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

By
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Volume II

Progress Report
Federal Aid in Wildlife Restoration
Project W-22-1, Job 4.16R

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PROGRESS REPORT (RESEARCH)

State: Alaska

Cooperator: U.S. Army, Fort Wainwright, Alaska

Project No.: W-22-1 Project Title: Big Game Investigations

Job No.: 4.16R Job Title: Population Structure, Reproductive Biology, and Movement Patterns of Grizzly Bears in the Northcentral Alaska Range

Period Covered: July 1, 1981 through June 30, 1982

SUMMARY

In 1981-82, the 1st phase of a study was begun to determine the status and reproductive biology of a grizzly bear (Ursus arctos) population in the northcentral Alaska Range. During this period, 35 bears were captured and 29 were radio-collared; captured bears included 13 males and 22 females. Estimated population density for the study area was 1 bear/52 km^2. Initial analysis of the structure of the population showed that few mature males were present, possibly the result of hunting pressure. Evidence suggests that females have a potentially long reproductive life span; at least some produce their 1st litters at about age 6 and a 25.5-year-old female weaned her 2.5-year-old offspring and bred. Based on 10 litters, including those of both cubs and yearlings, mean litter size was 1.7. All measures of population biology which were calculated should be considered tentative and contingent upon the collection of additional data.

In 1982, 11 mortalities were recorded in the study area: 6 hunter kills, 4 offspring of marked females, and 1 unmarked yearling which was not seen after the capture attempt and was presumed dead. Historical sport hunting records of grizzly bears in the study area during 1961-82 are reported. Analysis of the effects of present harvest on the population will await determination of population structure and reproductive biology.

The extent of movement and sizes of home range were apparently dependent upon sex and age of individuals. In general, adult males made the greatest movements and had the largest home range sizes. Measurements for other bears, in order of decreasing size, were as follows: breeding females, females with offspring, and young age bears (both males and females).

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 also 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 most susceptible of the large mammals to these changes.

Few research studies have addressed aspects of grizzly bear biology which are necessary to answer problems of increased exploitation and loss of habitat. Specifically, no population 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), 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.

To assess the impacts of changes in user pressure or changes in availability of habitat, it is first necessary to know bear population status. Past management decisions have been 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. Even though use of these data as a basis for past management has been adequate in many cases, more precise information is needed as management becomes more intensive. Management strategies for any area must consider the relative numbers of, and relationships between, wildlife species. Management goals for grizzly bears may require increasing, decreasing, or maintaining populations to reach desired densities that are compatible with 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 of harvest: population density and structure, movement and home range patterns, mortality and survival rates, and reproductive capacity including age at 1st breeding, litter size, and interval between litters (Craighead et al. 1974, Reynolds 1978, Bunnell and Tait 1980).

OBJECTIVE

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

PROCEDURES

The 3,900-km^2 (1,500-mi^2) study area is located in the mountains and foothills of the northcentral Alaska Range (Fig. 1). Its boundaries are the Wood River and Gold King Creek drainages 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 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 in the area 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 to about 1,200 m (4,000 ft).

Capture procedures followed standard helicopter immobilization techniques used on grizzly bears in the Brooks Range (Reynolds

1974, 1976, 1978). Bell 206B and Hughes 500D helicopters were used in 1981, and U.S. Army UH-1 (Bell 205) helicopters were used in 1982. In the area's precipitous terrain, the Hughes helicopter was preferred due to its maneuverability and climbing power. Although the U.S. Army UH-1 helicopter was not as maneuverable as the smaller helicopters, it surpassed them in power, climbing ability, and hauling capacity. Bears were immobilized with Sernylan (100 mg phencyclidine hydrochloride/ml; Bio-Ceutic Laboratories, St. Joseph, Mo.) and acepromazine maleate (10 mg/ml; Ayerst Labs, New York, N.Y.) injected into the rump using Cap-Chur equipment (Palmer Chemical and Equipment Co., Douglasville, Ga.). All animals were measured, weighed (Appendix A), tattooed for permanent identification, ear-tagged, and marked with individually coded visual ear flags as described by Reynolds (1974). In addition, except those offspring under maternal care, all bears captured were fitted with radio collars (Telonics, Inc., Mesa, Ariz.).

A 1st premolar tooth was extracted for determination of age based on cementum layering (Mundy and Fuller 1964, Stoneburg and Jonkel 1966, Craighead et al. 1970). The techniques used to section, stain, and mount teeth for age determination were described by Glenn (1972). Whole blood was collected from femoral arteries using 10-cc Vacutainers (Bection-Dickinson, Rutherford, N.J.). Blood and 1 g muscle samples were collected for blood chemistry and physical condition studies being conducted by Robert Brannon, University of Alaska, as master's degree research. Saliva swabs were collected for identification of aerobic and anaerobic bacteria present in bear mouths. Richard G. Parry, M.D., of the Eye, Ear, Nose, and Throat Clinic in Fairbanks is analyzing the results from these collections to facilitate treatment of bear attacks on humans. Fecal samples were collected to aid in determining seasonal food habits.

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

Radio-collared bears were relocated using a Piper PA-18 Super Cub equipped with a radio receiver-scanner and 4-element, high-gain Yagi antennas. Movements and home range sizes were determined from resightings of marked grizzlies during aerial surveys and from relocating animals fitted with radio transmitters. Home ranges were determined using the minimum home range polygon (Craighead and Craighead 1972; Pearson 1975, 1976; Craighead 1976). In this method, the outermost observation sites plotted on maps for each bear are connected to form a convex polygon; the enclosed area is measured to calculate home range.

A tentative population estimate was made using the direct count method (Reynolds 1974, 1976, 1978; Pearson 1976) and will be

compared with results from a Lincoln Index estimate (Overton 1971).

After the grizzly bear population size, status, structure, and movement patterns have been determined, the effects of different harvest rates will be examined. Hunting pressure will be increased by regulatory changes or by directing hunting effort to the area using the news media and contact with hunters at Alaska Department of Fish and Game offices. Changes in population size and productivity will be monitored and analyzed following a period of increased harvest rate.

RESULTS AND DISCUSSION

Bears Captured and Radio-collared

In the study area, 35 bears were captured, 5 in 1981 and 30 in 1982 (Table 1). Radio collars were placed on 29 bears, 4 were placed on young-age males (<5.5 years), 7 on adult males (>6.5 years), 8 on young-age females, and 10 on adult females. In 2 cases, collars were placed on all members of family groups: No. 1329 and her single yearling, No. 1330, and No. 1333 and her 2 yearlings, Nos. 1334 and 1335. Twenty-three collars were still functioning in fall 1982. Bear No. 1301 died of capture-related causes, 2 bears (Nos. 1305 and 1314) were shot by hunters, and 3 bears (Nos. 1302, 1316, and 1321) shed their collars.

Population Density

In early May 1982, the study area contained a minimum of 46 grizzly bears. These included the 34 marked bears which were alive in spring 1982 and 12 unmarked individuals which were either observed during 1982 capture operations or later killed by hunters. Of the unmarked bears, 8 were observed during capture operations, including 5 offspring of marked females, 1 adult female, her 1 cub of the year, and 1 breeding male accompanied by a marked female. Hunters killed 6 bears in 1982 (1 in May, 5 in September), but 2 of those were marked. Therefore, the minimum density of bears in the study area prior to hunting seasons in 1982 was 1 bear/85 km^2 (1/32 mi^2). However, the probable number of bears in the area is 70-80 (a density of 1 bear/49-56 km^2 or 1/19-21 mi^2), based on the estimated number of bears which utilize major drainages in the area but which were not observed during the capture period. Subsequent capture and observation of bears in the area will result in more accurate density measures. This tentative estimate is similar to, but lower than, the density of 1 bear/41 km^2 reported south of the Alaska Range in the Nelchina Basin of the upper Susitna River by Miller and Ballard (1982).

Population Structure

Of the 35 bears for which sex was known, 13 (37%) were males and 22 (63%) females. Six males were offspring (0.5-2.5 years of age) and 7 were adults (>6.5 years of age). The female component of the population consisted of 5 offspring, 6 young age (3.5-5.5 years of age), and 11 adults (Table 2). Whether this sex and age structure is representative of the population cannot be established without additional data. If biases did not strongly affect the sex or age proportions of bears captured, 3 patterns are evident: there are fewer males than females, no males are present beyond age 13.5, and there are fewer males in the young-age class (3.5-5.5 years) than females.

The fact that fewer males than females were captured probably reflects their relative presence in the population. Similar ratios of males:females have been recorded in populations subject to little sport hunting in Wyoming (Craighead et al. 1974) and northern Alaska (Reynolds 1980). The Alaska Range population is hunted and most bears harvested are males, so the sex ratio of the population should favor females. Males composed 68% of the bear harvest from 1961-81 in Game Management Unit 20, which includes the study area. Large adult males are very vulnerable to sport hunting (Bunnell and Tait 1980, Stringham 1980), so few survive past age 13-15 years. Reasons that no young-age males were captured are unknown. It could be due to the small sample size.

Reproductive Biology

Assessment of the reproductive potential of females requires data on ages at 1st and last production of young, interval between litters, and litter size (Craighead et al. 1969, Reynolds 1978, Bunnell and Tait 1980). Preliminary results indicate general patterns which must be corroborated by additional data.

Age at 1st Production of Young:

Six females aged 3.5-5.5 years showed no evidence of previous offspring or estrus. One 6.5-year-old estrus female (No. 1308) captured in late May 1982 had black enlarged mammaries indicating that she had weaned or lost a litter prior to breeding. An 8.5-year-old female (No. 1322) that was accompanied by a yearling bred successfully at 6.5 years (Table 3).

These data indicate that age at 1st production of young in the study area is higher than that in more southern portions of Alaska but lower than in northern Alaska. Females produce 1st litters between 4.5 to 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). These are all highly productive populations. At the other extreme, in the eastern Brooks Range, age at 1st litter ranges from 6.5 to 12.5 years ($\bar{x}$ = 10.1) (Reynolds 1976) and in the western Brooks Range, 5.5 to 11.5 ($\bar{x}$ = 8.0) (Reynolds and Hechtel 1982).

Outside Alaska, 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 9 females captured, which were older than 10 years, were accompanied by offspring or in breeding condition and showed evidence of previous offspring. The age at which 8 females last produced cubs of the year were 11 years, 1; 12 years, 2; 13 years, 1; 15 years, 3; and 23 years, 1. One female (No. 1305) produced cubs as a 23-year-old, weaned them as a 25.5-year-old, and then bred the same year. Unfortunately, she was killed by a hunter so the outcome of the breeding will not be determined.

Reproductive Interval:

Reproductive interval is the time between breeding by a female, and subsequent weaning of offspring (Reynolds 1980, Reynolds and Hechtel 1982). Years in which a female breeds but fails to conceive or 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, 1980; Glenn et al. 1976). Failure to conceive was prevalent in studies in the eastern (Reynolds 1974, 1976) and western Brooks Range (Reynolds 1980, 1981; Reynolds and Hechtel 1982).

In the study area, a minimum reproductive interval of 3 years was observed for only 1 female (No. 1305) when she weaned her 2-year-old offspring in 1982. Circumstantial evidence that other females also wean offspring at age 2.5 was observed: no adult females were seen which were accompanied by 2-year-olds during or after the breeding season, 1 2-year-old (No. 1303) was captured alone during the breeding season and was presumably weaned that year, and 1 3-year-old (No. 1302) was captured in early May prior to the time most offspring are weaned and therefore was probably weaned the previous year as a 2-year-old. Whether this pattern is widespread in this population should be verified in 1983, when 4 females will emerge from dens with 2-year-old offspring.

Litter Size:

Mean litter size was 1.5 for 4 cub litters and 1.8 for 6 yearling litters. Cub litter size is small, especially when compared to that of 2.3 found 100 km south in the Nelchina Basin (Miller and McAllister 1982); however, mean yearling litter size is similar to that of 1.6 for the Nelchina Basin. Sample size is too small to draw even tentative conclusions. Observations of litter sizes in future years should allow comparison and further analysis of this measure of productivity.

Reproductive Status of Males:

Six adult males were observed during the breeding season. The 4 older males (8.5-13.5 years) displayed breeding behavior or accompanied a female in estrus. Neither of the 6.5-year-old bears displayed breeding behavior. Young adult males may not breed due to physiological incapability or competition with older males. If young males are incapable of breeding, productivity could be adversely affected by exploitation of older males. But no conclusions can be drawn until more data are collected.

Mortality

Mortality during 1982 included 6 hunter kills and 5 offspring of marked females. Hunters killed 3 males and 3 females including 1 marked 25.8-year-old female (No. 1305) and 1 marked 6.8-year-old male (No. 1314). Unknown causes accounted for mortality of 4 offspring of 3 marked females. In addition, 1 of 2 yearlings of female No. 1327 was not observed after it was darted during the capture attempt and was presumed dead. The other yearling was marked on 8 July but not seen with the adult female after 27 August and presumed dead. Two litters of cubs were lost during the summer. Female No. 1318 had 1 cub when captured on 8 June and was observed with the cub on 18 June. On 2 July, she was observed without a cub and accompanied by a large adult male exhibiting courtship behavior. When captured on 26 May, female No. 1311 had 2 cubs which accompanied her until at least 5 August but were not observed on 27 August. The causes of cub and yearling mortality were not determined in this study. Cub deaths caused by adult males have been documented elsewhere in Alaska in the Brooks Range (Reynolds 1976, 1980; 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 1961-82 (Table 4). Prior to 1981, when the high annual reported kill of 14 occurred, the mean annual take was 4.6. Females composed 33% of the total annual kill during 1961-81, but only 11% of the bears that were taken during spring hunts were female. If the population has remained relatively stable during the 1961-82 period and future

research confirms a density estimate of 1 bear/40 km^2, the overall harvest rate has been between 4.5-5.0% of the population. However, before a usable sustained harvest rate can be calculated, sex- and age-specific mortality and population structure, productivity, and survival must be determined (Bunnell and Tait 1980, 1981).

Movement and Home Range Size

Movements and home range during 1982 were determined for 25 bears equipped with radio collars. Frequency of 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. Table 5 provides preliminary data on movements and home range for each bear.

None of the radio-collared bears moved outside the study area, except adult males which traveled beyond the northern edge of the study but then returned. Females and young-age bears generally stayed within the drainage where they were captured.

Home range sizes varied according to sex and age of bears (Table 6), but additional data must be collected before these data can be compared with home ranges from other areas. Home ranges of adult males were large, included variable habitat from glacial morraine to muskeg of the Tanana Flats, and traversed several river drainages (Fig. 2). Females with offspring had relatively small home ranges which tended to stay within a single river drainage (Fig. 3). Females were usually observed close to escape cover, possibly a reflection of the propensity for adult males to stalk or kill offspring of adult females (Reynolds 1980, Reynolds and Hechtel 1982). One breeding female (No. 1318) had a much larger home range than 3 others (Fig. 4); this particular female was accompanied by a single cub of the year, lost it, and later came into estrus. Subadult female home ranges did not vary greatly from those of adult females with offspring (Fig. 5). Home ranges of 2 subadult male siblings which had been weaned in May 1982 (Fig. 6) were small and probably reflected their maternal home range.

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

Because the study area included portions of military land on Ft. Wainwright and Ft. Greely, we were fortunate to be involved in a cooperative effort between the U.S. Army 172D Infantry Brigade

(Alaska) and the Department of Fish and Game. Army units from Ft. Wainwright which provided support included the 222nd Aviation Battalion, the Veterinary Activity, and the Natural Resources Office of the Facilities Engineers. The interest, skill, and willingness to help 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 pilot-in-command CW3 Bruce Watson and crews of the 222nd Aviation Battalion. Every individual from this unit who participated did so in a competent and professional manner. Super Cub pilot Bill Lentsch and observer Ed Crain again demonstrated their unequaled capabilities to spot bears in alder patches, glacial moraines, and fog banks. Bob Brannon, U of A, 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, was instrumental in seeing that the support was initiated, and ably instructed us in veterinary procedures for collecting samples. 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 Alan Bennett helped coordinate the project.

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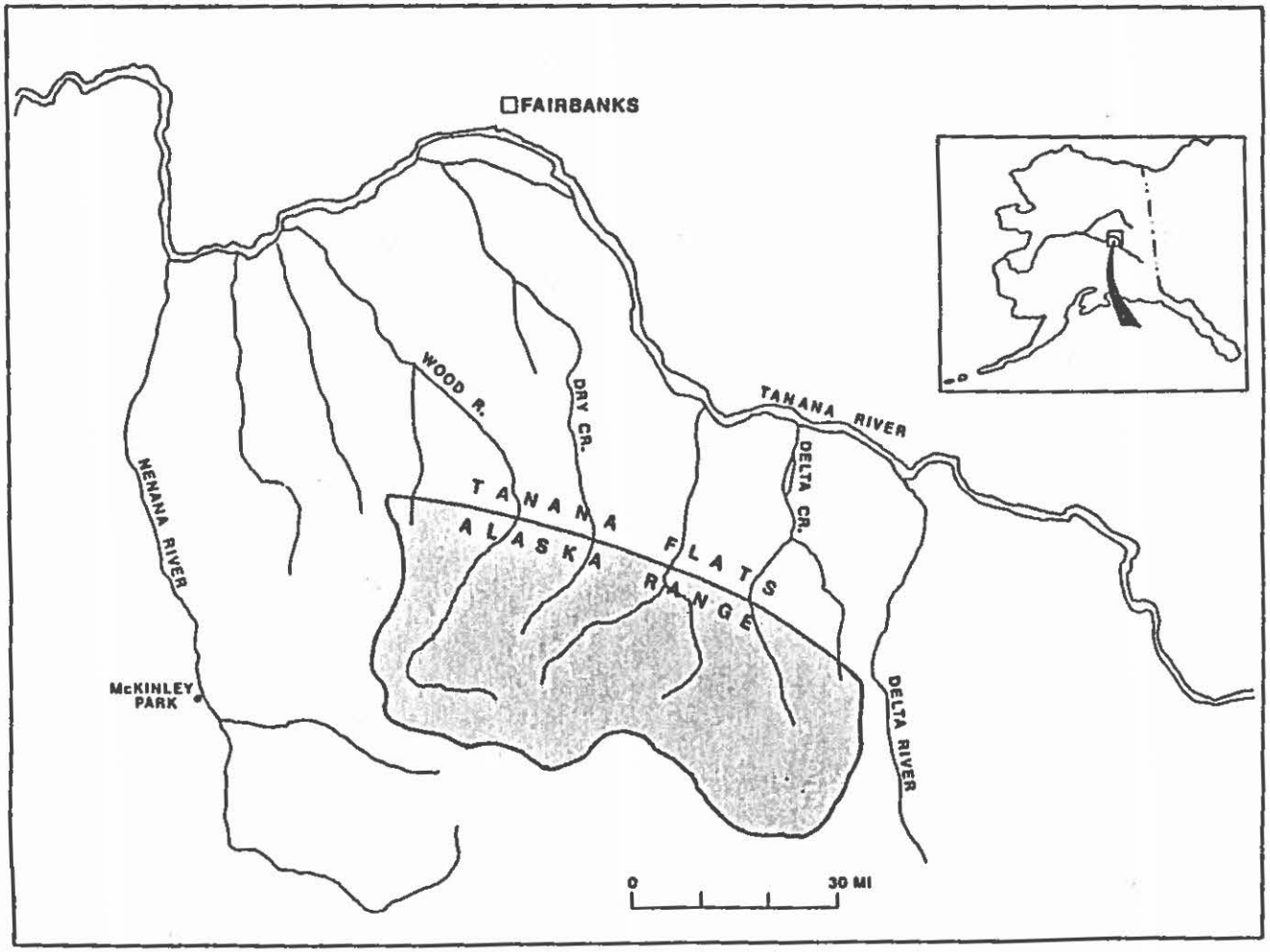

Fig. 1. Grizzly bear study area in northcentral Alaska Range.

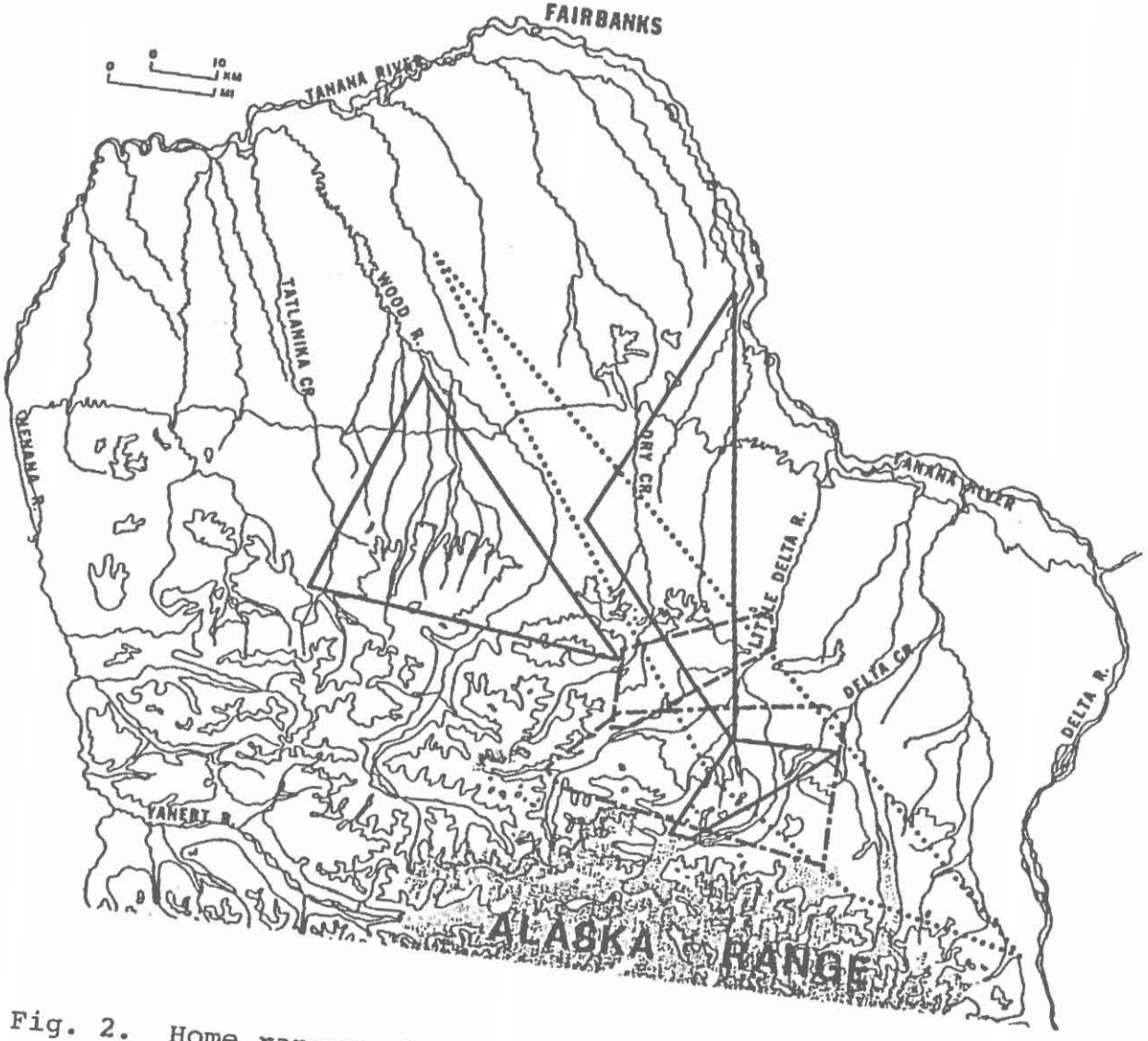

Fig. 2. Home ranges of 6 adult male grizzly bears, 1982.

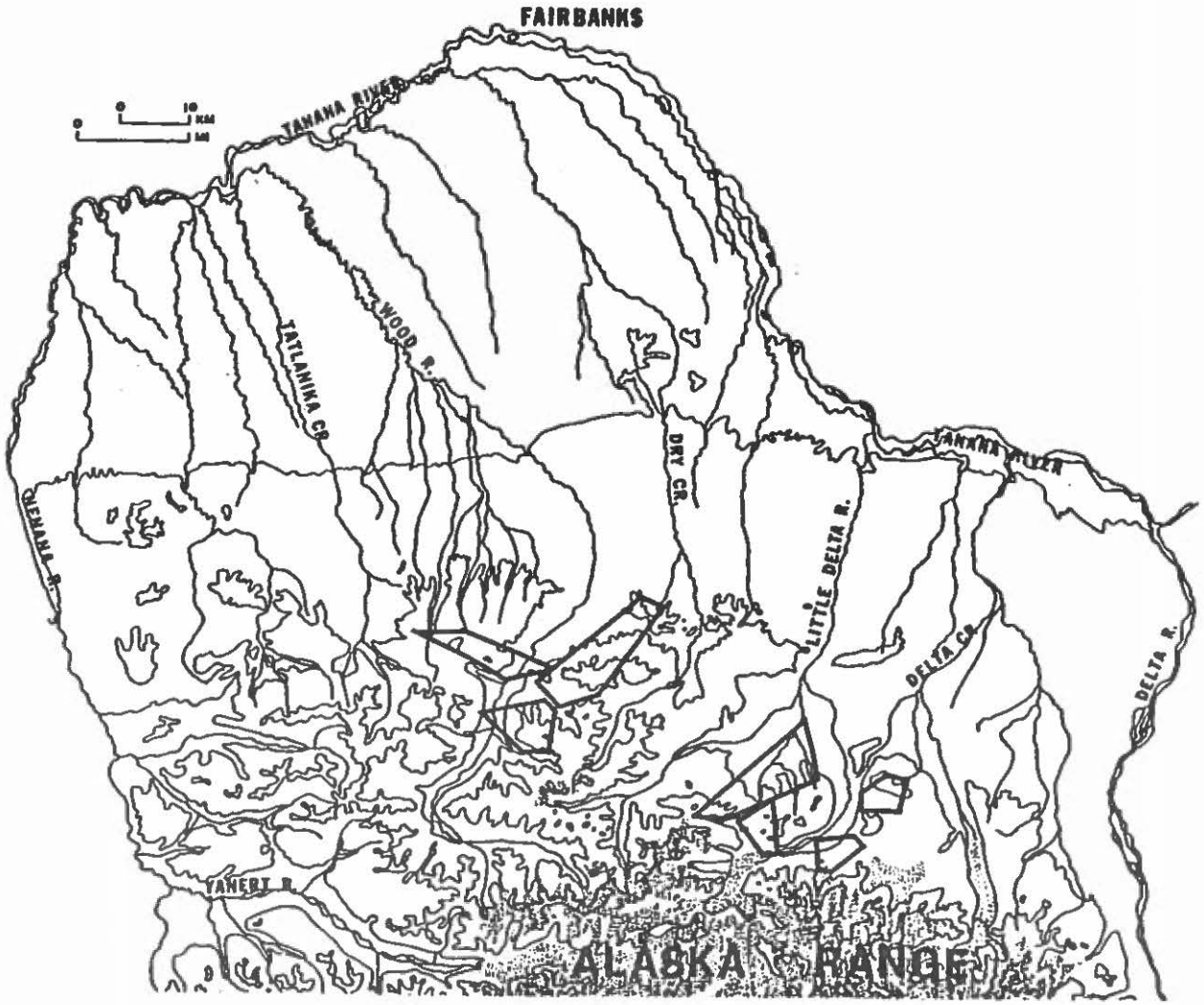

Fig. 3. Home ranges of 7 female grizzly bears with offspring, 1982.

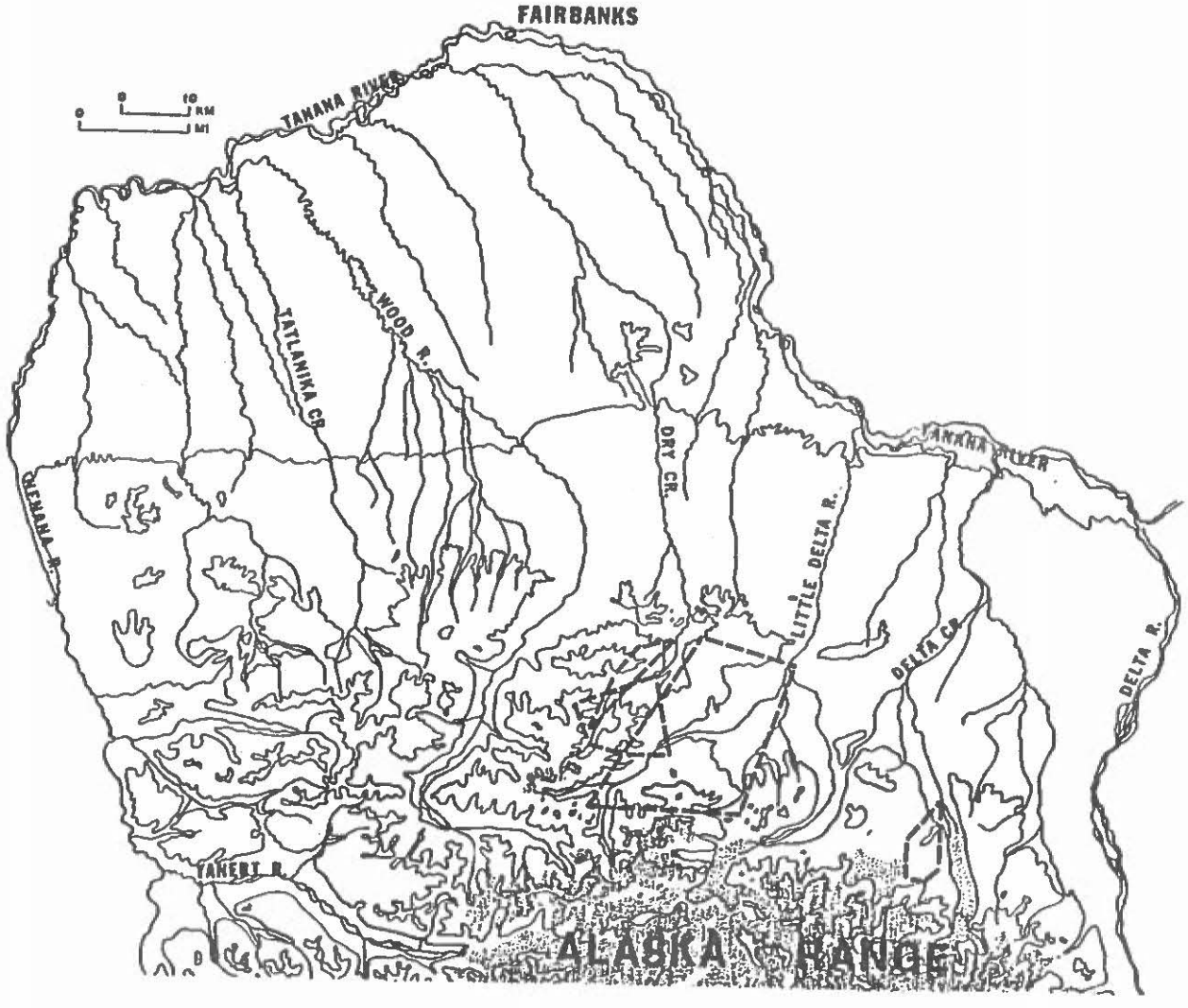

Fig. 4. Home ranges of 4 breeding female grizzly bears, 1982.

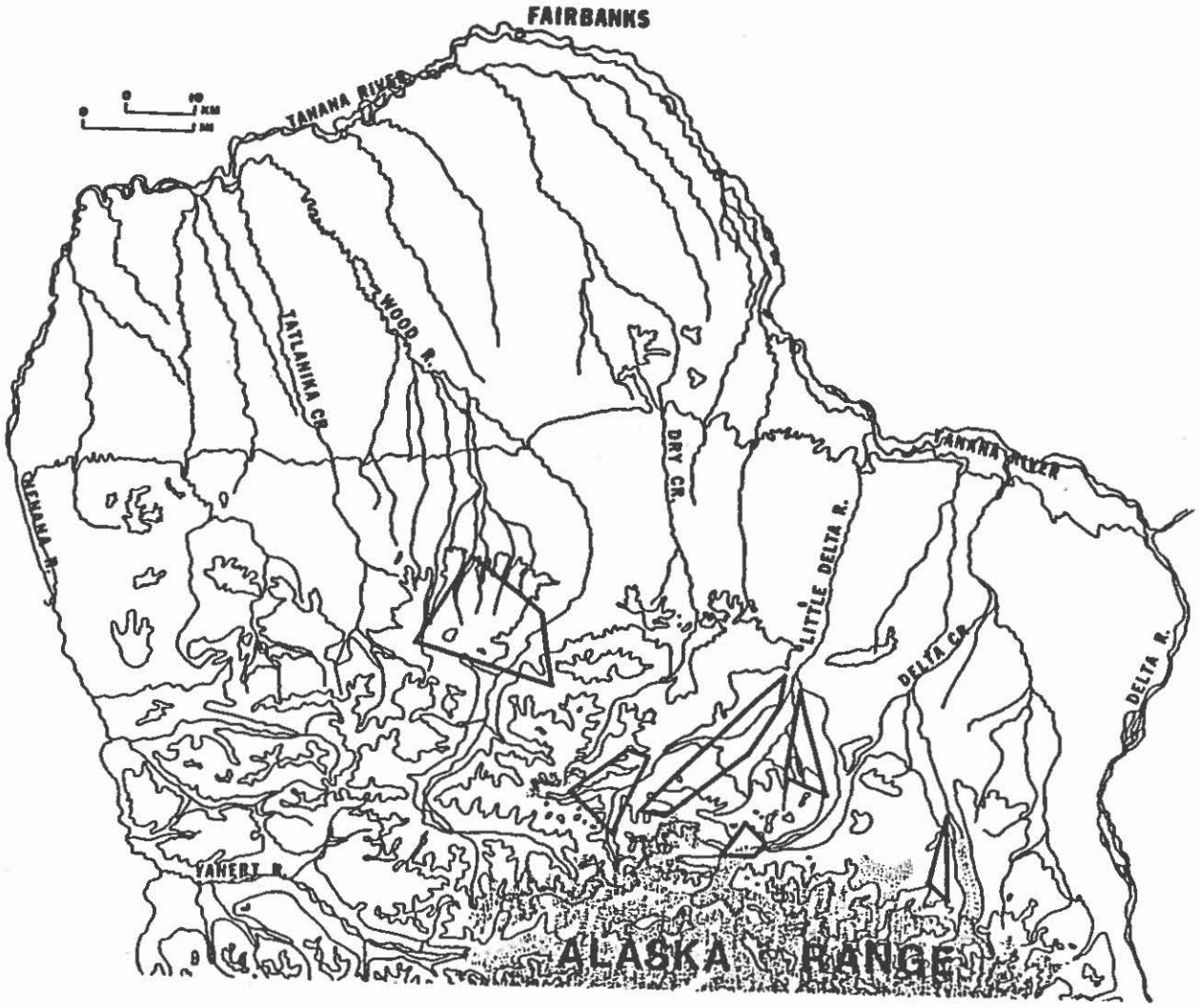

Fig. 5. Home ranges of 6 subadult female grizzly bears, 1982.

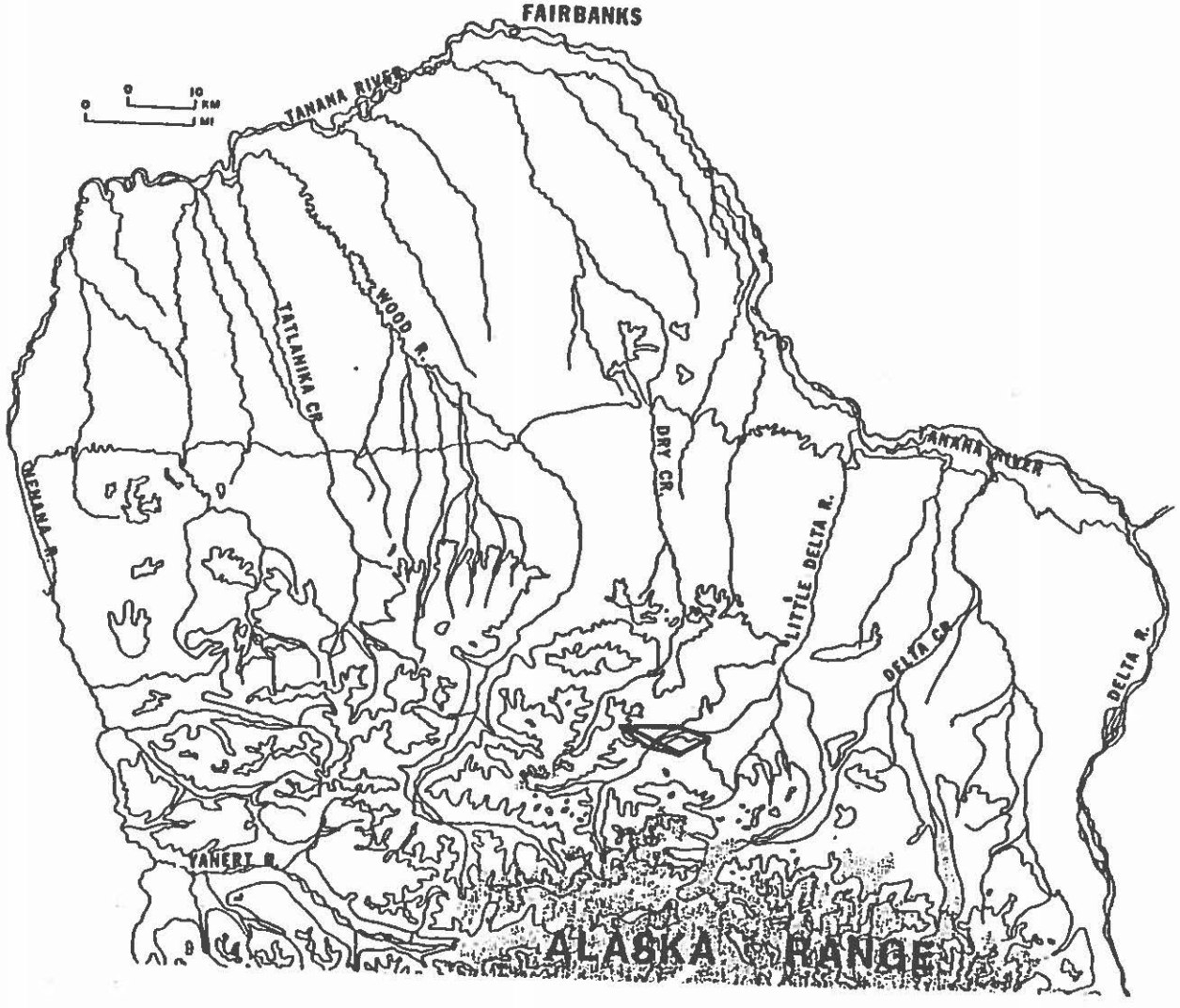

Fig. 6. Home ranges of 2 2-year-old male grizzly bears, 1982.

Table 1. Capture and marking characteristics of 35 bears captured in the northcentral Alaska Range, 1981-82.

Bear No. and sex	Cem. age (yr)	Date of capture	Weight (kg)	Location	Drug dosage[a]	Ear tags[b]	Markers[c]
1301 M	6.5	5/18/81	120	Buchanan Cr.	1.8/1.2H	373/374	G/G 0070
1302 F	3.5	5/19/81	75	E. Fork Delta	1.0/1.00	368/367	R/G 0190
1303 F	2.5	6/17/81	57	Mystic Mtn.	1.4/1.40	524/523	R/R 0240
1304 M	5.5	6/19/81	136	W. Fork Delta	2.4/2.00	451/452	lB/R 0080
1305 F	24.5	6/19/81	114	Slate Cr.	M 0	453/454	O/R 0070
1306 M	2.5	5/24/82	44	W. Fork Delta	1.0/1.0L	3151/3086	G/lB 0570
1307 M	2.5	5/24/82	44	W. Fork Delta	1.0/1.0H	3087/3152	lB/G 0580
1308 F	6.5	5/25/82	111[d]	Dry Cr.		3001/3154	O/Pp 0330
1309 M	8.5	5/25/82	318[d]	Dry Cr.	ML	3153/3101	dB/Bk0320
1310 M	12e	5/25/82	250[d]	Buchanan Cr.	2.0/2.00	No tags	0309
1311 F	12.5	5/26/82	120	Molybdenum Rg.	1.9/2.10	3106/3107	W/W 0300
1312 F	0.5	5/26/82	12	Molybdenum Rg.	0.1/0.1	3104/3155	O/W[e]
1313 F	0.5	5/26/82	12	Molybdenum Rg.	0.08/0.13	3156/3105	W/O[e]
1314 M	6.5	5/27/82	116	Iowa Rg.	2.1/1.9H	3088/3002	dB/lB0360
1315 M	13.5	6/4/82	272	Buchanan Cr.	1.9/2.1L	3102/3157	Bk/O 0420
1316 M	11.5	6/7/82	236	W. Fork Delta	3.8/0.0H	3089/3090	O/lB 0369
1317 F	3.5	6/8/82	36	Forgotten Cr.	1.2/1.8L	3091/3003	lB/0 0540
1318 F	13.5	6/8/82	104	Buchanan Cr.	ML	3004/3103	W/G 0469
1319 M	0.5	6/8/82	12	Buchanan Cr.	0.15/0L	3005/3092	R/Y[e]
1320 F	17.5	6/8/82	102	Trident Gl.	MO	3158/3093	G/B 0460
1321 F	16.5	6/9/82	141	Snow Mt. Glch.	2.1/1.90	3028/3108	G/W 0510
1322 F	8.5	6/9/82	91	Sheep Cr.	1.9/2.1M	3051/3159	W/lB 0350
1323 F	11.5	6/10/82	95	Mystic Mt.	1.9/2.10	3160/3030	G/G 0440
1324 F	0.5	6/10/82	12	Mystic Mt.	0.12/00	3027/3162	R/W[e]
1325 M	0.5	6/10/82	12	Mystic Mt.	0.10/00	3161/3031	W/R[e]
1326 F	4.5	6/18/82	93	Buchanan Cr.	2.2/1.80	3008/3163	W/R 0550
1327 F	16.5	7/8/82	127	Whistler Cr.	2.2/1.80	3134/3192	G/R 0490
1328 F	1.5	7/8/82	43	Whistler Cr.	0.9/1.10	3115/3014	dB/G
1329 F	13.5	7/9/82	120	Buchanan Cr.	2.4/1.60	3026/3111	W/R 0429
1330 M	1.5	7/9/82	48	Buchanan Cr.	0		R/W 0640
1331 F	4.5	7/10/82	77	Trident Gl.	2.4/1.60	3120/3194	Bk/0 0520
1332 F	5.5	7/12/82	104	Gillam Gl.	2.4/1.60	394/190	R/dB 0478
1333 F	16.5	7/13/82	141	Buchanan Cr.	MO	474/469	G/R 0449
1334 M	1.5	7/13/82	49	Buchanan Cr.	1.0/1.00	395/392	Y/G 0610
1335 F	1.5	7/13/82	38	Buchanan Cr.	1.0/1.00	32/456	G/Y 0630

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

[b] Left/right.

Table 1. Continued.

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[c] Marking designations:
Colors: R, red; G, light 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. Numbers, such as 0070, designate a radio collar with a frequency of 150.070 MHz.

[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. Age[a] and sex of bears captured in the northcentral Alaska Range, 1981-82.

Age by cementum (yr)	Males	Females	Unmarked/ sex unknown	Total known in age class[b]
0.5	2	3	1	6
1.5	2	2	5	9
2.5	2	0		2
3.5	0	2		2
4.5	0	3		3
5.5	0	1		1
6.5	2	1		3
7.5	1	0		1
8.5	1	1		2
9.5	0	0		0
10.5	0	0		0
11.5	1	1		2
12.5	1	1		2
13.5	1	2		2
14.5	0	0		0
15.5	0	0		0
16.5	0	3		3
17.5	0	1		1
18.5	0	0		0
19.5	0	0		0
20.5	0	0		0
21.5	0	0		0
22.5	0	0		0
23.5	0	0		0
24.5	0	0		0
25.5	0	1		1

[a] Bears were captured during 1981 and 1982 but assigned the ages they would have reached if alive in 1982.

[b] Ages were either established from premolar cementum annuli or after observation of animals as cubs or yearlings accompanied by an adult female. In addition, 2 unmarked adult bears, 1 male and 1 female, were observed accompanying marked bears in breeding condition.

Table 3. Reproductive status and litter sizes of potentially mature females in the northcentral Alaska Range, 1981-82.

Bear No.	Age in 1982	Offspring No.	1981[a]	1982	Reproductive history
1302	4		NB	UN	No offspring prior 1981
1303	3		NB	NB	No offspring prior 1981
1305	25	1306, 1307	2 ylg	2 2 yr/B	
1308	6			?/B	Offspring prior 1982
1311	12	1312, 1313	UN/B	2 cubs	Lost cubs 1982
1317	3			NB	No offspring prior 1982
1318	13	1319	UN/B	1 cub/B	Lost cub 1982
1320	17			?/B	Weaned or lost offspring 1982
1321	16	3 UM	3 cubs	3 ylg	
1322	8	1 UM	UN/1+cubs	1 ylg	
1323	11	1324, 1325	UN/B	2 cubs	
1326	4			NB	No offspring prior 1982
1327	16	1327, 1UM	UN/2+cubs	2 ylg	1UM capture mortality
1329	13	1330	UN/1+cubs	1 ylg	
1331	4			?B	No offspring prior 1982
1332	5			?B	No offspring prior 1982
1333	16	1334, 1335	UN/2+cubs	2 ylg	

[a] Designations: NB, not observed in breeding condition; UN, not observed in that year; B, observed in breeding condition; ?, status unknown; UM, unmarked; ylg, yearling; 2-yr, 2-year-old.

Table 4. Historic grizzly bear harvest within the study area, 1961-82.

Year	Drainage of reported harvest				
	Delta Creek	Little Delta River	Dry Creek	Wood River	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	2	5	2	3	12
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	0	4	5
1975	0	0	0	1	1
1976	0	0	0	1	1
1977	0	1	2	1	4
1978	0	0	0	2	2
1979	1	3	0	6	10
1980	1	3	0	3	7
1981	0	4	1	9	14
1982	0	3[a]	2[a]	1	6[a]
Totals	11	33	15	52	111

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

Table 5. Movement and home range sizes of radio-collared grizzly bears, northcentral Alaska Range, 1981-82.

Individual								
No.	Sex	Age in 1982 (yr)	Reproductive status[a]	Sightings N	Sightings Period	Maximum distance between sightings (km)	Home range size (km^2)	Comments
1302	F	4.5	NB	4	5/19/81-3/29/82	13	36	Shed collar between 8/11/81 and denning
1303	F	3.5	NB	13	6/17/81-10/31/82	21	183	
1304	M	6.5	NB?	14	6/19/81-10/31/82	45	768	Never sighted with female
1305	F	25.5	B	15	6/19/81-9/15/82	16	126	Shot by hunter
1306	M	2.5	NB	6	5/24/82-10/11/82	11	22	Post-weaning only
1307	M	2.5	NB	6	5/24/82-10/11/82	11	26	Post-weaning only
1308	F	6.5	B	7	5/25/82-10/31/82	14	26	
1309	M	8.5[b]	B	8	5/25/82-10/11/82	52	874	Not including den site
1310	M	12.5[b]	B	8	5/25/82-8/27/82	27	167	Not including den site
1311	F	12.5	w/cubs	8	5/26/82-10/31/82	8	28	Lost cubs
1314	M	6.5	NB?	7	5/27/82-9/15/82	67	762	Never sighted w/female, shot by hunter
1315	M	13.5	B	8	6/4/82-10/31/82	139	1475	
1316	M	11.5	B	5	6/7/82-8/4/82	29	201	Shed collar between 7/12 & 8/4
1317	F	3.5	NB	7	6/8/82-10/11/82	12	58	
1318	F	13.5	w/cub/B	12	6/8/82-10/11/82	36	467	Lost cub and bred
1320	F	17.5	B	7	6/8/82-10/31/82	12	45	
1321	F	16.5	w/ylgs	6	6/9/82-9/23/82	21	82	Shed collar between 8/27 & 9/23
1322	F	8.5	w/ylg	7	6/9/82-10/31/82	11	51	
1323	F	11.5	w/cubs	8	6/10/82-10/31/82	21	46	
1326	F	4.5	NB	7	6/18/82-10/31/82	28	98	
1327	F	16.5	w/ylg	4	7/8/82-9/23/82	6	17	Alone on 9/23
1329	F	13.5	w/ylg	6	7/9/82-10/11/82	20	110	
1331	F	4.5	NB	5	7/10/82-10/31/82	12	16	
1332	F	5.5	NB	5	7/12/82-10/31/82	7	16	
1333	F	16.5	w/ylgs	5	7/13/82-10/31/82	7	22	

[a] Designations: NB, nonbreeding; B, breeding; w/cubs, ylg, with cubs of the year or yearlings.

[b] Estimated.

Table 6. Home range sizes of grizzly bears of different sex and age groups, northcentral Alaska Range, 1981-82.

Age/sex category	Bear No.	Home range size km^2	$\bar{x}$ km^2	±SD km^2
Adult males				
(6.5 yr+)	1304	769		
	1309	875		
	1310	168		
	1314	761		
	1315	1,476		
	1316	202		
			710	484
Young-age males				
(2.5 yr)	1306	21		
	1307	26		
			23	
Females w/offspring				
(8.5 yr+)	1311	28		
	1321	83		
	1322	52		
	1323	47		
	1327	18		
	1329	111		
	1333	23		
			51	34
Breeding females				
(6.5 yr+)	1305	127		
	1308	26		
	1318	47		
	1320	469		
			167	205
Young-age females				
(2.5-5.5 yr)	1302	36		
	1303	184		
	1317	60		
	1326	75		
	1331	16		
	1332	16		
			65	62

APPENDIX A. Physical attributes[a] of grizzly bears captured in the northcentral Alaska Range, 1981-82.

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
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[d]	186	103	32	63	100	101	20.2	33.1	3.0	2.2b
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[d]	250[d]									b	b
1311	5/26/82	F	12.5	120	190	107	30	63	113	105	21.8	33.8	3.0	2.6
1312	5/26/82	F	0.5	12	81	48	15	28	43	42	10.2	16.5	d	d
1313	5/26/82	F	0.5	12	76	50	15	30	48	45	11.1	16.8	d	d
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
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	27.9		2.9	2.9
1318	6/8/82	F	13.5	104	188	113	31	57		113	19.5	33.5	3.1	2.8
1319	6/8/82	M	0.5	12	85	52	14	26	34	44	10.8	17.2	d	d
1320	6/8/82	F	17.5	102	181	110	29	65	103	100	21.0	33.1	2.9w	2.7w
1321	6/9/82	F	16.5	141	199	107	34	69	105	115	22.1	35.8	3.5	3.1
1322	6/9/82	F	8.5	91	169	100	29	62	97	97	18.9	32.8	3.2	3.0
1323	6/10/82	F	11.5	95	171	106	32	57	98	93	20.0	33.5	3.2	2.9
1324	6/10/82	F	0.5	12	77	49	16	29	47	39	10.6	17.5	d	d
1325	6/10/82	M	0.5	12	86	54	15	26	48	42	11.5	18.0	d	d
1326	6/18/82	F	4.5	93	172	102	27	54	88	98	17.9	31.4	3.1	2.9
1327	7/8/82	F	16.5	127	175	106	29	62	100	117	20.9	32.9	2.3	2.8
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

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]
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	27	42	87	72	14.4	24.9	1.3	1.6
1335	7/13/82	F	1.5	38	127	77	24	40	76	73	13.5	24.0	1.6	1.8

[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; d=deciduous.

[d] Estimate after close examination.