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Division of Wildlife Conservation
Federal Aid in Wildlife Restoration
Research Progress Report

EFFECTS OF HARVEST RATES ON GRIZZLY BEAR POPULATION DYNAMICS IN THE NORTHCENTRAL RANGE

by
Harry V. Reynolds
Toby A. Boudreau

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STATE OF ALASKA
Walter J. Hickel, Governor

DEPARTMENT OF FISH AND GAME
Don W. Collinsworth, Commissioner

DIVISION OF WILDLIFE CONSERVATION
W. Lewis Pamplin, Jr., Director
Wayne L. Regelin, Deputy Director

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Publications Technician
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Project No.: W-23-3 Project Title: Wildlife Research and Management

Study No.: 4.19 Study Title: Population Dynamics of a Hunted Grizzly Bear Population in the Northcentral Alaska Range

Period Covered: 1 July 1989-30 June 1990

SUMMARY

Changes in densities and harvest rates for the grizzly bear (Ursus arctos) population in the northcentral Alaska Range were estimated during the years 1981 through 1989. Baseline population status and reproductive biology were determined during the years 1981 through 1985; the effects of increased harvests on this population were the focus of investigations from 1986 through the reporting period.

During the spring of 1990 research emphasis was placed on monitoring movements, reproductive performances, and mortalities and maintaining a representative sample of radio-collared bears for the study. One 5-year-old male moved 32 km south of the study area (i.e., maternal home range) and was shot by a hunter; another young male moved out of the study area and shed his collar. No other movements of young-aged bears were observed, although two shed their collars and their movements were not monitored.

Six adult females produced 16 cubs during 1990; the mean litter size of 2.7 was the highest recorded during this study. Mean annual litter size for cubs from 1982 to 1990 was 2.17 (n = 36), and for both yearlings and 2-year-olds it was 2.00. There were 2 hunter-caused mortalities, one inside and one outside the study area, and 1 grizzly bear died of natural causes inside the study area. In addition, 2 probable human-caused mortalities that occurred during August 1989 were located. Sixteen grizzly bears were captured and radio-collared, including 8 previously collared bears that needed collar changes, 5 offspring of marked bears, and 3 previously unmarked bears.

Key Words: grizzly bear, Interior Alaska, population dynamics, reproductive biology, Ursus arctos.

CONTENTS

BACKGROUND

An understanding of the effects of hunter harvests on grizzly bear (Ursus arctos) population dynamics is necessary for effective management. To accomplish this, we need to determine (1) the effects of differing levels of harvest on population status, (2) how populations respond to hunter-caused mortality, and (3) whether hunting harvests constitute additive or compensatory mortality in grizzly bear populations. This study was begun in 1981 to address these information needs (Reynolds 1982).

Baseline population status and reproductive biology were determined during the years 1981 through 1985; the effects of increased harvest on this population were to be the focus of investigations from 1986 through 1991. The background and rationale for this long-term study have been described during previous reports (Reynolds and Hechtel 1983, 1984, 1985, 1986, 1988; Reynolds et al. 1987; Reynolds 1989, 1990).

Before the effects of various harvest rates can be assessed, the following information should be available: (1) population density or size; (2) population structure; (3) movement patterns; (4) home range sizes; (5) mortality and survival rates; and (6) reproductive potential, including age at 1st breeding, litter

size, and interval between litters (Craighead et al. 1974, Reynolds 1976, Bunnell and Tait 1980). The approach we have taken in this study is to monitor these characteristics annually so that relationships between harvest levels and potential population responses can be investigated.

Federal Aid reporting requirements changed during 1990. As a result, this progress report, unlike past reports, will not include data collected during the July-October period for the most recent year. Therefore, all data that are related to hunter-caused grizzly bear mortalities in the study area during the fall of 1990 will not be available until the 1991 report is published.

OBJECTIVES

To quantitatively relate changes in the harvest rate of grizzly bears to their population dynamics, especially population size, structure, productivity, survival, emigration, and immigration.

To determine the size, density, and sex and age structure of the grizzly bear population.

To determine measures of reproductive biology, including the age at 1st production of young, reproductive interval, and mean litter size.

To determine natural mortality rates for sex and age classes within the population.

To determine harvest rates for sex and age classes within the population.

To determine movement patterns and home range sizes for grizzly bears of various sex and age classes within the population.

STUDY AREA

The 3,900-km^2 (1,500-mi^2) study area is located in the mountains and foothills of the northcentral Alaska Range within Subunit 20A. The boundaries are the Wood River drainages between Saint George Creek and 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°N) to the north. It includes portions of 2 U.S. Army reservations: Fort Wainwright and Fort Greely.

Elevations in the area range from 500 to 3,700 m (1,500 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 an elevation of approximately 1,200 m (4,000 ft).

METHODS

I continued to use the same methods described in past reports to capture bears and measure population variables (Reynolds 1982, 1989, 1990; Reynolds and Hechtel 1983, 1984, 1985, 1986, 1988; Reynolds et al. 1987). Standardized weight and measurement data continued to be collected (Appendix A).

RESULTS AND DISCUSSION

In past annual reports, data and analyses were presented on a calendar year basis; however, because of changes in requirements and deadlines for Federal Aid reports, future reports, including this one, will document work accomplished on a 1 July-30 June fiscal-year basis. This report will only include data collected during the spring of 1990, because data collected during the summer and fall of 1989 were analyzed and included in the most recent progress report for this project (Reynolds 1990). Data collected during the spring season are primarily related to reproductive performances and will be included in this report; however, analysis of data or calculations that are dependent upon summer and fall observations will not be included until the 1991 report. This includes topics of survival, hunting mortality, population size, population structure, and movement.

To accomplish objectives for the 1990 season, we planned to capture at least 26 bears from May to June 1990 to replace radio collars or fit 2-year-old offspring of marked females with their 1st collars. By mid-June we had successfully captured 11 of these bears; 7 other bears had shed their collars; four either emigrated or had nonfunctional collars, two 2-year-olds were weaned before they could be captured, one was found dead, and one was not captured because available funding had been expended. We also captured 5 other grizzly bears: 1 marked male that had lost his radio collar, 1 unmarked male breeding with a marked female outside the study area, and 2 adult females on the periphery of the study area. After one of these females had been captured, a recently weaned 2-year-old, presumably her offspring, followed her scent trail and was also captured. The other adult female was accompanied by 3 yearlings that were not captured.

To be most effective, the capture of 2-year-old offspring in future years should be completed by 10 May. Although the mean observed weaning date was 26 May (range = 14 May-24 Jun, n = 9) during the 1982-86 period, during the 1987-90 period it was 15 May (range = 12-25 May, n = 12). During 1990, 2 females and 1 female weaned their 2-year-olds by 12 and 13 May, respectively; we were able to capture offspring from two of these family groups but not from the third.

Bears Captured and Radio-collared

One hundred and nine individual grizzly bears were captured in the study area during the period 1981 to 1990 (Table 1). In addition, 73 bears were recaptured for replacement of radio collars. During the period 1981 to 1983, initial captures were made from all sex and age classes. Since then, most initial captures were offspring of previously captured bears (Appendix B). Radio collars have been placed on 97 bears; i.e., 33 on young-age males (≤5 yrs), 18 on adult males (≥6 yrs), 23 on young-age females, and 23 on adult females. By mid-June 1990, 29 bears carried functioning radio collars; 17 bears had shed collars; 55 bears were dead; 1 bear was presumed dead; and 10 bears could not be located, presumably because of long-range movements or collar failure (Appendixes C, D, E).

During May and June 1990, 16 bears were captured; eight were unmarked (1 adult male, 2 adult females, and five 2-year-old offspring of marked females), and eight were marked. The unmarked adult male was captured outside the study area with a marked female, and the 2 unmarked adult females were captured on the periphery of the study area.

Although offspring observed as cubs had an even sex ratio of 15 males:15 females (3 unknowns), we are hesitant to conclude that the sex ratio at birth is even. We rarely attempted to capture cubs, so our sample size was low. The sex ratios in older juvenile age classes tend to be male dominant, but none have been significantly different from the male:female ratio we observed for cubs. Yearlings had a sex ratio of 20 males:17 females (3 unknowns); 2-year-olds, 20 males:18 females (2 unknowns); and 3-year-olds, 8 males:5 females. Of those 2- and 3-year-olds that were observed at weaning, 24 were males, 19 were females, and one was unknown. If there is a tendency toward greater male recruitment in the population, it is more likely the result of initial production, rather than a lower survival rate for females in litters. Of 27 litters, five were composed of all males, three were composed of all females, 14 were composed of mixed-sex litters, and five contained a litter mate whose sex was unknown. Similar sex ratios have been recorded in Yellowstone National Park; Craighead et al. (1974) found 57% of 74 cubs captured during the years 1959 through 1970 were males, and Knight and Eberhardt (1985) reported that 67% of 24 cubs captured during the years 1974 through 1982 were males.

Reproductive Biology

Reproductive Interval:

Reproductive interval, or reproductive cycle, is the period between weaning of 1 litter by an adult female and the successful rearing and weaning of her subsequent litter. For females producing cubs for the 1st time, intervals begin at the 1st

breeding that results in offspring. Years in which a female breeds but fails to conceive or loses her litter are included in this definition of reproductive interval. Therefore, observations of the length of time offspring accompany females before weaning should be viewed as minimum values of reproductive intervals, because females may not always produce young subsequent to breeding efforts following weaning (Craighead et al. 1969, 1976; Reynolds 1974, 1976, 1978, 1980; Glenn et al. 1976; Reynolds and Hechtel 1982). This definition differs from that used by others. Craighead et al. (1976) define a cycle as the interval from pregnancy to pregnancy.

During 1990, 2 females completed 3-year intervals, and one each completed 4- and 5-year intervals (Tables 2, 3). No females kept offspring as 2-year-olds, nor were any losses of cub or yearling litters observed. By comparison, during 1989, 4 females completed 3-year reproductive intervals, one completed a 5-year interval, and 4 others lost offspring, resulting in projected intervals of from 5 to 10 years.

Offspring were weaned as 2-year-olds (n = 16 litters) or 3-year-olds (n = 10 litters); however, the mean minimum reproductive interval was 4.2 years (n = 38), based on those cycles observed plus those that had been projected by assuming weaning of offspring as 2-year-olds (Table 4). Alternatively, if we project minimum cycle length based upon observed proportions of those litters weaned as 2- and 3-year-olds, then the mean reproductive interval was 4.3 years. All 13 intervals greater than 4 years resulted from interruption of the breeding cycle because of mortality of litters or breeding that did not produce cubs the following year.

Litter Size:

Mean observed litter size of cubs emerging from natal dens was larger during 1990 than during any other year from 1982 to 1989. Of 6 females producing cubs of the year, four had litters of 3 cubs and two had litters of 2 cubs. All cubs survived until at least 8 June. For comparison, 3 females in 1989 produced litters of 1, 2, and 3 cubs; only the litter with a single cub did not survive until 1990. However, another female and presumably her 2 cubs also died during the summer of 1989. All 4 litters of yearlings or 2-year-olds observed during 1989 survived until May or June 1990.

Mean litter size was 2.2 for 36 litters first observed as cubs, 1.9 for 16 litters first observed as yearlings, and 2.0 for 32 litters observed as yearlings, regardless of when they were first observed. For comparison, in the Nelchina Basin on the south side of the Alaska Range, Miller (1987) found the same mean cub litter size (2.1) but a mean yearling litter size of only 1.7. In this study the number of females producing cubs varied from year to year, ranging from 1 female producing 1 cub in 1983 to 7 females producing 14 cubs in 1982 (Table 4). In 1989 cub

production was low; only 5 cubs were produced by 3 females. Poor cub production in 1983 may have been due to failure of berry crops in 1982 (Miller 1984) or to the weather patterns during the winter of 1982-83, when little snow fell and temperatures fluctuated widely.

Although the difference in mean litter size between cubs and yearlings is small, it is primarily due to the mortality of entire litters, rather than high survival rates. Similar patterns of litter mortality have been recorded in northwestern Alaska (ADF&G files).

The mean size of 23 litters weaned as 2- or 3-year-olds was 2.0. The annual number of adult females in the population since 1982 has ranged from 18 to 21 (Tables 2, 5), and the observed annual number of litters produced were 7, 1, 6, 5, 2, 9, 5, 4, and 6 during the years 1982 through 1990, respectively; however, from 1982 to 1990, the observed annual numbers of weaned litters were only 1-2, 0-1, 4, 2, 4, 1, 2, 5, and 5, respectively. This pattern also reflects mortality of entire litters, mostly in cub or yearling age classes.

Mortality

Two grizzly bears died in the study area during the spring of 1990; female No. 1390 was killed by a hunter near Kansas Creek, and female No. 1376 died from unknown causes or was killed by another bear at the crest of Molybdenum Ridge. Also, male No. 1380 was killed by a hunter south of the study area.

Although the deaths of 2 other adult females occurred during the summer of 1989, they were not confirmed until 1990. The locations of both dead bears indicated they may have been mortally wounded by hunters. On 30 August the remains of No. 1320 was located in a shrubby draw, 500 m from what was presumably a sheep hunting camp. Bear No. 1341 had been accompanied by 2 cubs during June, and her remains were also located on 30 August, 1.5 km from a permanent hunting camp. Although the bear season was not open, these bears may have been taken under "defense of life or property" provisions of state regulations, but not recovered. Parts of skulls, hides, and claws were present at both sites, presumably making it less likely that hunters killed the bears illegally and then left the site. We plan to further investigate these sites to determine if bullet fragments can be found near the remains.

For comparison, during 1989 grizzly bears were killed by 8 hunters; two were killed illegally, two were killed in defense of life or property, and 1 missing offspring was presumed dead (Table 6). In addition, 3 marked bears were killed by hunters outside the study area; two were recently weaned 2-year-old males and the other one was an adult male whose home range had been primarily within the study area.

Movement

One male (No. 1380) that had been last located in the study area as a 4-year-old in 1989 was shot by a hunter outside the study area on 22 April 1990, 32 km south of his mother's home range. Another young male (No. 1389) moved out of the study area during the fall of 1989 and shed his collar 37 km south of his mother's home range. No other young-aged bears were observed outside the study area; however, two shed their collars, preventing monitoring of their movements. Adult female No. 1345, which had an established home range on the southwest edge of the study area, moved 6 km south of her home range to den. This probably represented an expansion of home range, rather than an emigration; no other adult females have moved from their established home ranges during this study.

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PREPARED BY:

Harry V. Reynolds, III
Wildlife Biologist III

Toby A. Boudreau
Graduate Student Intern

John W. Schoen
Acting Regional Research Coordinator

APPROVED BY:

W. Lewis Pamplin, Jr.
W. Lewis Pamplin, Jr., Director
Division of Wildlife Conservation

Wayne L. Regelin
Wayne L. Regelin, Deputy Director
Division of Wildlife Conservation

Table 1. Capture and marking characteristics of 109 bears captured in the northcentral Alaska Range, 1981-90.

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	5/18/81	120(265)	Buchanan Creek	1.8/1.2 H	373/374	G/G
1302 F	3	5/19/81	75(165)	East Fork Delta	1.0/1.0 M	368/367	R/
	8	6/12/86	114(250)	East Fork Delta	2.2 TEL M	280/281	O/1B
	11	5/12/89	109(241)	Buchanan Creek	4.5 TEL M	339/340	O/1B
1303 F	2	6/17/81	57(125)	Mystic Mountain	1.4/1.4 M	524/523	R/R
	4	6/27/83	82(180)	Hearst Creek	5.0 M99 M	3227/3214	R/R
	6	6/14/85	73(160)	Upper Gold King	2.0/2.0 M	486/487	R/R
1304 M	5	6/19/81	136(300)	West Fork Delta	2.4/2.0 M	451/452	1B/R
	11	5/21/87	255(560)	Threemile Creek	8.1 TEL M	430/431	W/mG
	13	6/7/89	245(540)	Slate Creek	7.0 TEL M	778/--	W/--
1305 F	24	6/19/81	114(250)	Slate Creek	A M	453/454	O/R
1306 M	2	5/24/82	44(97)	West Fork Delta	1.0/1.0 L	3151/3086	G/1B
1307 M	2	5/24/82	44(98)	West Fork Delta	1.0/1.0 H	3087/3152	1B/G
	5	6/17/85	114(250)[d]	Sheep Creek	2.4/2.6 L	3087/3152	1B/G
1308 F	6	5/25/82	111(245)	Dry Creek	-[e]	3001/3154	O/Pp
	8	6/20/84	120(265)	Dry Creek	5.0 M99 M	3001/471	O/Pp
	11	6/8/87	123(270)	Dry Creek	3.3 TEL M	528/529	O/Pp
1309 M	8	5/25/82	318(700)[d]	Dry Creek	A L	3153/3101	dB/Bk
1310 M	13	5/25/82	250(550)[d]	Buchanan Creek	2.0/2.0 M	No tags	
	15	6/20/84	241(530)	Molybdenum Ridge	4.0/2.0 M	467/473	O/W
	18	5/21/87	264(580)	Buchanan Creek	9.0 TEL M	414/413	Y/W
1311 F	12	5/26/82	120(265)	Molybdenum Ridge	1.9/2.1 M	3106/3107	W/W
	14	6/21/84	116(255)	Molybdenum Ridge	2.0/2.2 M	466/455	W/W
	17	6/8/87	123(270)[d]	Molybdenum Ridge	3.4 TEL M	571/570	W/W
1312 F	Cub	5/26/82	12(26)	Molybdenum Ridge	0.1/0.1	3104/3155	O/W[f]
1313 F	Cub	5/26/82	12(27)	Molybdenum Ridge	0.08/0.13	3156/3105	W/O[f]
1314 M	6	5/27/82	116(255)	Iowa Ridge	2.1/1.9 H	3088/3002	dB/1B
1315 M	13	6/4/82	272(600)	Buchanan Creek	1.9/2.1 L	3102/3157	Bk/O
	15	5/17/84	295(650)	Hayes Creek	A H	3322/none	Bk/-

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]
1316 M	11	6/7/82	236(520)	West Fork Delta	3.8/0.0 H	3089/3090	O/1B
1317 F	3	6/8/82	36(80)	Forgotten Creek	1.2/1.8 L	3091/3003	1B/O
	5	5/16/84	55(122)	Upper West Fork	A L	3486/3239	1B/O
	6	5/23/85	59(130)	Upper Wood River	7.0 M99	497/498	1B/O
1318 F	13	6/8/82	104(230)	Buchanan Creek	A L	3004/3103	W/G
	15	6/22/84	118(260)[d]	Slate Creek	A M	458/472	W/G
	18	6/2/87	105(230)[d]	Slate Creek	3.3 TEL M	--	--
1319 M	Cub	6/8/82	12(26)	Buchanan Creek	0.15/0 L	3005/3092	R/Y[f]
1320 F	17	6/8/82	102(225)	Trident Glacier	A M	3158/3093	G/B
	19	6/25/84	139(305)	East Hayes Creek	5.0 M99 M	463/461	G/B
	22	6/12/87	114(250)	Hayes Glacier	4.0 TEL M	517/518	mG/dB
1321 F	16	6/9/82	141(310)	Snow Mountain Gulch	2.1/1.9 M	3028/3108	G/W
	17	5/17/83	127(280)	Dry Creek	1.8/2.2 M	3028/3427	G/W
	19	7/22/85	218(480)	North VABM Wood	2.6/1.0 L	399/398	G/W
	23	6/6/89	170(375)	Dry Creek	-- TEL M	788/789	1G/W
1322 F	8	6/9/82	91(200)	Sheep Creek	1.9/2.1 M	3051/3159	W/1B
1323 F	11	6/10/82	95(210)	Mystic Mountain	1.9/2.1 M	3160/3030	G/G
	13	6/29/84	132(290)	VABM Wood	A M	579/582	G/G
1324 F	Cub	6/10/82	12(26)	Mystic Mountain	0.12/0 M	3027/3162	R/W[f]
	6	5/26/88	111(245)	Coal Creek	3.6 TEL L	159/160	Bk/W
1325 M	Cub	6/10/82	12(27)	Mystic Mountain	0.10/0 M	3161/3031	W/R[f]
	2	5/15/84	67(148)	Mystic Creek	1.0 M99 M	3233/3394	R/W
1326 F	4	6/18/82	93(205)	Buchanan Creek	2.2/1.8 M	3008/3163	W/R
	6	6/21/84	109(240)	Buchanan Creek	1.8/2.2 M	468/462	W/R
	7	6/27/85	111(245)	Slate Creek	2.4/1.6 L	426/427	W/W
1327 F	16	7/8/82	127(280)	Whistler Creek	2.2/1.8 M	3134/3192	G/R
	18	6/23/84	125(275)	Whistler Creek	A H	458/192	G/R
1328 F	1	7/8/82	43(95)	Whistler Creek	0.9/1.1 M	3115/3014	dB/G
1329 F	13	7/9/82	120(265)	Buchanan Creek	2.4/1.6 M	3026/3111	W/R
1330 M	1	7/9/82	48(106)	Buchanan Creek	-- M	--/--	R/W
	3	6/28/84	102(225)	East Fork Delta	2.6/3.0 M	597/598	R/W

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]
1331 F	4	7/10/82	77(170)	Trident Glacier	2.4/1.6 M	3120/3194	Bk/O
	9	5/20/87	114(250)[d]	East Hayes Creek	3.0 TEL M	519/520	Bk/Y
	12	5/15/90	111(245)	Trident Glacier	6.0 TEL H	196/197	Bk/Y
1332 F	5	7/12/82	104(230)	Gillam Glacier	2.4/1.6 M	394/190	R/dB
1333 F	16	7/13/82	141(310)	Buchanan Creek	A M	474/469	G/R
1334 M	1	7/13/82	49(108)	Buchanan Creek	1.0/1.0 M	395/392	Y/G
	3	6/27/84	107(235)	McGinnis Creek	A M	585/583	O/G
1335 F	1	7/13/82	38(84)	Buchanan Creek	1.0/1.0 M	32/456	G/Y
	3	6/25/84	80(175)	Gilliam Glacier	1.5/3.0 M	465/464	dB/G
1336 F	2	5/16/83	48(105)	Kansas Creek	1.0/1.0 M	3201/3204	Bk/mG
	3	6/26/84	89(195)	Copper Creek	2.0/3.0 M	470/595	Bk/mG
	4	6/17/85	102(224)	Wood River	A L	470/595	Bk/mG
	6	5/15/87	109(240)	Rogers Creek	2.2/2.0 M	521/522	Bk/mG
	8	5/17/89	145(320)	Upper Wood River	4.5 TEL M	330/329	Bk/mG
1337 M	20	5/18/83	293(645)	Sheep Creek	3.5/3.5	3209/3205	R/O
	25	6/15/88	277(610)	Sheep Creek	A TEL H	364/363	O/R
1338 M	6	5/20/83	111(245)	Molybdenum Ridge	A M	3203/3202	O/Bk
1339 M	6	5/23/83	120(265)	Trident Glacier	-- M	3286/3351	1B/W
	7	5/17/84	168(370)	East Fork Delta	6.0 M99 H	3254/3398	1B/W
1340 F	3	5/23/83	71(157)	Hayes Creek	1.2/0.8 H	3277/3208	G/O
	4	5/19/84	91(200)[d]	Molybdenum Ridge	4.0 M99 M	3277/3208	mG/O
	5	6/27/85	100(220)	West Hayes Creek	2.4/1.6 L	590/596	mG/mG
1341 F	10	5/23/83	107(235)	NE Portage	1.5/1.5 H	3210/3428	R/dB
	12	6/13/85	107(235)[d]	East Fork Delta	2.0/2.0 M	442/none	O/-
	15	6/14/88	164(360)	East Fork Delta	7.0 TEL M	356/355	dkB/Y
1342 M	2	5/24/83	49(108)	Threemile Creek	0.6/1.2 M	3354/3207	W/dB
1343 M	2	5/24/83	43(95)	Threemile Creek	0.6/1.2 M	3426/3285	R/Bk
1344 M	2	5/24/83	56(123)	Threemile Creek	0.6/1.2M	3361/3433	1B/Bk
	3	6/23/84	123(270)	Hayes Creek	2.2/3.2 M	475/460	1B/Bk

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]
1345 F	8	5/24/83	--	Upper West Fork	1.2/1.8 L	3206/3352	O/O
	10	5/23/85	105(230)[d]	Upper West Fork	7.0 M99	499/500	O/O
	14	5/13/89	118(260)	Upper Wood River	4.5 TEL M	445/446	O/O
1346 M	5	5/25/83	114(250)	Hayes Glacier	A M	3359/3356	1B/1B
	12	5/14/90	--	Trident Glacier	7.0 TEL M[h]	192/193	Mg/Mg
1347 M	6	5/31/83	189(415)	Coal Creek	3.5 M99	None	Dead
1348 F	12	5/31/83	123(270)[d]	Mystic Mountain	A M	3363/3372	W/O
	15	5/16/86	116(255)	Wood River	2.4/1.6 M	235/236	W/O
	19	5/12/90	141(310)	Gold King	6.0 TEL M	117/118	W/O
1349 M	18	6/2/83	264(580)	O'Brien Creek	3.8/1.2L	3364/3292	R/1B
1350 M	8	6/2/83	202(445)	Ptarmigan Creek	3.0/2.0L	3432/3430	dB/R
	11	6/12/86	205(450)[d]	East Fork Delta	3.5 TEL L	273/272	dB/R
1351 F	14	6/23/83	114(250)[d]	Dry Creek	4.0 M99 M	3217/3390	dB/W
	16	6/10/85	111(245)	Little Delta River	2.0/2.0 M	477/436	dB/W
	18	5/19/87	130(285)	Dry Creek	A M	503/504	dB/W
1352 F	14	6/27/83	111(245)	West Fork Delta	--	3215/3316	O/W
1353 M	1	6/27/83	27(60)	West Fork Delta	--	3310/none	O/-
1354 F	1	6/27/83	12(27)	West Fork Delta	--	None/3314	-/O
1355 M	3	6/30/83	60(133)	East Fork Delta	4.0 M99 H	3232/3473	O/Bk
	5	6/3/85	70(155)	Whistler Creek	2.2/1.8 H	586/587	O/Bk
1356 M	2	6/30/83	50(110)	Little Delta River	2.0 M99 H	3234/3392	Bk/O
1357 M	2	5/15/84	63(138)	Dry Creek	1.1 M99 M	3323/3235	W/Bk
	3	6/24/85	93(205)	Dry Creek	1.5/1.5 M	447/448	W/Bk
1358 M	13	5/18/84	205(450)	Hayes Creek	A L	3318/3447	1B/dB
	15	5/20/86	236(520)	Trident Glacier	3.4/2.0 L	297/296	1B/dB
1359 M	3	5/28/85	61(134)	Snow Mountain Gulch	4.0 M99 M	489/488	dB/O
1360 F	10	5/28/85	95(210)	Snow Mountain Gulch	7.0 M99 H	None	None
1361 F	3	5/28/85	63(138)	Dry Creek	4.0 M99 M	482/483	mG/R
	4	5/19/86	100(220)	Rogers Creek	1.7/2.0 L	274/275	G/Bk

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]
1362 F	6	6/5/85	--	Glacier Creek	2.0/2.0 L	None	None
	6	6/24/85	114(250)	Threemile Creek	2.2/1.8 L	443/490	dB/dB
	9	5/15/88	--	Sheep Creek	5.0 TEL H	197/198	O/Y
1363 M	3	6/5/85	55(120)	Slide Creek	1.0/2.0 M	592/593	dB/1B
1364 M	Cub	6/14/85	7(15)	Gold King Creek	0.7/- M	None	None
1365 M	5	6/19/85	118(260)	Wood River	A M	476/441	1B/G
1366 M	8	7/22/85	234(515)	Tatlanika River	3.2/1.0 M	390/391	mG/R
1367 M	2	5/19/86	61(134)	Threemile Creek	1.4/2.0 M	400/241	1B/W
1368 F	2	5/19/86	48(106)	Threemile Creek	1.4/2.0 M	257/256	1B/1B
1369 M	2	5/19/86	68(150)	Threemile Creek	1.4/2.0 L	247/246	W/dB
1370 F	2	5/20/86	47(103)	Buchanan Creek	1.4/2.0 H	253/252	dB/Bk
	3	5/20/87	69(151)	Buchanan Creek	1.5/1.5	--	--
1371 M	2	5/20/86	57(126)	Buchanan Creek	1.4/2.0 M	269/268	Bk/dB
1372 M	2	5/20/86	72(158)	Ptarmigan Creek	1.4/2.0 M	387/386	1B/O
	5	5/17/89	186(410)	Chute Creek	7.0 TEL M	310/309	1B/O
1373 M	7	5/21/86	193(425)	Delta Creek	4.0/2.0 M	295/294	1B/R
1374 F	6	5/21/86	106(233)	Delta Creek	2.0/2.0 M	249/248	R/G
	9	6/9/89	147(325)	Delta River	6.0 TEL M	320/319	1G/1B
1375 M	6	6/13/86	186(410)	Sheep Creek	4.5 TEL L	276/277	Y/W
	9	5/13/89	281(620)	Mystic Creek	6.0 TEL L[h]	439/440	O/W
1376 F	14	6/13/86	130(285)	Hayes Creek	3.0 TEL M	279/278	G/O
1377 M	2	8/28/86	132(290)	Iowa Ridge	4.0 TEL L	505/507	Bk/R
1378 F[g]	2	5/20/86	59(130)[d]	Ptarmigan Creek	--	None	None
1379 F	2	5/15/87	67(148)	Sheep Creek	2.2/2.0 L	334/335	W/W
	4	6/6/89	102(225)	Dry Creek	3.5 TEL L	777/776	W/W
1380 M	2	5/18/87	65(142)	West Fork Delta	2.2 TEL H	513/514	W/R
	3	5/17/88	109(240)	Buchanan Creek	3.2 TEL	175/174	W/R
1381 M	2	5/21/87	73(160)	Dry Creek	3.0 TEL M	481/480	1B/Bk
1382 F	3	5/15/88	68(150)	West Fork Delta	3.2 TEL M	169/170	R/Y
	4	6/7/89	84(185)	Buchanan Creek	4.0 TEL M	169/170	R/Y
1383 M	2[d]	6/12/87	77(170)	Coal Creek	AM	389/390	mG/dB

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]
1384 M	7[d]	5/15/88	191(420)	Chute Creek	7.0 TEL M	960/959	W/Y
1385 F	2	5/15/88	68(150)	Upper Wood River	2.2 TEL H	168/167	1B/Y
	3	5/13/89	82(180)	Wood River	3.4 TEL M	--	1B/Y
	4	5/11/90	95(210)	Upper Wood River	A TEL H	--	--
1386 M	2	5/15/88	73(160)	Upper Wood River	2.2 TEL M	181/180	Bk/Y
	3	5/13/89	91(200)	Upper Wood River	3.4 TEL M	181/180	Bk/Y
	4	6/07/90	120(265)	Upper Wood River	7.0 TEL H[h]	790/791	Bk/Y
1387 F	2	5/23/88	55(120)	Dry Creek	A TEL M	179/178	Y/R
	3	5/12/89	77(170)	Roger Creek	3.4 TEL M	337/338	Y/R
	4	5/51/90	84(185)	Sheep Creek	A TEL M	190/191	--
1388 M	2	5/25/88	68(150)	Dry Creek	2.5 TEL M	153/154	Y/1B
1389 M	3	5/13/89	84(185)	Mystic Creek	4.5 TEL H	343/344	W/dB
1390 F	3	5/13/89	77(170)	Mystic Creek	3.4 TEL H	345/346	Y/Y
1391 F	2	5/13/89	68(150)	Dry Creek	2.8 TEL L	333/334	O/mG
	3	5/12/90	95(210)	Dry Creek	3.8 TEL M	333/334	O/Mg
1392 M	2	5/13/89	89(195)	Dry Creek	2.8 TEL M	341/342	1G/O
1393 M	2	5/17/89	66(145)	Molybdenum Ridge	3.5 TEL H	326/325	Bk/1B
	3	5/14/90	100(220)	Trident Glacier	4.4TEL M	326/325	Bk/1B
1394 F	2	5/17/89	59(130)	Molybdenum Ridge	3.5 TEL -	331/332	1Bl/Bk
1395 M	2	5/17/89	86(190)	Molybdenum Ridge	3.1 TEL M	302/301	dkB/W
1396 M	13[d]	5/18/89	295(650)	Molybdenum Ridge	7.0 TEL M[h]	327/328	Y/O
1397 F	2	5/18/89	61(135)	Delta Creek	3.2 TEL M	314/313	O/O
1398 F	8[d]	5/18/89	127(280)	Delta Creek	4.5 TEL M	315/316	W/Y
1399 M	2	5/18/89	66(145)	Delta Creek	3.2 TEL M	303/304	R/R
1400 M	8[d]	6/8/89	239(525)	Trident Glacier	7.0 TEL M[h]	425/426	R/1B
1601 M	7[d]	6/9/89	193(425)	Whistler Creek	6.5 TEL M[h]	782/785	Gr/Y
1602 M	7[d]	5/13/90	166(365)	Molybdenum Ridge	A TEL M	122/121	1B/Gr
1603 F	2[d]	5/13/90	55(120)	Hayes Creek	3.6 TEL H	141/142	1B/dB
1604 F	2	5/13/90	48(105)	Buchanan Creek	3.4 TEL M	119/120	1B/R

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]
1605 F	2	5/13/90	59(130)	Buchanan Creek	3.6 TEL M	213/150	Mg/lB
1606 M	2	5/13/90	50(110)	Buchanan Creek	A TEL M	143/144	R/dB
1607 F	10[d]	5/14/90	141(310)	Glacier Creek	5.5 TEL M	188/189	W/lB
1608 F	16[d]	5/14/90	136(300)	Trident Glacier	5.5 TEL M	184/-	lG/-
1609 F	2[d]	5/14/90	61(135)	Trident Glacier	3.2 TEL M	103/104	dB/Mg

[a] Dosage in ml of phencyclidine hydrochloride/acepromazine maleate; use of M-99 is designated M99; use of Telezol is designated TEL; 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.

[c] Marking designations:
Colors: R, red; G, light green; mG, medium green; Gr, gray; 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] Data collected but not recorded.

[f] 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.

[g] Bear No. 1378, an offspring of No. 1311, was darted but not immobilized on 20 May 1986. We left her with her mother to recover from the darting chase, but she was killed by hunters before we returned. We include her in this table for ease of data analysis.

[h] Dosages of Telezol administered at a concentration of 300 mg/ml, instead of the usual 200 mg/ml.

Table 2. Reproductive status and litter sizes of potentially mature females in the northcentral Alaska Range, 1981-90.

Bear No.	Age in 1989[a] (yr)	Offspring No.	Reproductive status[b] 1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Reproductive history
1302	12	3UM, 1604, 1605, 1606	NB	UN	UN	UN	UN	B	B	3cb	3ylg	3 2yr/B	No offspring prior 1986
1303	11	1364, 1UM	NB	NB	B?	B	2cb/B	UN	UN	UN	UN	UN	No offspring prior 1981; lost 2 cubs 1985
1305	25	1306, 1307	2ylg	2 2yr/B D									Hunter kill fall 1982
1308	14	2UM, 1391, 1392, 3UM		?/B	B	2cb	2ylg	1 2yr/B	2cb	2ylg	2 2yr/B	3cb	Offspring 1982 or before; lost 1 ylg 1985
1311	20	1312, 1313, 1372, 1378, 1UM, 1395, 2UM	UN/B	2cb	B	2cb	2ylg	2 2yr/B	2cb	2ylg	2 2yr/B	2cb	Lost cubs August 1982 Lost UM 2yr?, spring 1989
1317	6			NB	NB?	NB	NB/D						Illegal kill 1985
1318	21	1319, 1380, 1382, 2UM	UN/B	1cb/B	B	B	2cb	2ylg	2 2yr	2 3yr/B	2cb	2ylg	Lost cub 1982
1320	24	1UM, 3UM, 2UM		?/B	1cb/B?	B	3cb	B	2cb	1ylg	B/D		Weaned or lost offspring 1982; lost cub 1983; lost 3 cubs 1985, lost 1 cub 1987; lost 1 ylg 1988; dead fall 1989
1321	23	1342, 1343, 1344, 1UM, 1379,[c] 1381[c] 3UM	UN/ 3+cb	3ylg	3 2yr	2 3yr/B	3cb	3ylg	2 2yr/B	3 cb	B/D		1342 killed illegally fall 1983; lost 1 ylg 1983; lost 3 cubs 1988
1322	15	1336	UN/1+cb	1ylg	1 2yr	1 3yr/B	UN	UN	UN	UN	UN		
1323	18	1324, 1325 2UM	UN/B	2cb	2ylg	2 2yr/B	UN	UN	2+cb	2+ylg	2 2yr/D		DLP kill[b] fall 1989
1324	8	1389, 1390, 2UM		NB	NB	NB	UN/NB?	UN/B	2+cb	2ylg	2 2yr/B	2cb	
1326	8	1UM		NB	B	B	1cb	B/D					No offspring prior 1982; lost cub 1985; hunter kill 1986

Table 2. Continued.

Bear No.	Age in 1989[a] (yr)	Offspring No.	Reproductive status[b] 1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Reproductive history
1327	18	1328, UM, 3UM	UN/2+cb	2ylg	B	3cb/D							1UM ylg capture mortality; lost 1328 in 1982; 1327 capture mortality? 1984
1329	14	1330	UN/1+cb	1ylg	1 2yr/D								Killed by male May 1983
1331	12	1UM, (1603)?		NB	B	UN/B	UN/B	UN/1+cb	1ylg/B	1+cb	1ylg	1 2yr/B	No offspring prior 1982; lost ylg 1987
1332	6			NB?	D								No offspring prior 1982; died in den 1983
1333	18	1334, 1335	UN/2+cb	2ylg	2 2yr	2 3yr/B/D							Hunter kill 1984
1336	9	2UM, 3UM			NB	NB	B	B	2cb	2ylg	B	3cb	No offspring prior 1983 lost 2 ylg 1988
1340	10				NB	NB	B	UN	UN	UN	UN	UN	No offspring prior 1983
1341	16	1UM, 1370, 1371, 2UM, 2UM		UN/1+cb	1ylg/B	2cb	2ylg	2 2yr/B	B	2cb/B	2cb/D		Lost ylg 1983; lost 2 cubs 1988; dead fall 1989
1345	15	2UM, 1385, 1386, 3UM			B	2cb	1ylg/B	2cb	2ylg	2 2yr	2 3yr/B	3cb	Lost 1 cub 1984; lost 1 ylg 1985
1348	19	1367, 1368, 1369, 2UM, 1UM, 3UM			?/B	3cb	3ylg	3 2yr/B	2cb	2ylg/B	1 cb/B	3cb	Probably weaned or lost offspring 1983; lost 2 ylg 1988; lost 1 cub 1989
1351	19	1357, 1361, 1UM, 3UM	UN/B	UN/3+cb	3ylg	3 2yr	2 3yr/B	UN/3+cb	3ylg/D				Lost 1UM offspring 1984; hunter kill 1987, 3UM ylg orphaned?
1352	16	1353, 1354	UN/B	UN/2+cb	2ylg	2 2yr/D							Hunter kill 1984; 1353, hunter kill 1984
1360	11	1359, 1363	UN/B	UN/2+cb	UN/2+ ylg	UN/2+ 2yr	2 3yr/D						Capture mortality 1985
1361	8					NB	NB	NB	UN	UN	UN	UN	No offspring prior 1985
1362	11	1387, 1388				UN	B	2cb	2ylg	2 2yr/B	B	UN	No offspring prior 1985

Table 2. Continued.

Bear No.	Age in 1989[a] (yr)	Offspring No.	Reproductive status[b] 1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Reproductive history
1374	10	2UM, 2UM				UN/B	UN/2+cb	2ylg	?/B	2+cb	2ylg	2 2yr	
1376	18	1393, 1394					UN	?/B	2cb	2ylg	2 2yr	2 3yr/D	Offspring prior 1986; dead spring 1990
1379	5									NB	B	UN	Dropped collar spring 1990
1398	9	1397, 1399						?/B	2+cb	2+ylg	2 2yr/B	UN	
1607	10	3UM								?/B	3+cb	3ylg	
1608	16	16097										1 2yr?/B	

[a] Age in 1989 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; cb, cub of year; ylg, yearling; 2-yr, 2-year-old; +, offspring first observed in subsequent year and therefore litter size may have been larger; D, dead; DLP, killed in defense of life or property.

[c] Siblings 1379 and 1381 were captured separately after weaning within 1321's home range and were sighted together once during the summer. We assume that the siblings were those recently weaned by 1321.

Table 3. Observed and projected minimum reproductive intervals for adult female grizzly bears in the northern Alaska Range, 1981-90.

Bear No.	Age when interval began	Minimum cycle length[a]	Annual reproductive status for adult females[b]										
			Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
1302	7	5	B?	B	B	C	Y	2/B					
1303	5	5	B	C/B	B	C	Y	2/B					
1305	22	3	W/B	C	Y	2/B/D							
1308	6	4,3	C?/B	B	C	Y	2/B	C	Y	2/B	C		
1311	10	5,3	W/B	C	B	C	Y	2/B	C	Y	2/B	C	
1318	12	7,3	W/B	C/B	B	B	C	Y	2	3/B	C	Y	2/B
1320	17	10	W/B	C/B?	B	C	B	C	Y/B?	B/D	C		
1321	14	4,3,5	W/B	C	Y	2	3/B	C	Y	2/B	C	B/D	C
1322	6	4	B	C	Y	2	3/B						
1323	11	3,6	W/B	C	Y	2/B	?	?/B	C	Y	2/B/D	3	
1324	5	3	B	C	Y	2/B	C						
1326	6	5	B	C/B?	B/D	C	Y	2/B					
1329	11	3	W/B	C	Y	2/D							
1331	7	5	B	C	Y/B	C	Y	2/B					
1333	14	4	W/B	C	Y	2	3/B/D						
1336	5	6	B	C	Y	B	C	Y	2/B				
1341	10	5,5	W/B	C	Y/B	C	Y	2/B	B	C/B	C/D	Y	2/B
1345	8	5	B	C	Y/B	C	Y	2	3/B	C			
1348	12	3,6	W/B	C	Y	2/B	C	Y/B	C/B	C	Y	2/B	
1351	12	4,3	W/B	C	Y	2	3/B	C	Y/D	2/B			
1352	13	3	W/B	C	Y	2/D							
1360	6	4	W/B	C	Y	2	3/D						
1362	6	3,4	B	C	Y	2/B	B	C	Y	2/B	C		
1374	4	3	B	C	Y	2/B	C	Y	2/B				
1376	14	4	W/B	C	Y	2	3?/D						
1398	5	3	B	C	Y	2/B	C						
1607	6[c]	3	B	C	Y	2/B							
1608	?	3	2?/B	C	Y	2/B							

Table 3. Continued.

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[a] All reproductive cycles or intervals were minimum values because they were partially based on projections prior to or after years when actual observations were made. In addition, all projected calculations assume weaning of young as 2-year-olds; however, in weanings which were observed, 5 of 11 females weaned offspring as 3-year-olds.

[b] Underlining indicates reproductive status was projected to allow minimum cycle length calculation; status which was observed is not underlined. Designations are: B, bred; W/B, weaned offspring, then bred; C/B, lost cubs, then bred; Y/B, lost yearling, then bred; C, with cubs; Y, with yearlings; 2, with 2-year-olds; 3, with 3-year-olds; D, died.

[c] Based on estimated age.

Table 4. Observed litter size and number of offspring in cub, yearling, 2-year-old, and 3-year-old age classes, Alaska Range, 1982-90.

Age class	Observed no. of litters									Total		Mean litter size
	1982	1983	1984	1985	1986	1987	1988	1989	1990	No. of litters	No. of offspring	
Cub												
litter size 1	1	1	0	1	0	0	0	1	0	4	4	
litter size 2	2	0	4	2	2	7	1	2	2	22	44	
litter size 3	0	0	2	2	0	0	2	0	4	10	30	
total	3	1	6	5	2	7	3	3	6	36	78	2.17
Yearling												
litter size 1	2	1	0	1	0	1	1	1	0	7	7	
litter size 2	2	2	0	3	2	2	5	1	0	18[a]	36[a]	
litter size 3	1	1	0	1	1	1	0	1	1	7	21	
total	5	4	0	5	3	4	6	3	1	32[a]	64[a]	2.00[a]
2-year-old												
litter size 1	0	2	0	0	1	0	0	0	1	4	4	
litter size 2	1	1	2	0	2	2	2	5	1	16	32	
litter size 3	0	1	1	0	1	0	0	0	1	4	12	
total	1	4	3	0	4	2	2	5	3	24	48	2.00
3-year-old												
litter size 1	0	0	1	0	0	0	0	0	0	1	1	
litter size 2	0	0	2	1	0	0	1	1	1	6	12	
litter size 3	0	0	0	1	0	0	0	0	0	1	3	
total	0	0	3	2	0	0	1	0	1	8	16	2.00

[a] One litter with 2 yearling offspring was first observed in 1981 and is included in these calculations.

Table 5. Annual number of breeding females, cubs produced, cub survival to weaning, and subsequent presence of offspring in the Alaska Range study area, 1981-91 (+ indicates minimum figures).

No. during given year	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Females bred during the previous year[a]	5+	6+	3+	9	9	5+	11+	5	5	9	4
Cubs produced	9	13+	1	14+	11	8+	18+	10+	8+	16	--
Cubs survived to weaning	6[b,c]	8[c]	0	8[b]	4	4[b]	10[c]	7	--	--	--
Cubs still in area 3 years later	6	2	0	3	3	3-4	4-8	--	--	--	--
Cubs still in area 5 years later	1	1	0	2	0-1	--	--	--	--	--	--
Offspring weaned during year	--	2+	1[c]	9[c]	4	8	2	4	12[c]	9	--

[a] If the reproductive status of females could not be established for the year subsequent to breeding, they were not included here.

[b] In 3 instances mortality of offspring was human-caused. During 1981, an unmarked yearling of female no. 1327 was not observed after a capture attempt and was assumed dead. During 1984, no. 1327 died from capture-related causes or was killed by another bear while recovering from immobilization; her 3 cubs were assumed dead as well. During September 1986 a hunter killed bear no. 1351; subsequent survival of her 3 yearlings is unlikely.

[c] The survival of 3 litters of 2-year-olds to weaning age was assumed, because most offspring are weaned at that age. During 1983, female no. 1329 was killed by an adult male prior to the time her 2-year-old, no. 1330, would normally have been weaned. Similarly, female no. 1352 was killed by a hunter during May 1984 before it was determined whether she had weaned her offspring. Bear no. 1323 was shot in self-defense by a hunter in August 1989; her 2 accompanying offspring would have been weaned as 3-year-olds.

Table 6. Mortality of grizzly bears in Alaska Range study area, 1981-90.

Bear No.[a]	Sex[b]	Age[c]	Date of initial 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	West Fork Little Delta	Hunter kill
UM	M	2	--	9/4/81	Wood River	Hunter kill
UM	F	2	--	9/6/81	Iowa Ridge	Hunter kill
UM	M	12	--	9/7/81	Wood River[d]	Hunter kill
UM	M	2	--	9/12/81	West Fork Little Delta	Hunter kill
UM	F	3	--	9/28/81	Wood River[d]	Hunter kill
UM	M	7	--	10/2/81	East Fork Little Delta	Hunter kill
UM	M	Unk	--	10/8/81	Wood River	Hunter kill
UM	F	5	--	10/9/81	Wood River[d]	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	West Fork Little Delta	Unk, offspring of 1318
UM	Unk	1	7/8/82	7/8/82	East Fork 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	East Fork Little Delta	Unk, offspring of 1327
UM	F	5	--	9/15/82	West Fork Little Delta	Hunter kill
UM	M	2	--	9/15/82	Dry Creek	Hunter kill
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	East Fork 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

Table 6. Continued.

Bear No.[a]	Sex[b]	Age[c]	Date of initial capture	Date of death	Location	Cause of death
1338	M	6	5/20/83	5/20/83	Molybdenum Ridge	Capture mortality
UM	F	5	--	5/24/83	West Fork Little Delta	Hunter kill
1347	M	6	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	West Fork Little Delta	Hunter kill
1356[e]	M	3	6/30/83	5/20/84	Gerstle River	Hunter kill
1333	F	18	7/12/82	5/22/84	East Fork Little Delta	Hunter kill
1352	F	15	6/27/83	5/30/84	West Fork Little Delta	Hunter kill
1327	F	18	7/8/82	6/23/84	East Fork Little Delta	Capture mortality?
3UM	Unk	Cub	--	6/23/84	East Fork Little Delta	Unk, offspring of 1327
UM	Unk	Cub	--	6/84	Wood River	Unk, offspring of 1345
UM	Unk	2	--	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	West Fork Little Delta	Hunter kill
UM	M	3	--	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 Creek	Defense of life or property kill
1335	F	3	7/13/82	9/14/84	East Fork Little Delta	Hunter kill
1309	M	10	5/25/82	9/15/84	Gold King	Hunter kill
UM	F	17	--	10/7/84	West Fork Little Delta	Hunter kill
3UM	Unk	Cub	--	5/85	Hayes Glacier	Unk, offspring of 1320
UM	Unk	1	--	5/12/85-5/15/86	Dry Creek	Unk, offspring of 1308
1360	F	10	5/28/85	5/28/85	Snow Mountain Gulch	Capture mortality

Table 6. Continued.

Bear No.[a]	Sex[b]	Age[c]	Date of initial capture	Date of death	Location	Cause of death
UM	Unk	Cub	--	5/23-6/5/85	Mystic Creek	Unk, offspring of 1303
UM	Unk	1	--	5/23-7/22/85	Upper Wood River	Unk, offspring of 1345
1364	M	Cub	--	6/14-24/85	Mystic Creek	Unk, offspring of 1303
UM	Unk	Cub	--	6/18-27/85	Buchanan Creek	Unk, offspring of 1326
1317	F	6	6/8/82	9/85	Wood River/Yanert River	Illegal kill?[g]
1355	M	5	6/30/83	9/13/85	Iowa Ridge	Hunter kill
1378	F	2	--	5/25/86	Delta Creek	Hunter kill, offspring of 1311
1326	F	8	6/18/82	5/27/86	O'Brien Creek	Hunter kill
1358	M	15	5/18/84	5/31/86	Delta Creek	Hunter kill
1368	F	2	5/19/86	5/31/86	Bonnifield Creek	Defense of life or property kill, offspring of 1348
1367	M	2	5/19/86	6/28/86	Bonnifield Creek	Defense of life or property kill, offspring of 1348
UM	M	3[f]	--	9/2/86	Wood River	Hunter kill
1373[e]	M	7	5/20/86	9/2/86	McGinnis Creek	Hunter kill
UM	M	2[f]	--	9/3/86	West Fork Little Delta	Hunter kill, offspring of 1308?
1371	M	2	5/20/86	9/7/86	Little Delta River	Hunter kill, offspring of 1341
1357[e]	M	4	5/15/84	9/23/86	Tatlanika River	Hunter kill, offspring of 1351
UM	Unk	1	--	fall 1986	Dry Creek	Unk, offspring of 1321
UM	Unk	1	--	5/20/87-7/3/87	East Hayes Creek	Unk, offspring of 1331
UM	Unk	Cub	--	7/3/87-8/30/87	Hayes Glacier	Unk, offspring of 1320
UM	M	3[f]	--	5/9/87	Slate Creek	Hunter kill, offspring of 1308?
1370	F	3	5/20/86	5/20/87	Buchanan Creek	Capture mortality, offspring of 1341

Table 6. Continued.

Bear No.[a]	Sex[b]	Age[c]	Date of initial capture	Date of death	Location	Cause of death
1349[e]	M	22	6/2/83	5/22/87	Coal Creek (Healy)	Hunter kill
1369[e]	M	3	5/19/86	6/26/87	Lignite	Defense of life or property kill, offspring of 1348
UM	F	2	--	9/2/87	Delta Creek	Hunter kill, offspring of 1374?
UM	M	2	--	9/2/87	Wood River	Hunter kill
UM	M	8	--	9/2/87	Wood River	Hunter kill
UM	M	17	--	9/7/87	Virginia Creek	Hunter kill
1381	M	2	5/21/87	9/8/87	Dry Creek	Hunter kill
1351	F	18	6/23/83	9/11/87	Slide Creek	Hunter kill
1334[e]	M	7	7/13/82	4/14/88	Tangle Lakes	Hunter kill
UM	Unk	1	--	Spring 1988	Hayes Glacier	Unk, offspring of 1320
UM	Unk	Cub	--	Spring 1988	Sheep Creek	Unk, offspring of 1321
UM	Unk	Cub	--	Spring 1988	East Fork Delta River	Unk, offspring of 1345
UM	Unk	Cub	--	Spring 1988	East Fork Delta River	Unk, offspring of 1345
UM	Unk	Cub	--	June 1988	Wood River	Unk, offspring of 1348
UM	Unk	Cub	--	June 1988	Wood River	Unk, offspring of 1348
UM	M	3[f]	--	9/7/88	South of Gold King	Hunter kill
1350	M	13	6/2/83	9/14/88	Dry Creek	Hunter kill
UM	Unk	Cub-ylg	--	8/30/88-5/12/89	Glacier Creek	Unk, offspring of 1321
UM	Unk	Cub-ylg	--	8/30/88-5/12/89	Glacier Creek	Unk, offspring of 1321
UM	Unk	Cub-ylg	--	8/30/88-5/10/89	Upper Wood River	Unk, offspring of 1336
UM	Unk	Cub-ylg	--	8/30/88-5/10/89	Upper Wood River	Unk, offspring of 1336
1384	M	7	5/15/88	4/23/89	Wood River	Hunter kill
UM	Unk	Cub	--	5/18/89-6/7/89	Wood River	Unk, offspring of 1348
M	Unk	Unk	--	7/89	St. George Creek	Illegal kill
UM	Unk	2[f]	--	/89	St. George Creek	Illegal kill
UM	M	3[f]	--	8/16/89	Gillam Glacier	Defense of life or property kill

Table 6. Continued.

Bear No.[a]	Sex[b]	Age[c]	Date of initial capture	Date of death	Location	Cause of death
1323	F	18	6/10/82	8/18/89	Gold King Creek	Defense of life or property kill
1321	F	23	6/9/82	9/1/89	Dry Creek	Hunter kill
1310[e]	M	20	5/25/82	9/1/89	Tangle Lakes, GMU 13	Hunter kill
UM	M	2[f]	--	9/1/89	West Fork Little Delta	Hunter kill
UM	M	3[f]	--	9/1/89	West Fork Little Delta	Hunter kill
1382	F	4	5/15/88	9/9/89	West Fork Little Delta	Hunter kill
1395[e]	M	2	5/17/89	9/9/89	Jumbo Dome	Hunter kill
1399[e]	M	2	5/18/89	9/9/89	Ruby Creek/Delta River	Hunter kill
UM	M	3[f]	--	9/15/89	Trident Glacier	Hunter kill
1337	M	26	5/18/83	9/16/89	Blair Lakes	Hunter kill
UM	M	4[f]	--	9/19/89	Coal Creek	Hunter kill
1320	F	24	6/8/82	8/10-30/89	Hayes Creek	Unknown
1341	F	16	5/23/83	6/9-8/30/89	Little Delta River	Unknown
1380	M	5	5/18/87	4/22/90	Nenana Glacier	Hunter kill
1376	F	18	6/13/86	5/5-15/90	Moly Ridge	Unk, scavenged by bear
1390	F	4	5/13/89	5/18/90	Kansas Creek	Hunter kill

[a] UM designates an unmarked bear; M, marked but unknown bear no.
[b] M, male; F, female; Unk, unknown sex.
[c] Age at death; Unk denotes unknown age.
[d] Hunter kills with location only listed as Wood River were counted in the study area.
[e] Killed outside study area.
[f] Estimate.
[g] Bear killed in September 1985, but not reported or sealed.

Appendix A. Physical attributes[a] of grizzly bears captured in the northcentral Alaska Range, 1981-90.

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	120	180	119	31	61	114	101	21.0	36.8	3.4	3.0
1302	5/19/81	F	3	75	165	102	26	55	100	90	16.7	30.5	3.0	2.7
	6/12/86	F	8	114	180	--	--	61	106	--	19.2	33.1	--	--
	5/12/89	F	11	109	161	--	--	59	103	--	19.1	33.5	--	--
1303	6/17/81	F	2	57	122	87	23	53	89	78	15.1	27.7	2.5	2.7
	6/27/83	F	4	82	159	97	26	55	91	79	18.4	32.3	3.0	2.9
	6/14/85	F	6	73	--	--	--	47	85	--	18.8	32.2	--	--
1304	6/19/81	M	5	136	196	121	30	63	108	109	20.0	36.0	3.9	3.5
	5/21/87	M	11	255	205	--	--	80	132	--	24.0	39.7	--	--
	6/7/89	M	13	245	217	--	--	77	147	--	26.0	39.2	--	--
1305	6/19/81	F	24	114	174	103	28	60	100	96	20.1	32.6	3.0b	3.3b
1306	5/24/82	M	2	44	131	85	26	44	73	76	15.1	29.6	2.7	2.8
1307	5/24/82	M	2	44	148	84	28	46	74	83	15.4	27.3	2.6	2.5
	6/17/85	M	5	114[d]	--	--	--	55	94	--	19.2	34.8	--	--
1308	5/25/82	F	6	111	186	103	32	63	100	101	20.2	33.1	3.0	2.2b
	6/20/84	F	8	120	--	--	--	64	116	--	20.8	34.1	--	--
	6/8/87	F	11	123	183	--	--	56	106	--	21.5	34.9	--	--
1309	5/25/82	M	8	318[d]	238	150	36	89	152	128	25.0	39.1	4.0	3.5
1310	5/25/82	M	13	250[d]	--	--	--	--	--	--	--	--	b	--
	6/20/84	M	15	255	--	--	--	74	129	--	24.6	39.3	--	--
	5/21/87	M	18	264	212	--	--	80	143	--	25.5	39.1	--	--
1311	5/26/82	F	12	120	190	107	30	63	113	105	21.8	33.8	3.0	2.6
	6/21/84	F	14	116	--	--	--	59	100	--	20.0	34.2	--	--
	6/8/87	F	17	123[d]	188	--	--	62	115	--	21.2	34.1	--	--
1312	5/26/82	F	cb	12	81	48	15	28	43	42	10.2	16.5	m	m
1313	5/26/82	F	cb	12	76	50	15	30	48	45	11.1	16.8	m	m
1314	5/27/82	M	6	116	191	114	33	61	105	99	18.5	34.8	3.6	3.3
1315	6/4/82	M	13	273	197	126	36	96	154	122	26.4	38.2	3.5	3.3
	5/17/84	M	15	295	--	--	--	97	139	--	26.8	37.5	--	--

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]
1316	6/7/82	M	11	236	211	133	33	81	133	135	24.0	40.7	3.8	3.7
1317	6/8/82	F	3	36	142	91	24	38	62	72	14.2	27.9	2.9	2.9
	5/16/84	F	5	55	--	--	--	45	89	--	16.2	29.7	--	--
	5/23/85	F	6	59	--	--	--	43	77	--	16.4	30.3	--	--
1318	6/8/82	F	13	104	188	113	31	57		113	19.5	33.5	3.1	2.8
	6/22/84	F	15	118[d]	--	--	--	59	105	--	19.8	33.5	--	--
	6/2/87	F	18	105[d]	--	--	--	--	--	--	--	--	--	--
1319	6/8/82	M	cb	12	85	52	14	26	34	44	10.8	17.2	d	d
1320	6/8/82	F	17	102	181	110	29	65	103	100	21.0	33.1	2.9w	2.7w
	6/25/84	F	19	139	--	--	--	62	106	--	21.0	33.0	--	--
	6/12/87	F	22	114	173	--	--	58	106	--	21.7	33.4	--	--
1321	6/9/82	F	16	141	199	107	34	69	105	115	22.1	35.8	3.5	3.1
	5/17/83	F	17	127	178	91	30	69	109	112	21.9	36.0	2.4b	3.2
	7/22/85	F	19	218	--	--	--	63	121	--	22.1	35.6	--	--
	6/6/89	F	23	170	199	--	--	71	125	--	22.0	35.9	--	--
1322	6/9/82	F	8	91	169	100	29	62	97	97	18.9	32.8	3.2	3.0
1323	6/10/82	F	11	95	171	106	32	57	98	93	20.0	33.5	3.2	2.9
	6/29/84	F	13	132	--	--	--	61	109	--	20.9	33.6	--	--
1324	6/10/82	F	cb	12	77	49	16	29	47	39	10.6	17.5	m	m
	5/26/88	F	6	111	158	--	--	63	109	--	18.8	34.0	--	--
1325	6/10/82	M	cb	12	86	54	15	26	48	42	11.5	18.0	m	m
	5/15/84	M	2	67	--	--	--	46	80	--	16.5	30.1	--	--
1326	6/18/82	F	4	93	172	102	27	54	88	98	17.9	31.4	3.1	2.9
	6/21/84	F	6	109	--	--	--	58	92	--	18.9	32.8	--	--
	6/27/85	F	7	111	--	--	--	52	95	--	20.1	33.3	--	--
1327	7/8/82	F	16	127	175	106	29	62	100	117	20.9	32.9	2.3	2.8
	6/23/84	F	18	125	--	--	--	61	109	--	21.0	33.5	--	--
1328	7/8/82	F	1	43	122	83	26	41	75	68	14.5	25.7	2.0	1.7
1329	7/9/82	F	13	120	186	112	30	59	106	104	19.8	34.2	3.3	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]
1330	7/9/82	M	1	48	130	83	27	45	75	67	14.4	26.2	1.4	1.8
	6/28/84	M	3	102	--	--	--	50	99	--	17.5	32.9	--	--
1331	7/10/82	F	4	77	161	102	28	50	96	98	17.0	30.5	--	--
	5/20/87	F	9	114[d]	175	--	--	56	104	--	19.8	33.4	--	--
	5/15/90	F	12	111	189	--	--	54	90	--	20.5	34.0	--	--
1332	7/12/82	F	5	104	173	100	32	54	92	97	18.0	33.4	3.1	2.9
1333	7/13/82	F	16	141	175	112	33	65	117	124	21.0	34.0	3.1	2.6
1334	7/13/82	M	1	49	129	86	27	42	87	72	14.4	24.9	1.3	1.6
	6/27/84	M	3	107	--	--	--	52	104	--	18.1	31.3	--	--
1335	7/13/82	F	1	38	127	77	24	40	76	73	13.5	24.0	1.6	1.8
	6/25/84	F	3	80	--	--	--	47	90	--	16.8	30.0	--	--
1336	5/16/83	F	2	47	141	86	27	56	90	86	14.9	28.2	2.6	2.4
	6/26/84	F	3	89	--	--	--	49	101	--	16.9	31.7	--	--
	6/17/85	F	4	102	--	--	--	61	102	--	18.3	33.3	--	--
	5/15/87	F	6	109	160	--	--	67	103	--	18.8	34.6	--	--
	5/17/89	F	8	145	175	--	--	67	133	--	21.2	33.2	--	--
1337	5/18/83	M	20	289	210	122	36	98	151	135	26.6	39.8	4.0b	b
	6/15/88	M	25	277	210	--	--	84	135	--	26.6	39.4	--	--
1338	5/20/83	M	6	111	175	89	29	35	107	101	19.9	34.8	3.5	3.4
1339	5/20/83	M	6	120	174	103	29	37	109	100	19.7	34.4	3.6	3.1
	5/17/84	M	7	168	--	--	--	60	102	--	20.0	35.0	--	--
1340	5/23/83	F	3	71	159	86	27	58	95	91	15.7	30.2	3.2	3.2
	5/19/84	F	4	91[d]	--	--	--	51	95	--	17.3	31.8	--	--
	6/27/85	F	5	100	--	--	--	54	94	--	18.5	33.6	--	--
1341	5/23/83	F	10	107	171	110	31	63	125	110	20.7	33.2	3.2	3.1
	6/13/85	F	12	107	--	--	--	57	104	--	--	--	--	--
	6/14/88	F	15	164	185	--	--	59	114	--	21.8	34.1	--	--
1342	5/24/83	M	2	49	133	85	27	52	91	67	15.6	27.2	2.5	2.8
1343	5/24/83	M	2	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	56	151	79	--	49	93	--	14.9	28.5	2.5	2.5
	6/23/84	M	3	123	--	--	--	55	105	--	18.5	33.2	--	--
1345	5/24/83	F	8	--	175	99	30	65	110	98	18.3	33.0	3.1	2.8
	5/23/85	F	10	105[d]	--	--	--	56	103	--	18.6	33.6	--	--
	5/13/89	F	14	118	165	--	--	65	105	--	19.6	33.2	--	--
1346	5/25/83	M	5	114	145	98	30	71	110	94	19.7	25.1	3.2	3.0
	5/14/90	M	12	--	213	--	--	88	141	--	26.0	39.1	--	--
1347	5/31/83	M	6	189	188	119	23	71	144	114	22.0	37.5	3.7	3.4
1348	5/31/83	F	12	--	175	107	20	72	123	110	20.0	37.6	3.2	2.9
	5/16/86	F	15	116	180	--	--	58	100	--	20.2	32.8	--	--
	5/12/90	F	19	141	191	--	--	57	112	--	21.0	33.3	--	--
1349	6/2/83	M	18	264	217	124	33	93	145	125	25.6	35.5	4.0b	3.4
1350	6/2/83	M	8	202	201	119	30	77	118	118	22.5	--	3.7	3.1
	6/12/86	M	11	205	207	--	--	76	--	--	23.7	38.2	--	--
1351	6/23/83	F	14	114[d]	181	91	23	69	114	116	21.0	38.0	3.3	3.2
	6/10/85	F	16	111	--	--	--	56	98	--	21.3	35.5	--	--
	5/19/87	F	18	130	178	--	--	64	110	--	22.0	35.5	--	--
1352	6/27/83	F	14	111	175	102	29	59	103	108	19.5	34.1	3.1	2.8
1353	6/27/83	M	1	27	107	75	20	34	54	56	12.4	21.9	r	r
1354	6/27/83	F	1	12	87	60	17	24	41	43	11.0	18.4	r	r
1355	6/30/83	M	3	60	138	98	27	45	77	77	15.2	27.5	--	--
	6/3/85	M	5	70	--	--	--	49	84	--	17.4	31.6	--	--
1356	6/30/83	M	2	50	--	--	24	46	69	--	14.9	25.2	--	--
1357	5/15/84	M	2	63	--	--	--	53	90	--	14.7	27.5	--	--
	6/24/85	M	3	93	--	--	--	50	88	--	18.5	31.1	--	--
1358	5/18/84	M	13	205[d]	--	--	--	86	--	--	--	38.4	--	--
	5/20/86	M	15	236	216	--	--	79	143	--	24.2	38.5	--	--
1359	5/28/85	M	3	61	--	--	--	44	--	--	14.4	29.1	--	--
1360	5/28/85	F	10	95	--	--	--	--	89	--	19.5	34.4	--	--

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]
1361	5/28/85	F	3	63	--	--	--	44	81	--	17.3	30.0	--	--
	5/19/86	F	4	100	155	--	--	51	100	--	18.6	32.1	--	--
1362	6/5/85	F	6	--	--	--	--	--	--	--	--	--	--	--
	6/24/85	F	6	114	--	--	--	55	98	--	19.2	33.1	--	--
	5/15/88	F	9	--	181	--	--	56	102	--	20.0	34.0	--	--
1363	6/5/85	M	3	55	128	--	--	50	86	--	16.0	28.3	--	--
1364	6/14/85	M	cb	7	69	--	--	20	37	--	9.8	15.6	--	--
1365	6/19/85	M	5	118	--	--	--	57	97	--	18.9	34.9	--	--
1366	7/22/85	M	8	234	--	--	--	83	130	--	23.2	36.3	--	--
1367	5/19/86	M	2	61	138	--	--	48	91	--	15.5	28.8	--	--
1368	5/19/86	F	2	48	140	--	--	51	82	--	15.0	27.0	--	--
1369	5/19/86	M	2	68	158	--	--	56	98	--	16.4	30.2	--	--
1370	5/20/86	F	2	47	136	--	--	41	81	--	14.9	25.5	--	--
	5/20/87	F	3	69	136	--	--	46	92	--	16.3	29.0	--	--
1371	5/20/86	M	2	57	150	--	--	51	83	--	16.5	28.2	--	--
1372	5/20/86	M	2	72	--	--	--	--	--	--	--	--	--	--
	5/17/89	M	5	186	186	--	--	84	118	--	23.3	37.5	--	--
1373	5/21/86	M	7	193	190	--	--	69	119	--	22.6	37.1	--	--
1374	5/21/86	F	6	106	171	--	--	64	99	--	19.8	35.2	--	--
	6/9/89	F	9	148	178	--	--	68	109	--	21.8	35.7	--	--
1375	6/13/86	M	6	186	208	--	--	67	117	--	21.0	36.6	--	--
	5/13/89	M	9	281	211	--	--	87	141	--	25.2	39.5	--	--
1376	6/13/86	F	14	130	171	--	--	64	103	--	21.8	34.2	--	--
1377	8/28/86	M	3[d]	132	174	--	--	58	98	--	17.3	31.6	--	--
1378	5/20/86	F	2	130[d]	--	--	--	--	--	--	--	--	--	--
1379	5/15/87	F	2	67	--	--	--	52	96	--	15.4	27.3	--	--
	6/6/89	F	4	105	156	--	--	63	99	--	19.4	33.5	--	--
1380	5/18/87	M	2	65	153	--	--	49	84	--	16.6	30.3	--	--
	5/17/88	M	3	109	178	--	--	50	92	--	17.5	33.5	--	--

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]
1381	5/21/87	M	2	73	158	--	--	45	83	--	16.3	29.6	--	--
1382	5/14/88	F	3	68	154	--	--	46	83	--	16.2	30.3	--	--
	6/7/89	F	4[e]	84	174	--	--	49	89	--	17.8	31.9	--	--
1383	6/12/87	M	2[d]	77	146	--	--	52	88	--	17.4	30.9	--	--
1384	5/15/88	M	7[d]	191	198	--	--	83	116	--	24.5	39.8	--	--
1385	5/15/88	F	2	68	142	--	--	50	76	--	15.5	27.4	--	--
	5/13/89	F	3	82	140	--	--	50	92	--	17.2	30.8	--	--
	5/11/90	F	4	95	178	--	--	50	85	--	18.3	32.1	--	--
1386	5/15/88	M	2	73	146	--	--	45	75	--	16.0	29.1	--	--
	5/13/89	M	3	91	162	--	--	49	88	--	17.7	32.5	--	--
	6/07/90	M	4	120	183	--	--	61	99	--	19.0	35.2	--	--
1387	5/23/88	F	2	55	129	--	--	58	79	--	15.8	27.5	--	--
	5/12/89	F	3	77	137	--	--	49	83	--	16.5	28.8	--	--
	5/15/90	F	4	84	166	--	--	49	87	--	17.3	31.7	--	--
1388	5/25/88	M	2	68	148	--	--	50	93	--	16.3	29.0	--	--
1389	5/13/89	M	3	84	157	--	--	53	88	--	17.6	33.1	--	--
1390	5/13/89	F	3	77	148	--	--	50	83	--	16.2	30.0	--	--
1391	5/13/89	F	2	68	139	--	--	50	83	--	16.1	29.4	--	--
	5/12/90	F	3	95	171	--	--	52	97	--	18.5	31.5	--	--
1392	5/13/89	M	2	89	145	--	--	55	86	--	17.1	31.0	--	--
1393	5/17/89	M	2	66	150	--	--	51	85	--	17.0	28.7	--	--
	5/24/90	M	3	100	169	--	--	52	92	--	18.3	31.5	--	--
1394	5/17/89	F	2	59	144	--	--	49	83	--	16.1	26.2	--	--
1395	5/17/89	M	2	86	159	--	--	63	103	--	18.5	30.7	--	--
1396	5/18/89	M	13[d]	295	206	--	--	91	163	--	25.0	38.1	--	--
1397	5/18/89	F	2	61	142	--	--	45	76	--	15.4	26.8	--	--
1398	5/18/89	F	8[d]	127	188	--	--	67	104	--	20.2	33.1	--	--
1399	5/18/89	M	2	66	157	--	--	50	78	--	15.3	27.0	--	--
1400	6/8/89	M	8[d]	239	208	--	--	88	--	--	23.8	39.5	--	--

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]
1601	6/9/89	M	7[d]	193	193	--	--	88	135	--	23.2	38.2	--	--
1602	5/13/90	M	7[d]	166	198	--	--	69	110	--	21.3	35.8	--	--
1603	5/13/90	F	2[d]	55	150	--	--	42	73	--	16.3	28.1	--	--
1604	5/13/90	F	2	48	141	--	--	42	69	--	14.5	26.6	--	--
1605	5/13/90	F	2	59	140	--	--	43	76	--	15.3	26.7	--	--
1606	5/13/90	M	2	50	135	--	--	43	68	--	14.7	27.4	--	--
1607	5/14/90	F	10[d]	141	198	--	--	--	107	--	21.6	36.8	--	--
1608	5/14/90	F	16[d]	136	189	--	--	68	111	--	22.5	35.3	--	--
1609	5/14/90	F	2[d]	61	145	--	--	56	84	--	15.7	27.5	--	--

[a] Weights in kg and measurements in cm; head measurements made using calipers, all others were with a steel tape.

[b] Age determined by cementum layering; cubs of the year are designated as cb.

[c] Designations of tooth characteristics: b=broken, w=heavily worn; r=erupting; m=deciduous milk teeth.

[d] Estimate after close examination.

Appendix B. Grizzly bear captures, recaptures, and capture-related mortalities, Alaska Range, 1981-90.

Year	Bear No.		Total no. captured during year	Cumulative no. total captures	Capture mortalities			
	New captures	Recaptures			Yearly total	Bear No.	Percentage Year	Percentage Cumulative
1981	1301-1305		5	5	1	1301	20	20
1982	1306-1335		31a	36a	1	UM yrlg[a]	3	6
1983	1336-1356	1303, 1321	23	59	2	1338, 1347	9	7
1984	1357, 1358	1308, 1310, 1311, 1315, 1317, 1318, 1320, 1323, 1325, 1326, 1327, 1330, 1334, 1335, 1336, 1339, 1340, 1344	20	79	2(5)	1315, 1327[b], 3UM[b]	10	8
1985	1359-1366	1303, 1307, 1317, 1321, 1326, 1336, 1340, 1341, 1345, 1351, 1355, 1357	20	99	1	1360	5	7
1986	1367-1378	1302, 1348, 1350, 1358, 1361	16	115	0	--	0	6

Appendix B. Continued.

Year	Bear No.		Total no. captured during year	Cumulative no. total captures	Capture mortalities			
	New captures	Recaptures			Yearly total	Bear No.	Percentage	
							Year	Cumulative
1987	1379-1383	1304, 1308, 1310, 1311, 1318, 1320, 1331, 1336, 1351	13	128	1	1370	8	6
1988	1382, 1384-1388	1324, 1337, 1341, 1362, 1380	11	139	0	--	0	6
1989	1389-1400, 1601	1302, 1304, 1321, 1336, 1345, 1372, 1374, 1375, 1379, 1382, 1385, 1386, 1387	26	165	0	--	0	5
1990	1602-1609	1331, 1346, 1348, 1385, 1386, 1387, 1391, 1393	16	181	0	--	0	4

[a] One unmarked (UM) yearling of female No. 1327 was not located after it was darted during a capture attempt and was assumed to have died.

[b] No. 1327 was found dead at the capture site and may have been killed by another bear before she recovered from immobilization drugs. We assume that her 3 cubs died without her care.

Appendix C. Current status of marked bears in the northcentral Alaska Range, spring 1990.

Bear No.	Sex	Initial capture Age	Initial capture Date	Date last location	Status as of spring 1990
1301	M	6	5/18/81	5/18/81	Dead, capture mortality
1302	F	3	5/19/81	6/7/90	Alive, functional collar; bred
1303	F	2	6/17/81	7/22/85	Unk, shed collar by 12/3/85
1304	M	5	6/19/81	6/7/89	Alive, removed collar
1305	F	24	6/19/81	9/15/82	Dead, hunter kill
1306	M	2	5/24/82	5/20/84	Dead, hunter kill
1307	M	2	5/24/82	6/13/86	Unk, probably alive, shed collar?
1308	F	6	5/25/82	6/7/90	Alive, functional collar; with cubs
1309	M	8	5/25/82	9/15/84	Dead, hunter kill
1310	M	13	5/25/82	9/1/89	Dead, hunter kill
1311	F	12	5/26/82	6/7/90	Alive, functional collar; with cubs
1312	F	Cub	5/26/82	8/5/82	Dead, disappeared between 8/5 and 8/27/82
1313	F	Cub	5/26/82	8/5/82	Dead, disappeared between 8/5 and 8/27/82
1314	M	6	5/27/82	9/15/82	Dead, hunter kill
1315	M	13	6/4/82	5/17/84	Dead, capture mortality
1316	M	11	6/7/82	7/12/82	Unk, shed collar between 7/12 and 8/4/82
1317	F	3	6/8/82	7/22/85	Probable illegal kill
1318	F	13	6/8/82	8/10/89	Unk, shed collar; seen by hunters? 5/90
1319	M	Cub	6/8/82	6/18/82	Dead, disappeared between 6/18 and 7/2/82
1320	F	17	6/8/82	8/30/89	Dead, Unk cause between 8/10 and 8/30/89
1321	F	16	6/8/82	9/1/89	Dead, hunter kill
1322	F	8	6/9/82	4/27/84	Unk, probably alive, collar nonfunctional
1323	F	11	6/10/82	8/18/89	Dead, killed in defense of life or property
1324	F	Cub	6/10/82	6/6/90	Alive, collar functional; with cubs
1325	M	Cub	6/10/82	9/9/84	Dead, killed in defense of life or property
1326	F	4	6/18/82	5/27/86	Dead, hunter kill
1327	F	16	7/8/82	6/23/84	Dead, capture-related mortality
1328	F	1	7/8/82	8/27/82	Dead, disappeared between 8/27 and 9/23/82
1329	F	13	7/9/82	5/15/83	Dead, killed and eaten by bear No. 1315M
1330	M	1	7/9/82	8/14/84	Unk, probably emigrated
1331	F	4	7/10/82	5/15/90	Alive, collar functional; bred
1332	F	5	7/12/82	10/31/82	Dead, died in den, winter 82/83
1333	F	16	7/12/82	5/22/84	Dead, hunter kill
1334	M	1	7/13/82	4/14/88	Dead, hunter kill
1335	F	1	7/13/82	9/14/84	Dead, hunter kill
1336	F	2	5/16/83	6/7/90	Alive, functional collar; with cubs
1337	M	20	5/18/83	9/1/89	Dead, hunter kill
1338	M	6	5/20/83	5/20/83	5/20/83 Dead, capture mortality
1339	M	6	5/20/83	6/4/84	Unk, shed collar between 6/4 and 9/10/84
1340	F	3	5/23/83	6/27/85	Unk, collar shed between 6/27/85 and 4/28/86
1341	F	10	5/23/83	8/30/89	Dead, Unk cause, Fall 1989
1342	M	2	5/24/83	6/27/83	Dead, illegal kill, snared fall 1983
1343	M	2	5/24/83	5/15/84	Unk, collar nonfunctional or emigrated?

Appendix C. Continued.

Bear No.	Sex	Initial capture Age	Initial capture Date	Date last location	Status as of spring 1990
1344	M	2	5/24/83	9/7/84	Dead, hunter kill
1345	F	8	5/24/83	6/7/90	Alive, functional collar; with cubs
1346	M	5	5/25/83	5/15/90	Alive, functional collar
1347	M	6	5/31/83	5/31/83	Dead, capture mortality
1348	F	12	5/31/83	6/6/90	Alive, functional collar; with cubs
1349	M	18	6/2/83	5/22/87	Dead, hunter kill
1350	M	8	6/2/83	9/14/88	Dead, hunter kill
1351	F	14	6/23/83	9/11/87	Dead, hunter kill
1352	F	14	6/27/83	5/30/84	Dead, hunter kill
1353	M	1	6/27/83	9/4/84	Dead, hunter kill
1354	F	1	6/27/83	5/18/84	Unk, never radio-collared, assumed dead
1355	M	3	6/30/83	9/13/85	Dead, hunter kill
1356	M	2	6/30/83	5/20/84	Dead, hunter kill
1357	M	2	5/15/84	9/23/86	Dead, hunter kill
1358	M	12	5/18/84	5/31/86	Dead, hunter kill
1359	M	3	5/28/85	11/6/86	Unk, shed collar between 4/28/86 and 11/6/86
1360	F	10	5/28/85	5/28/85	Dead, capture mortality
1361	F	3	5/28/85	11/6/86	Unk, shed collar in den
1362	F	6	6/5/85	5/18/89	Unk, collar nonfuctional
1363	M	3	6/5/85	4/28/86	Unk, shed collar between 4/28/86 and 5/16/86
1364	M	Cub	6/14/85	6/14/85	Dead, disappeared between 6/14/85 and 6/24/85
1365	M	5	6/19/85	7/28/86	Unk, not located in 1988-89
1366	M	8	7/22/85	12/3/85	Unk, shed collar
1367	M	2	5/19/86	6/28/86	Dead, killed in defense of life or property
1368	F	2	5/19/86	5/31/86	Dead, killed in defense of life or property
1369	M	2	5/19/86	6/26/87	Dead, killed in defense of life or property
1370	F	2	5/20/86	5/20/87	Dead, capture mortality
1371	M	2	5/20/86	9/7/86	Dead, hunter kill
1372	M	2	5/20/86	6/8/89	Unk, shed collar 1989
1373	M	7	5/21/86	9/2/86	Dead, hunter kill
1374	F	6	5/21/86	5/13/90	Alive, functional collar; bred
1375	M	6	6/13/86	8/10/89	Unk, shed collar
1376	F	14	6/13/86	8/10/88	Dead, between 5/5/90 and 5/15/90
1377	M	3[a]	8/28/86	3/25/87	Unk, shed collar between 3/25/87 and 8/30/87
1378	F	2	6/20/86	6/20/86	Dead, hunter kill
1379	F	2	5/15/87	8/30/89	Unk, shed collar
1380	M	2	5/18/87	8/30/88	Dead, hunter kill 4/22/90
1381	M	2	5/21/87	9/8/87	Dead, hunter kill
1382	F	3	5/15/88	9/9/89	Dead, hunter kill
1383	M	2	6/12/87	9/19/87	Unk, shed collar between 9/19/87 and 4/18/88
1384	M	7[a]	5/15/88	4/23/89	Dead, hunter kill
1385	F	2	5/15/88	6/7/90	Alive, functional collar
1386	M	2	5/15/88	6/7/90	Alive, functional collar

Appendix C. Continued.

Bear No.	Sex	Initial capture Age	Initial capture Date	Date last location	Status as of spring 1990
1387	F	2	5/23/88	6/6/90	Alive, functional collar
1388	M	2	5/25/88	8/30/88	Unk, shed collar
1389	M	3	5/13/89	7/89	Unk, shed collar Yanert
1390	F	3	5/13/89	8/30/89	Dead, hunter kill 5/18/90
1391	F	2	5/13/89	6/7/90	Alive, functional collar
1392	M	2	5/13/89	8/10/89	Unk, shed collar
1393	M	2	5/17/89	5/13/90	Alive, functional collar
1394	F	2	5/17/89	8/10/89	Unk, nonfunctional collar?
1395	M	2	5/17/89	9/9/89	Dead, hunter kill
1396	M	13[a]	5/18/89	8/30/89	Unk, shed collar
1397	F	2	5/18/89	8/30/89	Unknown
1398	F	8[a]	5/18/89	8/30/89	Unknown
1399	M	2	5/18/89	9/9/89	Dead, hunter kill
1400	M	8[a]	6/8/89	8/30/89	Unknown
1601	M	7[a]	6/9/89	6/9/89	Unknown
1602	M	7[a]	5/13/90	5/13/90	Alive, functional collar
1603	F	2[a]	5/13/90	5/13/90	Alive, functional collar
1604	F	2	5/13/90	5/13/90	Alive, functional collar
1605	F	2	5/13/90	5/13/90	Alive, functional collar
1606	M	2	5/13/90	5/13/90	Alive, functional collar
1607	F	10[a]	5/14/90	6/6/90	Alive, functional collar; with yearlings
1608	F	16[a]	5/14/90	5/14/90	Alive, functional collar
1609	F	2[a]	5/14/90	5/14/90	Alive, functional collar

[a] Estimate.

Appendix D. Status summary of marked bears in the northcentral Alaska Range, spring 1990.

Dead		Alive, active collar	Shed or nonfunctional collar unknown status		
			Alive in the area?	Dispersed? or dead?	Never collared, dead?
1301	1368	1302	1303	1316	1354
1305	1369	1308	1304	1330	
1306	1370	1311	1307	1339	
1309	1371	1324	1318	1343	
1310	1373	1331	1322	1359	
1312	1376	1336	1340	1363	
1313	1378	1345	1361	1365	
1314	1380	1346	1362	1366[a]	
1315	1381	1348	1372	1389	
1317	1382	1374[a]	1375	1397	
1319	1384	1379	1377		
1320	1390	1385	1383		
1321	1395	1386	1388		
1323	1399	1387	1396		
1325		1391	1398		
1326		1392	1400		
1327		1393	1601		
1328		1394			
1329		1602[a]			
1332		1603			
1333		1604			
1334		1605			
1335		1606			
1337		1607			
1338		1608			
1341		1609			
1342					
1344					
1347					
1349					
1350					
1351					
1352					
1353					
1355					
1356					
1357					
1358					
1360					
1364					
1367					

[a] Captured outside study area.

Appendix E. Status of maternal grizzly bears and their offspring in the northcentral Alaska Range, 1981-90.

Maternal female			Offspring			
Bear No.	Age at capture (yrs)	Present status	Bear No. and sex	Year of birth	Age at weaning (yrs)	Present status
1302	3	Alive	1604 F	1988	2	Weaned 1990
			1605 F	1988	2	Weaned 1990
			1606 M	1988	2	Weaned 1990
1303	2	Last observed 1985	1364 M	1985	--	Assumed dead 1985
			UM	1985	--	Assumed dead 1985
1305	24	Hunter kill 1982	1306 M	1980	2	Hunter kill 1984
			1307 M	1980	2	Last observed 1986
1308	6	Alive	UM	1984	--	Assumed dead 1985
			UM	1984	2	Probable hunter kill 1986
			1391 F	1987	2	Weaned 1989
			1392 M	1987	2	Weaned 1989
			UM	1990		With mother 1990
			UM	1990		With mother 1990
			UM	1990		With mother 1990
1311	12	Alive	1312 F	1982	--	Assumed dead 1982
			1313 F	1982	--	Assumed dead 1982
			1372 M	1984	2	Last observed 1989
			1378 F	1984	2	Hunter kill 1986
			UM	1987	2	Hunter kill 1989?
			1395	1987	2	Hunter kill 1989
1318	13	Alive?	1319 M	1982	--	Assumed dead 1982
			1380 M	1985	--	Hunter kill 1990
			1382 F	1985	--	Hunter kill 1989
			UM	1989	--	With mother 1990?
			UM	1989	--	With mother 1990?
1320	17	Dead 1989	UM	1983	--	Assumed dead 1983
			UM	1985	--	Assumed dead 1985
			UM	1985	--	Assumed dead 1985
			UM	1985	--	Assumed dead 1985
			UM	1987	--	Assumed dead 1987
			UM	1987	--	Assumed dead 1987
1321	16	Hunter kill 1989	1342 M	1981	--	Illegal kill 1983
			1343 M	1981	3	Last observed 1984
			1344 M	1981	3	Hunter kill 1984
			UM	1985	--	Assumed dead 1986
			1379 F	1985	2	Last observed 1989
			1381 M	1985	2	Hunter kill 1987
			UM	1988	--	Assumed dead 1988
			UM	1988	--	Assumed dead 1988-89
			UM	1988	--	Assumed dead 1988-89
1322	8	Last observed 1984	1336 F	1981	3	Had cubs 1987, 1990

Appendix E. Continued.

Maternal female			Offspring			
Bear No.	Age at capture (yrs)	Present status	Bear No. and sex	Year of birth	Age at weaning (yrs)	Present status
1323	11	Hunter kill 1989	1324 F	1982	2	Had cubs 1987, 1990
			1325 M	1982	2	Killed DLP[b] 1984
			UM	1987	--	With mother 1989
			UM	1987	--	With mother 1989
1324	0	Alive	?1389 M	1987	2	Last observed 1989
			?1390 F	1987	2	Hunter kill 1990
			UM	1990		With mother 1990
			UM	1990		With mother 1990
1326	4	Hunter kill 1986	UM	1985	--	Assumed dead 1985
1327	16	Dead 1984	1328 F	1981	--	Assumed dead 1982
			UM	1981	--	Capture death 1982
			UM	1984	--	Assumed dead 1984
			UM	1984	--	Assumed dead 1984
			UM	1984	--	Assumed dead 1984
1329	13	Dead 1983	1330 M	1981	2[c]	Last observed 1984
1331	4	Alive	UM	1986	--	Assumed dead 1987
			?1603F	1988	--	Weaned 1990
1333	16	Hunter kill 1984	1334 M	1981	3	Hunter kill 1988
			1335 F	1981	3	Hunter kill 1984
1336	2	Alive	UM	1987	--	Assumed dead 1988
			UM	1987	--	Assumed dead 1988
			UM	1990		With mother 1990
			UM	1990		With mother 1990
			UM	1990		With mother 1990
1341	10	Dead 1989	UM	1982	--	Assumed dead 1983
			1370 F	1984	2	Capture death 1987
			1371 M	1984	2	Hunter kill 1986
			UM	1988	--	Assumed dead 1988
			UM	1988	--	Assumed dead 1988
			UM	1989	--	Assumed dead 1989
			UM	1989	--	Assumed dead 1989
1345	8	Alive	UM	1984	--	Assumed dead 1984
			UM	1984	--	Assumed dead 1985
			1385 F	1986	3	Weaned 1989
			1386 M	1986	3	Weaned 1989
			UM	1990		With mother 1990
			UM	1990		With mother 1990
			UM	1990		With mother 1990
1348	12	Alive	1367 M	1984	2	Killed DLP 1986
			1368 F	1984	2	Killed DLP 1986
			1369 M	1984	2	Killed DLP 1987
			UM	1987	--	Assumed dead 1988
			UM	1987	--	Assumed dead 1988
			UM	1989	--	Assumed dead 1989

Appendix E. Continued.

Maternal female			Offspring			
Bear No.	Age at capture (yrs)	Present status	Bear No. and sex	Year of birth	Age at weaning (yrs)	Present status
			UM	1990		With mother 1990
			UM	1990		With mother 1990
			UM	1990		With mother 1990
1351	14	Hunter kill 1987	UM	1982	--	Assumed dead 1984
			1357 M	1982	3	Hunter kill 1986
			1361 F	1982	3	Last observed 1986
			UM	1986	1[d]	Unk, 1987[d]
			UM	1986	1[d]	Unk, 1987[d]
			UM	1986	1[d]	Unk, 1987[d]
1352	14	Hunter kill 1984	1353 M	1982	--	Hunter kill 1984
			1354 F	1982	--	Assumed dead 1984
1360	11	Dead 1985	1359 M	1982	--	Last observed 1986
			1363 M	1982	--	Last observed 1986
1362	6	Alive	1387 F	1986	2	Alive 1990
			1388 M	1986	2	Last observed 1988
1374	6	Alive	UM	1985	2?	Weaned 1987?
			UM	1985	2?	Weaned 1987?
			UM	1988	2	Weaned 1990
			UM	1988	2	Weaned 1990
1376	23[e]	Dead May 1990	UM	1987	3?	Weaned 1990?
			UM	1987	3?	Weaned 1990?
1398	8[e]	Alive	1397 F	1987	2	Weaned 1989
			1399 M	1987	2	Hunter kill 1989
1607	10[e]	Alive	UM	1989	--	With mother 1990
			UM	1989	--	With mother 1990
			UM	1989	--	With mother 1990
1608	16[e]	Alive	?1609F	1988	2	Weaned 1990

[a] UM denotes unmarked.

[b] Killed legally in defense of life or property.

[c] Orphaned when 1329 was killed and eaten by adult male 1315.

[d] Unknown, orphaned when 1351 was killed by hunter fall 1987.

[e] Estimate.