large home ranges and their low reproductive potential, grizzly bears (Ursus arctos) are among the large mammals that are most susceptible to these changes.

Few research studies have addressed aspects of grizzly bear biology that need to be investigated to solve problems of increased exploitation and loss of habitat. Specifically, no population dynamics data are available for Interior Alaska north of the Alaska Range except for 2 studies in Denali National Park (Dean 1976, Valkenburg 1976). Elsewhere in Alaska, baseline biological information has been determined for

brown/grizzly bear populations on the south side of the Alaska Range (Ballard et al. 1982; Miller and Ballard 1982; Miller 1983, 1984), on the Alaska Peninsula (Lentfer et al. 1969, Glenn et al. 1976), and in the Brooks Range (Crook 1971, 1972; Reynolds 1976, 1978, 1981). However, there is no evidence that data from these areas are applicable to the northcentral Alaska Range.

Assessment of the impacts of changes in user pressure or changes in availability of habitat requires knowledge of bear population status. Management decisions are based on the number, sex, and age of bears harvested. Other than the use of these parameters and general estimations of the status of grizzly populations, no data are available to use as a basis for regulating harvest rates. Use of these data as a basis for past management has been adequate in many cases, but more detailed information is needed as management becomes more intensive. Management strategies for any area must consider the relative numbers of, and relationships among, wildlife species. Management goals for grizzly bears may require increasing, decreasing, or maintaining populations to reach densities that are compatible with desired population levels of ungulates.

Although safe annual harvest rates of 2-4% of the grizzly population have been proposed for areas of similar habitat in Canada (Lortie 1978), and rates of 2-3% have been used as a basis for harvest in the Brooks Range (Reynolds 1976), additional information is necessary before appropriate harvest rates can be estimated for the Alaska Range. The following baseline information must be known to accurately predict the effects of harvest: population density and structure, movement and home range patterns, mortality rates of age classes, and reproductive potential including age at 1st breeding, litter size, and interval between litters (Craighead et al. 1974, Reynolds 1978, Bunnell and Tait 1980).

In 1981, Phase I of this study was begun in a long-term investigation of the effects of different harvest rates on a grizzly bear population (Reynolds 1982, Reynolds and Hechtel 1983, 1984). The emphasis of Phase I is to gather baseline information on the population biology of northcentral Alaska Range grizzly bears. Most data necessary for an accurate baseline description and population model were collected during 1981-84, but will be supplemented by information gathered in future years. The harvest level during 1965-83 was generally low, 3-5%. In Phase II of the study, harvest rates will be calculated and the harvest level increased to about 8-15% through manipulation of seasons and by directing public hunting effort

to the area by using the news media. Changes in population size and productivity will be monitored and analyzed to determine the effects of increased harvest on population size and reproductive parameters and to determine if population compensatory mechanisms occur as harvest level is increased.

OBJECTIVE

To determine population density, structure, reproductive potential, and movements of grizzly bears in the northcentral Alaska Range.

PROCEDURES

The 3,900 km² (1,500 mi²) study area is located in the mountains and foothills of the northcentral Alaska Range (Fig. 1). The boundaries are Gold King Creek drainage and Wood River drainage downstream from Virginia Creek to the west, the crest of the Alaska Range to the south, the Delta Creek drainage to the east, and the southern edge of the Tanana Flats (approx. 64° north latitude) to the north. It includes portions of 2 U.S. Army reservations, Ft. Wainwright and Ft. Greely.

Elevations in the area range from 500 to 3,700 m (1,600 to 12,000 ft). Most rivers flow through U-shaped, glacially formed valleys and are fed by active glaciers. Treeline occurs at approximately 900 m (3,000 ft). Dense patches of willow (Salix spp.) or alder (Alnus crispa), which bears use for cover, may be present up to about 1,200 m (4,000 ft).

Procedures for capture, specimen preparation, measurements (Appendix A), and calculation of movement and population characteristics followed those presented in previous reports (Reynolds 1982, Reynolds and Hechtel 1983, 1984).

RESULTS AND DISCUSSION

Bears Captured and Radio-collared

In the study area, 58 individual bears were captured: 5 in 1981, 30 in 1982, 21 in 1983, and 2 in 1984 (Table 1). In addition, 20 bears were recaptured to replace radio collars: 2 in 1983 and 18 in 1984. Radio collars were placed on 48 bears; 13 on young-age males (≤5.5 years), 10 on adult males (≥6.5 years), 9 on young-age females, and 16 on adult females. By fall 1984, 19 of 48 bears carried functioning radio collars; 10 bears had shed collars; 15 bears had died; and 4 bears could not be located, presumably because of long-range movements or collar failure.

Population Density

The minimum spring 1982 population of the study area was 73 grizzly bears, a density of 1.87 bears/100 km² (4.8/100 mi²). These included the 56 marked bears which were alive in early May 1982 and 17 unmarked individuals which were either observed during 1982-83 capture operations or later killed by hunters. Similar calculations of minimum spring grizzly bear numbers and population density for 1983 indicated at least 69 bears were present in the study area, a density of 1.77 bears/100 km² (4.6/100 mi²); for 1984, a minimum of 73 were present for a density of 1.87 bears/100 km² (4.8/100 mi²).

The probable density of bears in the area, however, was 2.3-2.8 bears/100 km² (6.0-7.3 bears/100 mi²). The minimum density is an underestimate because it does not include unmarked bears which were not killed by hunters, or bears which were not observed during the study. Based on the home ranges and distribution of marked bears living in major drainages of the area, it is likely that the available habitat supports an additional 15-35 bears. Therefore, the probable population of bears in the area is 90-110. This estimate is similar to the density of 2.44 bears/100 km² (6.3/100 mi²) reported south of the Alaska Range in the upper Susitna River (Miller and Ballard 1982).

The accuracy of the population estimate depends on the proportion of the population that is marked. One indication of the success of the capture efforts is the percentage of marked animals in the harvest. From 1982 through 1984, 22 bears were reported killed. Eleven of these were marked. During 1984, 7 of 10 bears shot were marked. Sample sizes are small, but it appears that more than half the bears in the study area have been marked. Additional intensive capture effort and harvest data are needed to test this assumption.

Biases in the data and small sample sizes prevent the use of techniques such as the Petersen/Lincoln Index to estimate population size. The population is not closed; births, deaths, ingress, and egress occur at unknown rates. Future data from radio-collared animals will indicate the extent to which these factors are influencing the population. Also, calculations of a Petersen/Lincoln Index require equal probability of taking marked and unmarked bears, an assumption that cannot be made (see Mortality section).

Population Structure

Of the 67 bears captured or killed by hunters, 46% were males and 54% were females. The 31 males included 13 offspring of marked females (0.5-2.5 years of age), 5 young-age bears (3.5-5.5 years), and 13 adults ($\geq$6.5 years of age). The 36

females included 7 offspring, 11 young-age, and 18 adults. Additional data are required to determine if this sex and age structure is representative of the population. If it is representative, 3 patterns are evident: there are more male than female offspring, there are more young-age and adult females than males, and few males live beyond age 13.5. This would indicate that there is greater production and higher mortality rate for males, and lower production and lower mortality rate for females.

Reproductive Biology

Age at 1st Production of Young:

The age at which females first produce cubs in this area ranged from 6.5 to 8.5 years (Table 2). None of 8 females aged 4.5-5.5 years showed evidence of suckling. Three females 5.5 years of age were observed breeding and 2 were not. Of the 3 which were known to have bred, 1 did not have cubs and it is unknown whether or not the other 2 had cubs. One 6.5-year-old estrous female (No. 1308) captured in late May 1982 had black enlarged mammaries, indicating that she had lost a litter of cubs prior to the onset of estrus. Three other 6.5-year-old breeding females had never produced cubs, and 1 female each had 1st litters at ages 7.5 and 8.5.

These data indicate that age at 1st production of young in the study area is greater than that in more southern portions of Alaska, but less than in northern Alaska. Females produce 1st litters between 4.5 and 7.5 years of age in the Nelchina Basin (Miller and McAllister 1982), Kodiak Island (Hensel et al. 1969), and the Alaska Peninsula (Glenn et al. 1976). The bear populations in these areas are highly productive. On the other extreme, in the eastern Brooks Range, age at 1st litter ranged from 6.5-12.5 ($\bar{x}$ 10.1) (Reynolds 1976) and in the western Brooks Range, 5.5 to 11.5 ($\bar{x}$ = 8.0) (Reynolds and Hechtel 1982; Reynolds, in press).

Pearson (1975, 1976) concluded that females in southwestern Yukon Territory are first capable of conception at age 6.5, but in the northern part of the province the age at 1st conception was 7.5 years. In Yellowstone National Park, Craighead et al. (1969, 1976) observed that some 3.5-year-old females copulated, but none were accompanied by cubs the following spring, and that females first bred successfully at 4.5-8.5 years.

Maximum Productive Age:

All 13 females older than 10 years of age were accompanied by offspring, or were in breeding condition and showed evidence of

previous offspring. The maximum productive age is at least 23.5 years (Table 2).

Reproductive Interval:

"Reproductive interval" is defined as the time between breeding by a mature female and the subsequent weaning of a litter (Reynolds 1980, Reynolds and Hechtel 1982). Years in which a female breeds but fails to conceive or loses her litter are included in a reproductive interval. Therefore, observations of the length of time offspring accompany females before weaning should be viewed as minimum values of reproductive intervals since females may not always produce young subsequent to breeding efforts (Craighead et al. 1969, 1976; Reynolds 1974, 1976, 1980, in press; Glenn et al. 1976; Reynolds and Hechtel 1982).

In the study area, offspring were weaned as 2-year-olds ($n = 2$) or 3-year-olds ($n = 3$). Minimum reproductive intervals, however, ranged from 3 to 6 years ($\bar{x} = 4.4$, $n = 12$). All 5 intervals greater than 4 years resulted from interruption of the breeding cycle through mortality of litters or to breeding which did not produce cubs the following year (Table 2).

Litter Size:

Mean litter size was 1.91 for 11 cub litters and 2.0 for 8 yearling litters. Combining yearling and cub litters, the mean size was 1.95. Mean cub litter size is small, especially compared to 2.3 found in the Nelchina Basin (Miller and McAllister 1982); however, mean yearling litter size was only 1.6 for the Nelchina Basin. The number of females which produced cubs varied from year to year. During 1981, 5 females produced a minimum of 9 cubs; in 1982, 6 females produced 11 cubs; in 1983, 1 female produced 1 cub; and in 1984, 6 females produced 14 cubs. Poor cub production in 1983 may have been due to failure of berry crops in 1982 (Miller 1984) or to the weather patterns of winter 1982-83, in which little snow fell and temperatures fluctuated widely.

Mortality

During 1981-84, at least 54 bears died in the study area: 14 in 1981, 11 in 1982, 11 in 1983, and 18 in 1984. During 1981-83, the 36 confirmed mortalities included 23 hunter kills, 1 illegal kill, 4 capture mortalities, 2 natural mortalities, and 6 missing offspring (Table 3). During 1984, mortality included 10 hunter kills (not including No. 1356, shot 50 km

east of the study area), 1 defense of life or property kill, 1 confirmed capture mortality, 1 unconfirmed capture mortality, and 5 missing offspring which were presumed dead.

The causes of cub and yearling mortality could not be determined. Cub deaths caused by adult males have been documented in Alaska in the Brooks Range (Reynolds 1976, 1980, in press; Reynolds and Hechtel 1982), south of the Alaska Range (Troyer and Hensel 1962, Glenn et al. 1976), and in Canada (Mundy and Flook 1973; Pearson 1975, 1976).

Sport hunting is a major source of mortality in this population. Annual harvest has ranged from 1 to 14 during 1961-84 (Table 4). The high reported kill of 14 occurred in 1966. Prior to 1981 the mean annual take was 5.0. If the population has remained relatively stable during the 1961-80 period and future research confirms a density estimate of 2.5 bears/100 km^2 (6.5/100 $miles^2$), the average annual harvest rate has been approximately 4.5-5.5% of the population.

Harvest rates can be estimated using a variety of methods when a proportion of the population is marked. Three estimates of harvest rates were calculated using the 1984 data. During 1984 hunters killed 7 marked and 3 unmarked bears in the study area. The harvest rate, based on a total kill of 10 animals from an estimated population of 90-110 bears, is 9-11%. During 1984 there was a maximum of 46 marked bears in the study area. Therefore, the minimum harvest rate for marked bears is 7 of 46, or 15%. However, because females with cubs or yearlings are protected from hunting by regulation and are not available for harvest, the harvest rate of available marked bears was 7 of 40, or 18%.

The harvest rate estimates have a number of limitations and biases. The rate, based on the estimated population, is contingent upon the accuracy of the population estimate; biases of the population estimate were previously discussed. Because sample sizes are small and hunter numbers, distribution, and effort can vary widely from year to year, small changes in numbers of marked bears killed could result in large changes in the estimated rate of harvest. The harvest rate for marked bears is not necessarily representative of the population unless there is an equal probability of a hunter killing a marked or an unmarked bear. Possible influencing factors are: (1) some hunters have reported a reluctance to shoot marked bears; (2) marked bears may either be more vulnerable to hunters due to habituation to aircraft used to monitor their movements, or less vulnerable due to increased wariness resulting from capture and handling; and (3) marked bears might be more visible. The harvest rates for marked bears are minimums because marked bears of unknown status were counted as

alive, in the study area, and available. In addition, the number of bears counted as available is a maximum figure because it also includes females and their 2-year-olds which may legally be taken, but which in practice are often passed up by hunters unable to differentiate between yearlings and 2-year-olds or reluctant to shoot females with offspring.

Although these biases undoubtedly affect the validity of harvest rate estimates, their impact may be reduced through collection of additional data and by directing research to address these problems. Before a sustained harvest rate can be calculated, sex- and age-specific mortality, population structure, productivity, and survival must be determined (Bunnell and Tait 1980, 1981).

Movement and Home Range Size

Movements and home range during 1982-84 were determined for 44 bears equipped with radio collars. The time between sightings varied from 4 days to 5 weeks due to weather, sighting conditions, or available flight time. On this basis, general patterns of movement were identified, but more specific measures, such as daily movement patterns, could not be calculated. Preliminary data on movements and home range for each bear were calculated (Table 5).

Some adult male bears moved outside the study area and returned after traveling as far as 40 km north of the study area. Female bears generally stayed within the drainage where they were captured.

The fidelity of young-age bears to their maternal home range varied (Table 6). Of 7 2.5- and 3.5-year-old males which were followed after being weaned, 3 moved from 44 to 74 km outside their maternal home range. Both females which were monitored stayed within their maternal home range.

Denning

Fifty-two dens of radio-collared bears were located during 1981-84; 3 in 1981, 17 in 1982, 22 in 1983, and 10 in 1984. These bears denned in a variety of terrain ranging from creek banks at 900 m elevation to precipitous mountain slopes above glaciers in the Alaska Range at 1,600 m. No special denning areas or concentration sites were found and dens were distributed throughout the study area; bears tended to den within their home ranges. During 1982-84, grizzlies in the Alaska Range denned a mean distance of 7 km (range 0.5-17.0 km) from the dens they used the previous year. No reuse of dens was

documented. Physiographic characteristics of den sites including slope, aspect, and den measurements may be collected after bears leave their dens in 1985, funds permitting.

RECOMMENDATIONS

Research should continue to focus on learning the status and structure of this population so that accurate models of sustained yield can be calculated and tested.

ACKNOWLEDGMENTS

This study was a cooperative effort between the U.S. Army 172nd Infantry Brigade (Alaska) and the Department of Fish and Game. Portions of Ft. Wainwright and Ft. Greely were included in the study area. Army units that provided support from Ft. Wainwright included the 222nd Aviation Battalion, the Veterinary Activity, and the Natural Resources Office of the Facilities Engineers. The interest, skill, and willingness to help that were exhibited by the many individuals who were involved greatly contributed to the study.

Locating and capturing bears in this area was a particularly arduous task due to vegetative cover and precipitous terrain. The success we enjoyed was due in large part to the skill and abilities of UH-1 helicopter pilots-in-command Bruce Watson, Frank Wilson, and Jim Kennedy, and crews of the 222nd Aviation Battalion. Individuals from this unit participated in a competent and professional manner. Super Cub pilot Bill Lentsch again demonstrated his unequaled ability to spot bears in alder patches, glacial moraines, and fog banks. Bob Brannon, University of Alaska, did an excellent job as a field assistant and instructor in field surgical techniques.

Ft. Wainwright U.S. Army personnel provided welcome and able assistance in all aspects of field research. Capt. Michael Terry, Ret., VETACT, originally proposed the cooperative aspects of the study. He instructed us in veterinary procedures for collecting samples; Major Harold Smith and Capt. William E. Clymer, VETACT, provided veterinary expertise for the project as well as supporting and contributing to the concept of this project. Junior Kerns, Jim Clark, and Steve Harrington, Natural Resources Office, Ft. Wainwright, and Alan Bennett, 172nd Infantry Brigade, Ft. Richardson, assisted in data collection, observation, and handling of bears; Junior Kerns and Major Harold Smith helped coordinate the project.

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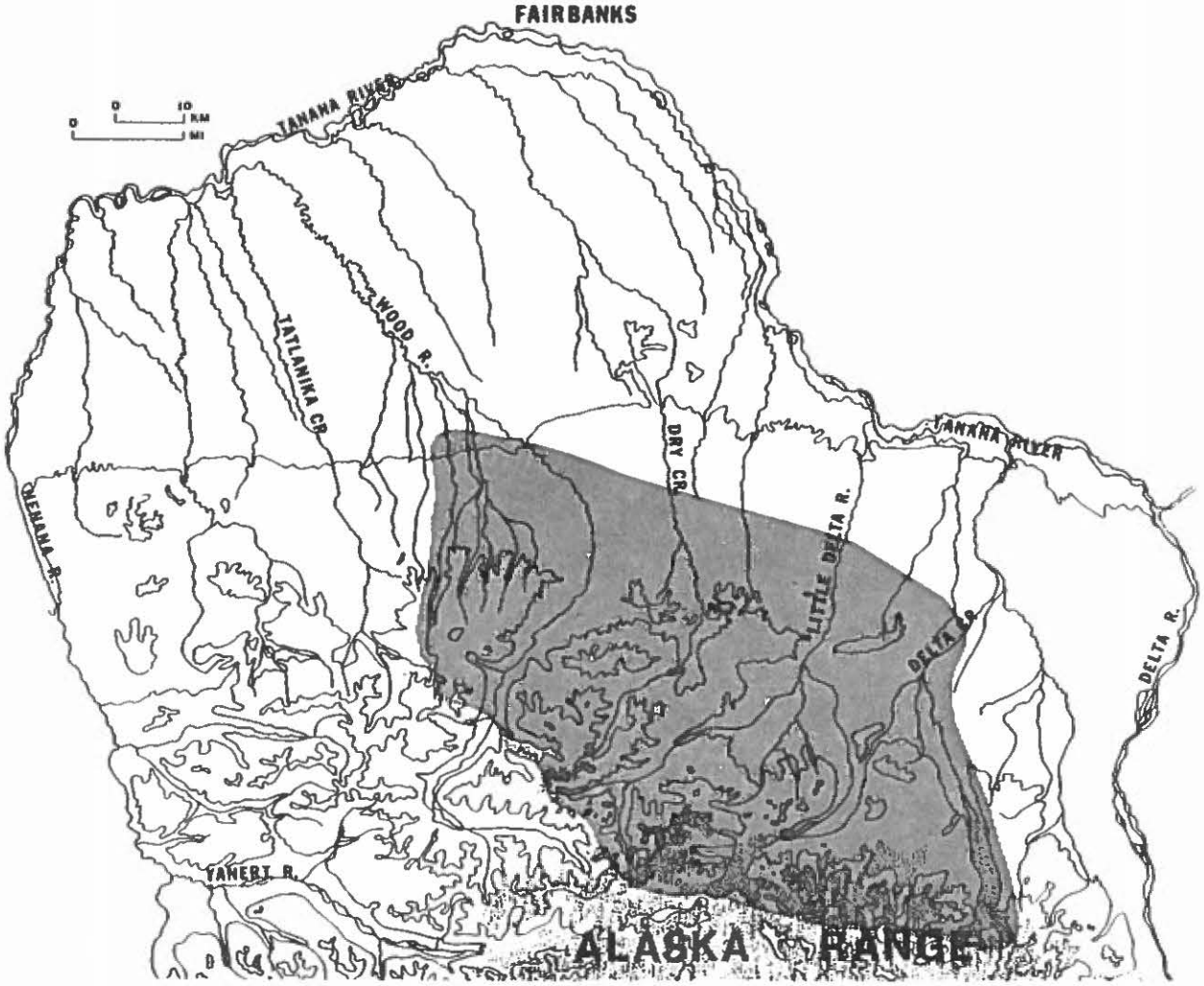

Fig. 1. Grizzly bear study area in northcentral Alaska Range.

Table 1. Capture and marking characteristics of 58 bears captured in the northcentral Alaska Range, 1981-84.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1301 M	6.5	5/18/81	120(265)	Buchanan Cr.	1.8/1.2 H	373/374	G/G
1302 F	3.5	5/19/81	75(165)	E. Fork Delta	1.0/1.0 M	368/367	R/G
1303 F	2.5	6/17/81	57(125)	Mystic Mtn.	1.4/1.4 M	524/523	R/R
	4.5	6/27/83	82(180)	Herst Cr.	5.0 M99 M	3227/3214	R/R
1304 M	5.5	6/19/81	136(300)	W. Fork Delta	2.4/2.0 M	451/452	1B/R
1305 F	24.5	6/19/81	114(250)	Slate Cr.	AM	453/454	O/R
1306 M	2.5	5/24/82	44(97)	W. Fork Delta	1.0/1.0 L	3151/3086	G/1B
1307 M	2.5	5/24/82	44(98)	W. Fork Delta	1.0/1.0 H	3087/3152	1B/G
1308 F	6.5	5/25/82	111(245)	Dry Cr.	--	3001/3154	O/Pp
	8.5	6/20/84	120(265)[d]	Dry Cr.	5.0 M99 M	3001/471	O/Pp
1309 M	8.5[d]	5/25/82	318(700)[d]	Dry Cr.	AL	3153/3101	dB/Bk
1310 M	12[d]	5/25/82	250(550)[d]	Buchanan Cr.	2.0/2.0 M	No tags	
	14[d]	6/20/84	241(530)	Molybdenum Rg.	4.0/2.0 M	467/473	O/W
1311 F	12.5	5/26/82	120(265)	Molybdenum Rg.	1.9/2.1 M	3106/3107	W/W
	14.5	6/21/84	116(255)	Molybdenum Rg.	2.0/2.2 M	466/455	W/W
1312 F	0.5	5/26/82	12(26)	Molybdenum Rg.	0.1/0.1	3104/3155	O/W[e]
1313 F	0.5	5/26/82	12(27)	Molybdenum Rg.	0.08/0.13	3156/3105	W/O[e]
1314 M	6.5	5/27/82	116(255)	Iowa Rg.	2.1/1.9 H	3088/3002	dB/1B
1315 M	13.5	6/4/82	272(600)	Buchanan Cr.	1.9/2.1 L	3102/3157	Bk/O
	15.5	5/17/84	295(650)	Hayes Cr.	AH	3322/-	Bk/-
1316 M	11.5	6/7/82	236(520)	W. Fork Delta	3.8/0.0 H	3089/3090	O/1B
1317 F	3.5	6/8/82	36(80)	Forgotten Cr.	1.2/1.8 L	3091/3003	1B/O
	5.5	5/16/84	55(122)	Upper West Fk.	AL	3486/3239	1B/O
1318 F	13.5	6/8/82	104(230)	Buchanan Cr.	AL	3004/3103	W/G
	15.5	6/22/84	118(260)	Slate Cr.	AM	458/472	W/G
1319 M	0.5	6/8/82	12(26)	Buchanan Cr.	0.15/0 L	3005/3092	R/Y[e]
1320 F	17.5	6/8/82	102(225)	Trident Gl.	AM	3158/3093	G/B
	19.5	6/25/84	138(305)	E. Hayes Cr.	5.0 M99 M	463/461	G/B

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1340 F	3.5	5/23/83	71(157)[d]	Hayes Cr.	1.2/0.8 H	3277/3208	G/O
	4.5	5/19/84	91(200)[d]	Molybdenum Rg.	4.0 M99 M	3277/3208	mG/O
1341 F	10.5	5/23/83	107(235)	NE Portage	1.5/1.5 H	3210/3428	R/dB
1342 M	2.5	5/24/83	49(108)	Threemile Cr.	0.6/1.2 M	3354/3207	W/dB
1343 M	2.5	5/24/83	43(95)	Threemile Cr.	0.6/1.2 M	3426/3285	R/Bk
1344 M	2.5	5/24/83	56(123)	Threemile Cr.	0.6/1.2 M	3361/3433	1B/Bk
	3.5	6/23/84	123(270)	Hayes Cr.	2.2/3.2 M	475/460	1B/Bk
1345 F	8.5	5/24/83	--	Upper W. Fork	1.2/1.8 L	3206/3352	O/O
1346 M	5.5[d]	5/25/83	114(250)	Hayes Gl.	AM	3359/3356	1B/1B
1347 M	12[d]	5/31/83	189(415)	Coal Cr.	--	--	--
1348 F	12.5	5/31/83	--	Mystic Mtn.	AM	3363/3372	W/O
1349 M	18.5	6/2/83	264(580)	O'Brien Cr.	3.8/1.2 L	3364/3292	R/1B
1350 M	8.5	6/2/83	202(445)[d]	Ptarmigan Cr.	3.0/2.0 L	3432/3430	dB/R
1351 F	14.5	6/23/83	114(250)[d]	Dry Cr.	4.0M99 M	3217/3390	dB/W
1352 F	14.5	6/27/83	111(245)	W. Fork Delta	--	3215/3316	O/W
1353 M	1.5	6/27/83	27(60)	W. Fork Delta	--	3310/-	O/-
1354 F	1.5	6/27/83	12(27)	W. Fork Delta	--	-/3314	-/O
1355 M	3.5	6/30/83	60(133)	E. Fork Delta	4.0M99 H	3232/3473	O/Bk
1356 M	2.5	6/30/83	50(110)	Ltle. Delta R.	2.0M99 H	3234/3392	Bk/O
1357 M	2.5[d]	5/15/84	63(138)	Dry Cr.	1.1 M99 M	3323/3235	W/Bk
1358 M	13.5[d]	5/18/84	204(450)	Hayes Cr.	AL	3318/3447	1B/dB

[a] Dosage in ml of phencyclidine hydrochloride/acepromazine maleate; use of M-99 is designated M99; A denotes multiple injections with unknown effective dosage. Drug effects were as follows: L = light, M = optimum, H = heavy.

[b] Ear tag numbers, left/right.

Table 1. Continued.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight kg (lb)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1321 F	16.5	6/9/82	141(310)	Snow Mt. Glch.	2.1/1.9 M	3028/3108	G/W
	17.5	5/17/83	127(280)	Dry Cr.	1.8/2.2 M	3028/3427	G/W
1322 F	8.5	6/9/82	91(200)	Sheep Cr.	1.9/2.1 M	3051/3159	W/1B
1323 F	11.5	6/10/82	95(210)	Mystic Mt.	1.9/2.1 M	3160/3030	G/G
	13.5	6/29/84	132(290)	VABM Wood	AM	579/582	G/G[e]
1324 F	0.5	6/10/82	12(26)	Mystic Mt.	0.12/0 M	3027/3162	R/W[e]
1325 F	0.5	6/10/82	12(27)	Mystic Mt.	0.10/0 M	3161/3031	W/R[e]
	2.5	5/15/84	67(148)	Mystic Cr.	1.0 M99 M	3233/3394	R/W
1326 F	4.5	6/18/82	93(205)	Buchanan Cr.	2.2/1.8 M	3008/3163	W/R
	6.5	6/21/84	109(240)	Buchanan Cr.	1.8/2.2 M	468/462	W/R
1327 F	16.5	7/8/82	127(280)	Whistler Cr.	2.2/1.8 M	3134/3192	G/R
	18.5	6/23/84	125(275)	Whistler Cr.	AH	458/192	G/R
1328 F	1.5	7/8/82	43(95)	Whistler Cr.	0.9/1.1 M	3115/3014	dB/G
1329 F	13.5	7/9/82	120(265)	Buchanan Cr.	2.4/1.6 M	3026/3111	W/R
1330 M	1.5	7/9/82	48(106)	Buchanan Cr.	M	--	R/W
	3.5	6/28/84	102(225)	E. Fk. Delta	2.6/3.0 M	597/598	R/W
1331 F	4.5	7/10/82	77(170)	Trident Gl.	2.4/1.6 M	3120/3194	Bk/O
1332 F	5.5	7/12/82	104(230)	Gillam Gl.	2.4/1.6 M	394/190	R/dB
1333 F	16.5	7/13/82	141(310)	Buchanan Cr.	AM	474/469	G/R
1334 M	1.5	7/13/82	49(108)	Buchanan Cr.	1.0/1.0 M	395/392	Y/G
	3.5	6/27/84	107(235)	McGinnis Cr.	AM	585/583	O/G
1335 F	1.5	7/13/82	38(84)	Buchanan Cr.	1.0/1.0 M	32/456	G/Y
	3.5	6/25/84	79(175)	Gilliam Gl.	1.1.5/3.0 M	465/464	dB/G
1336 F	2.5	5/16/83	47(104)	Kansas Cr.	1.0/1.0 M	3201/3204	Bk/mG
	3.5	6/26/84	89(195)	Copper Cr.	2.0/3.0 M	470/595	Bk/mG
1337 M	20.5	5/18/83	289(635)	Sheep Cr.	3.5/3.5	3209/3205	R/O
1338 M	6.5	5/20/83	111(245)	Molybdenum Rg.	AM	3203/3202	O/Bk
1339 M	6.5	5/23/83	120(265)	Trident Gl.	M	3286/3351	1B/W
	7.5	5/17/84	168(370)	E. Fk. Delta	6.0 M99 H	3254/3398	1B/W

Table 1. Continued.

[c] Marking designations:
Colors: R, red; G, light green; mG, medium green; O, orange; lB, light blue; dB, dark blue; W, white; Bk, black; Pp, purple; Y, yellow.
Marker types:
One or 2 color combinations were used for ear flags, e.g., O/W is orange in left ear, white in right ear; -/G is no flag, left; green, right.

[d] Estimated.

[e] Ear tags only and not ear flagging material were used to mark cubs of the year; therefore, for these bears only, marker colors indicate ear tags and not ear flags.

Table 2. Reproductive status and litter sizes of potentially mature females in the northcentral Alaska Range, 1981-84.

Bear No.	Age in 1984[a] (yr)	Offspring No.	Reproductive status[b] 1981	1982	1983	1984	Reproductive history
1302	6		NB	UN	UN	UN	No offspring prior 1981
1303	5		NB	NB	B?	B	No offspring prior 1981
1305	25	1306, 1307	2 yrlg	2 2-yr/B	Dead		Hunter kill, fall 1982
1308	8			?/B	B	2 cubs	Offspring prior 1982
1311	14	1312, 1313	UN/B	2 cubs	B	2 cubs	Lost cubs August 1982
1317	5			NB	NB?	NB	No offspring prior 1982
1318	15	1319	UN/B	1 cub/B	B	B	Lost cub 1982
1320	19			?/B	1 cub	B	Weaned or lost offspring 1982, lost cub 1983
1321	17	1342, 1343, 1344	3+ cubs	3 yrlgs	3 2-yr	2 3-yr/B	1342 killed illegally, fall 1983
1322	10	1336	UN/1+cubs	1 yrlg	1 2-yr	1 3-yr/B	
1323	13	1324, 1325	UN/B	2 cubs	2 yrlgs	2 2-yr/B	
1326	6			NB	B	B	No offspring prior 1982
1327	18	1328, 1UM	UN/2+cubs	2 yrlgs	B	3 cubs/ Dead	1UM yrlg capture mortality, ?/1328 dead?/1327 capture mortality?, 1984
1329	14	1330	UN/1+cubs	1 yrlg	Dead		Killed by male, May 1983
1331	6			NB	B	UN	No offspring prior 1982
1332	6			B?	Dead		No offspring prior 1982, died in den 1983
1333	18	1334, 1335	UN/2+cubs	2 yrlgs	2 2-yr	2 3-yr/B	Hunter kill 1984; 1335, hunter kill 1984
1340	3				NB	NB	No offspring prior 1983
1341	11	1UM		1+cubs	1 yrlg/B	2 cubs	Lost yrlg 1983

Table 2. Continued.

Bear No.	Age in 1984[a] (yr)	Offspring No.	Reproductive status[b] 1981	1982	1983	1984	Reproductive history
1345	8				B	2 cubs	Lost 1 cub 1984
1348	12				?/B	3 cubs	Probably weaned or lost offspring 1983
1351	14	1357, 2UM	UN/B	3+cubs	3 yrlgs	3 2-yr	Lost 1 UM offspring 1984
1352	14	1353, 1354	UN/B	2+cubs	2 yrlgs	2 2-yr	Hunter kill 1984; 1353, hunter kill 1984

[a] Age in 1984 or last year in which bear was alive.

[b] Designations: NB, not observed in breeding condition; UN, not observed in that year; B, observed in breeding condition; ?, status unknown; UM, unmarked; cub, cub of year; yrlg, yearling; 2-yr, 2-year-old; +, offspring first observed in subsequent year and therefore litter size may have been larger.

Table 3. Mortality of grizzly bears in Alaska Range study area, 1981-84.

Bear No.[a]	Sex	Age[b]	Date of capture	Date of death	Location	Cause of death
UM	F	3	--	5/16/81	Dry Creek	Hunter kill
UM	M	6	--	5/18/81	Buchanan Creek	Hunter kill
1301	M	6	5/18/81	5/18/81	Buchanan Creek	Capture mortality
UM	M	2	--	5/23/81	Wood River	Hunter kill
UM	M	3	--	5/25/81	W Fk Little Delta	Hunter kill
UM	M	2	--	9/4/81	Wood River	Hunter kill
UM	F	2	--	9/6/81	Iowa Ridge[c]	Hunter kill
UM	M	12	--	9/7/81	Wood River[c]	Hunter kill
UM	M	2	--	9/12/81	W Fk Little Delta	Hunter kill
UM	F	3	--	9/28/81	Wood River[c]	Hunter kill
UM	M	7	--	10/2/81	E Fk Little Delta	Hunter kill
UM	M	Unk	--	10/8/81	Wood River	Hunter kill
UM	F	5	--	10/9/81	Wood River[c]	Hunter kill
UM	M	8	--	10/17/81	Gold King	Hunter kill
UM	M	10	--	5/22/82	Gold King	Hunter kill
1319	M	Cub	6/8/82	6/18-7/2/82	W Fk Little Delta	Unk, offspring of 1318
UM	Unk	1	7/8/82	7/8/82	E Fk Little Delta	Capture mortality, offspring of 1327
1312	F	Cub	5/26/82	8/5-27/82	Molybdenum Ridge	Unk, offspring of 1311
1313	F	Cub	5/26/82	8/5-27/82	Molybdenum Ridge	Unk, offspring of 1311
1328	F	1	7/8/82	8/27-9/23/82	E Fk Little Delta	Unk, offspring of 1327
UM	F	5	--	9/15/82	W Fk Little Delta	Hunter kill
UM	M	2	--	9/15/82	Dry Creek	Hunter kill

Table 3. Continued.

Bear No.[a]	Sex	Age[b]	Date of capture	Date of death	Location	Cause of death
1305	F	25	6/19/81	9/15/82	Dry Creek	Hunter kill
1314	M	6	5/27/82	9/15/82	Little Delta River	Hunter kill
UM	F	11	--	9/17/82	E Fk Little Delta	Hunter kill
1332	F	6	7/12/82	winter 82/83	Buchanan Creek	Unk, den mortality
UM	F	4	--	5/1/83	Trident Glacier	Hunter kill
1329	F	14	7/9/82	5/15/83	Buchanan Creek	Killed and eaten by 1315M
1338	M	6	5/20/83	5/20/83	Molybdenum Ridge	Capture mortality
UM	F	5	--	5/24/83	W Fk Little Delta	Hunter kill
1347	M	5[d]	5/31/83	5/31/83	Wood River	Capture mortality
UM	Unk	Cub	--	6/83	Delta Creek	Unk, offspring 1320
UM	Unk	1	--	5/23-8/21/83	Little Delta River	Unk, offspring 1341
UM	F	14	--	9/16/83	Kansas Creek	Hunter kill
UM	M	7	--	9/19/83	Little Delta River/ Tenmile Creek	Hunter kill
1342	M	2	5/24/83	10/83	Wood River	Nonsport illegal kill
1315	M	15	6/4/82	5/17/84	Delta Creek	Capture mortality
1306	M	4	5/24/82	5/20/84	W Fk Little Delta	Hunter kill
1356	M	3	6/30/83	5/20/84	Gerstle River	Hunter kill
1333	F	18	7/12/82	5/22/84	E Fk Little Delta	Hunter kill
1352	F	15	6/27/83	5/30/84	W Fk Little Delta	Hunter kill
1327	F	18	7/8/82	6/23/84	E Fk Little Delta	Capture mortality?
3UM	Unk	Cub	--	6/23/84	E Fk Little Delta	Unk, offspring of 1327
UM	Unk	1	--	6/84	Wood River	Unk, offspring of 1345

Table 3. Continued.

Bear No.[a]	Sex	Age[b]	Date of capture	Date of death	Location	Cause of death
UM	Unk	1	--	8-9/84	Dry Creek	Unk, offspring of 1351
UM	F	Unk	--	9/2/84	Delta Creek	Hunter kill
1353	M	2	6/27/83	9/4/84	W Fk Little Delta	Hunter kill
UM	M	Unk	--	9/6/84	Dry Creek	Hunter kill
1344	M	3	5/24/83	9/7/84	Dry Creek	Hunter kill
1325	M	2	6/10/82	9/9/84	Gold King	Defense of life and property kill
1335	F	3	7/13/82	9/14/84	E Fk Little Delta	Hunter kill
1309	M	10	5/25/82	9/15/84	Gold King	Hunter kill
UM	F	20+	--	10/7/84	W Fk Little Delta	Hunter kill

[a] UM designates an unmarked bear; M, male; F, female; Unk, unknown sex.

[b] Age at death; unk denotes unknown age.

[c] Hunter kills with location only listed as Wood River were counted in the study area.

[d] Estimate.

Table 4. Historic grizzly bear harvest within the study area, 1961-84.

Year	Drainage of reported harvest				
	Delta Creek	Little Delta River	Dry Creek	Wood River[a]	Total
1961	0	2	2	3	7
1962	0	2	1	1	4
1963	0	1	1	5	7
1964	3	3	1	2	9
1965	0	0	1	1	2
1966	3	5	3	3	14
1967	0	1	0	0	1
1968	1	1	1	1	4
1969	0	1	0	1	2
1970	1	0	0	1	2
1971	0	1	0	1	2
1972	0	1	0	0	1
1973	1	1	1	5	8
1974	1	0	1	4	6
1975	1	0	0	1	2
1976	0	0	0	1	1
1977	1	1	2	1	5
1978	0	0	1	2	3
1979	1	3	0	6	10
1980	1	4	1	3	9
1981	0	5[b]	1[b]	7	13[b]
1982	0	3	2	1	6
1983	1	2	0	1	4
1984	1	6[c]	2[c]	1[c]	10[c]
Totals	16	43	21	52	132

[a] The study area does not include the entire Wood River drainage. However, because many harvest records do not record specific portions of the drainage, all harvest records that designated Wood River as the location of kill are included.

[b] Single, marked bears were killed by hunters in the Little Delta River and Dry Creek drainages.

[c] Seven marked bears (5 in the Little Delta River, 1 in Dry Creek, and 1 in Wood River) were killed by hunters in the study area during 1984.

Table 5. Movement and home range sizes of radio-collared grizzly bears, northcentral Alaska Range, 1981-84.

Individual No.	Sex	Age in 1984 (yr)	Locations n	Locations Period	Maximum distance between locations (km)	Home range size (km^2)	Comments
1302	F	6.5	4	5/9/81-3/29/82	13	36	Shed collar
1303	F	5.5	30	6/17/81-10/17/84	26	355	
1304	M	8.5	14	6/19/81-10/31/82	45	768	Shed collar
1306	M	4.5	9	5/24/82-10/14/83	12	52	Shed collar
1307	M	4.5	13	5/24/82-8/14/84	28	232	
1308	F	8.5	27	5/25/82-10/17/84	29	234	
1309	M	10.5[b]	14	5/25/82-9/15/84	52	874	Hunter kill
1310	M	14.5[b]	18	5/25/82-8/14/84	42	601	
1311	F	14.5	25	5/26/82-10/17/84	18	78	
1315	M	15.5	12	6/4/82-5/17/84	139	1726	Dead
1316	M	13.5	5	6/7/82-8/4/82	29	201	Shed collar
1317	F	5.5	18	6/8/82-10/17/84	30	232	
1318	F	15.5	26	6/8/82-6/4/84	37	603	
1320	F	19.5	23	6/8/82-10/17/84	17	85	
1321	F	18.5	29	6/9/82-10/17/84	27	363	
1322	F	10.5	14	6/9/82-4/27/84	20	133	
1323	F	13.5	23	6/10/82-10/17/84	27	286	
1325[a]	M	2.5	7	4/27/84-9/9/84	24	134	Defense of life or property kill
1326	F	6.5	19	6/18/82-9/23/84	35	360	
1327	F	18.5	15	7/8/82-8/14/84	9	30	Dead
1330	M	3.5	9	3/15/83-9/23/84	21	82	
1331	F	6.5	11	7/10/82-10/14/83	12	39	Shed collar
1333	F	18.5	16	7/13/82-5/22/84	13	68	Hunter kill
1334[a]	M	3.5	7	4/27/84-6/26/84	56	445	
1335[a]	F	3.5	7	4/27/84-9/14/84	10	18	Hunter kill
1336[a]	F	3.5	12	4/27/84-10/17/84	15	69	
1337	M	21.5	8	5/18/83-6/4/84	80	1552	Shed collar

Table 5. Continued.

Individual No.	Sex	Age in 1984 (yr)	Locations n	Locations Period	Maximum distance between locations (km)	Home range size (km^2)	Comments
1339	M	7.5	10	5/20/83-8/14/84	38	269	
1340	F	4.5	8	5/23/83-8/14/84	26	226	
1341	F	11.5	13	5/23/83-10/17/84	27	134	
1343[a]	M	3.5	2	4/27/84-5/15/84	9	--	
1344[a]	M	3.5	4	4/27/84-9/7/84	50	205	Hunter kill
1345	F	9.5	7	5/24/83-6/23/84	18	64	
1346	M	6.5	2	5/25/83-8/19/83	24	--	Shed collar
1348	F	13.5	12	5/31/83-8/14/84	19	114	
1349	M	19.5	2	6/2/83-10/15/83	57	--	Shed collar
1350	M	9.5	2	6/3/83-8/21/83	24	--	
1351	F	15.5	11	6/23/83-10/17/84	15	62	
1352	F	15.5	6	6/27/83-5/18/84	17	57	Hunter kill
1355	M	4.5	6	6/30/83-6/4/84	8	17	
1356	M	3.5	5	6/30/83-4/27/84	89	--	Hunter kill
1358	M	13.5[b]	3	5/18/84-6/4/84	19	--	Shed collar

[a] Locations of offspring from year of weaning only.

[b] Estimated.

Table 6. Movement of young-age bears subsequent to weaning, Alaska Range 1983-84.

Bear No. and sex	Maternal female No.	Age when weaned	Age during movement	Movement pattern
1306 M	1305	2.5	2.5	Within maternal home range (MHR)
			3.5	Within MHR
			4.5	Killed by hunter 5/20/84 in MHR
1307 M	1305	2.5	2.5	Within MHR
			3.5	Within MHR
			4.5	Sighted once within 15 km of MHR
1344 M	1321	3.5	3.5	Moved 44 km SE of MHR between 5/15-6/4/84, remained there through 6/23; killed within MHR by hunter 9/7/84
1336 F	1322	3.5	3.5	Within MHR
1325 M	1323	2.5	2.5	Within MHR; killed in defense of life or property 9/9/84
1330 M	1329	2.5[a]	2.5	Within MHR
1334 M	1333	3.5	3.5	Moved 48 km to SE between 6/4 and 6/25/84
1335 F	1333	3.5	3.5	Killed by hunter within MHR
1356 M	Unk	Unk	3.5	Moved 74 km ESE of den area between 4/27 and 5/20/84 when killed by hunter

[a] Orphaned when No. 1329 was killed and eaten by No. 1315, adult male.

APPENDIX A. Physical attributes[a] of grizzly bears captured in the northcentral Alaska Range, 1981-84.

Bear No.	Date	Sex	Age (yr)[b]	Measured weight	Total length	Shoulder height	Hind foot	Neck	Girth	Body length	Head width	Head length	Left upper canine[c]	Left lower canine[c]
1301	5/18/81	M	6.5	120	180	119	31	61	114	101	21.0	36.8	3.4	3.0
1302	5/19/81	F	3.5	75	165	102	26	55	100	90	16.7	30.5	3.0	2.7
1303	6/17/81	F	2.5	57	122	87	23	53	89	78	15.1	27.7	2.5	2.7
	6/27/83	F	4.5	82	159	97	26	55	91	79	18.4	32.3	3.0	2.9
1304	6/19/81	M	5.5	136	196	121	30	63	108	109	20.0	36.0	3.9	3.5
1305	6/19/81	F	24.5	114	174	103	28	60	100	96	20.1	32.6	3.0B	3.3B
1306	5/24/82	M	2.5	44	131	85	26	44	73	76	15.1	29.6	2.7	2.8
1307	5/24/82	M	2.5	44	148	84	28	46	74	83	15.4	27.3	2.5	2.5
1308	5/25/82	F	6.5	111	186	103	32	63	100	101	20.2	33.1	3.0	2.2B
	6/20/84	F	8.5	120[d]	--	--	--	64	116	--	20.8	34.1	--	--
1309	5/25/82	M	8.5[d]	318[d]	238	150	36	89	152	128	25.0	39.1	4.0	3.5
1310	5/25/82	M	12.5[d]	250[d]	--	--	--	--	--	--	--	--	b	--
	6/20/84	M	14.5[d]	241	--	--	--	74	129	--	24.6	39.3	--	--
1311	5/26/82	F	12.5	120	190	107	30	63	113	105	21.8	33.8	3.0	2.6
	6/21/84	F	14.5	116	--	--	--	59	100	--	20.0	34.2	--	--
1312	5/26/82	F	0.5	12	81	48	15	28	43	42	10.2	16.5	M	M
1313	5/26/82	F	0.5	12	76	50	15	30	48	45	11.1	16.8	M	M
1314	5/27/82	M	6.5	116	191	114	33	61	105	99	18.5	34.8	3.6	3.3
1315	6/4/82	M	13.5	272	197	126	36	96	154	122	26.4	38.2	3.5	3.3
	5/17/84	M	15.5	295	--	--	--	97	139	--	26.8	37.5	--	--
1316	6/7/82	M	11.5	236	211	133	33	81	133	135	24.0	40.7	3.8	3.7
1317	6/8/82	F	3.5	36	142	91	24	38	62	72	14.2	27.9	2.9	2.9
	5/16/84	F	5.5	55	--	--	--	45	89	--	16.2	29.7	--	--
1318	6/8/82	F	13.5	104[d]	188	113	31	57		113	19.5	33.5	3.1	2.8
	6/22/84	F	15.5	118[d]	--	--	--	59	105	--	19.8	33.5	--	--
1319	6/8/82	M	0.5	12	85	52	14	26	34	44	10.8	17.2	M	M
1320	6/8/82	F	17.5	102	181	110	29	65	103	100	21.0	33.1	2.9W	2.7W
	6/25/84	F	19.5	138	--	--	--	62	106	--	21.0	33.0	--	--
1321	6/9/82	F	16.5	141	199	107	34	69	105	115	22.1	35.8	3.5	3.1
	5/17/83	F	17.5	127	178	91	30	69	109	112	21.9	36.0	2.4B	3.2
1322	6/9/82	F	8.5	91	169	100	29	62	97	97	18.9	32.8	3.2	3.0

APPENDIX A. Continued.

Bear No.	Date	Sex	Age (yr)[b]	Measured weight	Total length	Shoulder height	Hind foot	Neck	Girth	Body length	Head width	Head length	Left upper canine[c]	Left lower canine[c]
1323	6/10/82	F	11.5	95	171	106	32	57	98	93	20.0	33.5	3.2	2.9
	6/29/84	F	13.5	132	--	--	--	61	109	--	20.9	33.6	--	--
1324	6/10/82	F	0.5	12	77	49	16	29	47	39	10.6	17.5	M	M
1325	6/10/82	M	0.5	12	86	54	15	26	48	42	11.5	18.0	M	M
	5/15/84	M	2.5	67	--	--	--	46	80	--	16.5	30.1	--	--
1326	6/18/82	F	4.5	93	172	102	27	54	88	98	17.9	31.4	3.1	2.9
	6/21/84	F	6.5	109	--	--	--	58	92	--	18.9	32.8	--	--
1327	7/8/82	F	16.5	127	175	106	29	62	100	117	20.9	32.9	2.3	2.8
	6/23/84	F	18.5	125	--	--	--	61	109	--	21.0	33.5	--	--
1328	7/8/82	F	1.5	43	122	83	26	41	75	68	14.5	25.7	2.0	1.7
1329	7/9/82	F	13.5	120	186	112	30	59	106	104	19.8	34.2	3.3	3.0
1330	7/9/82	M	1.5	48	130	83	27	45	75	67	14.4	26.2	1.4	1.8
	6/28/84	M	3.5	102	--	--	--	50	99	--	17.5	32.9	--[27]	--
1331	7/10/82	F	4.5	77	161	102	28	50	96	98	17.0	30.5		
1332	7/12/82	F	5.5	104	173	100	32	54	92	97	18.0	33.4	3.1	2.9
1333	7/12/82	F	16.5	141	175	112	33	65	117	124	21.0	34.0	3.1	2.6
1334	7/13/82	M	1.5	49	129	86	26	42	87	72	14.4	24.9	1.3	1.6
	6/27/84	M	3.5	107	--	--	--	52	104	--	18.1	31.3	--	--
1335	7/13/82	F	1.5	38	127	77	24	40	76	73	13.5	24.0	1.6	1.8
	6/25/84	F	3.5	79	--	--	--	47	90	--	16.8	30.0	--	--
1336	5/16/83	F	2.5	47	141	86	27	56	90	86	14.9	28.2	2.6	2.4
	6/26/84	F	3.5	89	--	--	--	49	101	--	16.9	31.7	--	--
1337	5/18/83	M	20.5	289	210	122	36	98	151	135	26.6	39.8	4.0B	B
1338	5/20/83	M	6.5	111	175	89	29	35	107	101	19.9	34.8	3.5	3.4
1339	5/20/83	M	6.5	120	174	103	29	37	109	100	19.7	34.4	3.6	3.1
	5/17/84	M	7.5	168	--	--	--	60	102	--	20.0	35.0	--	--
1340	5/23/83	F	3.5	71[d]	159	86	27	58	95	91	15.7	30.2	3.2	3.2
	5/19/84	F	4.5	91[d]	--	--	--	51	95	--	17.3	31.8	--	--
1341	5/23/83	F	10.5	107	171	110	31	63	125	110	20.7	33.2	3.2	3.1
1342	5/24/83	M	2.5	49	133	85	--	52	91	67	15.6	27.2	2.5	2.8
1343	5/24/83	M	2.5	43	139	85	26	48	88	69	15.5	27.1	3.0	3.0

APPENDIX A. Continued.

Bear No.	Date	Sex	Age (yr)[b]	Measured weight	Total length	Shoulder height	Hind foot	Neck	Girth	Body length	Head width	Head length	Left upper canine[c]	Left lower canine[c]
1344	5/24/83	M	2.5	56	151	79	--	49	93	--	14.9	28.5	2.5	2.5
	6/23/84	M	3.5	123	--	--	--	55	105	--	18.5	33.2	--	--
1345	5/24/83	F	8.5	--	175	99	30	65	110	98	18.3	33.0	3.1	2.8
1346	5/25/83	M	5.5	114	145	98	30	71	110	94	19.7	25.1	3.2	3.0
1347	5/31/83	M	5.0[d]	189	188	119	23	71	144	114	22.0	37.5	3.7	3.4
1348	5/31/83	F	12.5	--	175	107	20	72	123	110	20.0	37.6	3.2	2.9
1349	6/2/83	M	18.5	264	217	124	33	93	145	125	25.6	35.5	4.0B	3.4
1350	6/2/83	M	8.5	202	201	119	30	77	118	118	22.5	47.4	3.7	3.1
1351	6/23/83	F	14.5	114	181	91	23	69	114	116	21.0	38.0	3.3	3.2
1352	6/27/83	F	14.5	111	175	102	29	59	103	108	19.5	34.1	3.1	2.8
1353	6/27/83	M	1.5	27	107	75	20	34	54	56	12.4	21.9	E	E
1354	6/27/83	F	1.5	12	87	60	17	24	41	43	11.0	18.4	E	E
1355	6/30/83	M	3.5	60	138	98	27	45	77	77	15.2	27.5	--	--
1356	6/30/83	M	2.5	50	--	--	24	46	69	--	14.9	25.2	--	--
1357	5/15/84	M	2.5[d]	63	--	--	--	53	90	--	14.7	27.5	--	--
1358	5/18/84	M	13.5[d]	204[d]	--	--	--	86	--	--	--	38.4	--	--

[a] Weights in kg; measurements in cm.

[b] Age determined by cementum layering.

[c] Designations of tooth characteristics: B = broken; W = heavily worn; E = erupting; M = deciduous milk teeth.

[d] Estimate after close examination.