

# BLACK BEAR DENNING ACTIVITIES AND DEN CHARACTERISTICS IN WEST-CENTRAL IDAHO

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**Abstract:** Denning activities and den characteristics of black bears (*Ursus americanus*) were studied in west-central Idaho during 1973–77. Den entry and emergence varied among bears and years, and the denning season extended from mid-October until mid-April. Thirty-one radio-instrumented bears were handled 83 times in 65 different dens. Forty-seven (72%) of the 65 dens were ground dens excavated into a hillside or under the base of a tree, stump, or shrub. Thirteen (20%) dens were located in the base of hollow trees and 5 (8%) in hollow logs or rock cavities. Bears denned at various elevations, slopes, and aspects, and under a variety of canopy coverages, but some selection for snow and vegetative cover characteristics at different elevations and aspects was noted. No significant differences in den dimensions were noted for specific sex or age classes of bears, except that adult males dug larger entrances ( $P < 0.05$ ) than other bears. Four instances of den reuse were observed.

*Int. Conf. Bear Res. and Manage.* 5:79–86

Craighead and Craighead (1972) first used telemetry to obtain quantitative data on grizzly bear (*U. arctos*) denning ecology. Subsequently, many researchers have used telemetry to study the ecological and physiological parameters of denning bears (Craighead et al. 1976; Folk et al. 1976; Lindzey and Meslow 1976a, b; Reynolds et al. 1976; Johnson 1978; Hamilton and Marchinton 1980; LeCount 1980; Pelton et al. 1980). These studies documented the wide range of physical and environmental conditions that prevail throughout the bears' range in North America and demonstrated the adaptability bears exhibit in selecting the period when denning will occur and denning sites. This flexibility suggests a need to investigate the factors influencing denning chronology and den site selection throughout the bears' range.

During 1973–77, the Idaho Department of Fish and Game and the University of Idaho Cooperative Wildlife Research Unit conducted a radio-telemetry study of activity patterns, movements, and home range sizes of black bears in west-central Idaho (Amstrup and Beecham 1976; Reynolds and Beecham 1980). That study provided the opportunity to locate and examine 65 black bear dens. Objectives of our denning study were to investigate denning chronology and describe denning sites.

A. Ogden, D. Rhodenbaugh, R. Sherer, R. Beecham, C. Nellis, and S. Amstrup assisted with field work. J. Brown and S. Obenberger helped summarize the data. We also thank L. Oldenburg for administrative support and

C. Nellis and C. Jonkel for critical review of the manuscript. This paper is a contribution of Federal Aid in Wildlife Restoration Project W-160-R.

## STUDY AREA

The study area is located in west-central Idaho approximately 16 km southeast of Council, Idaho, and encompasses nearly 130 km<sup>2</sup>. The predominant geographic features of the area are Council Mountain, West Mountain Ridge, and the Middle Fork of the Weiser River which bisects the area.

The Columbia River basalt formation and Idaho Batholith granitic formation are the major geologic types. Elevations range from 975 m to over 2470 m on Council Mountain, and slopes generally exceed 30%.

Big sage (*Artemisia tridentata*) dominates the vegetative communities at lower elevations and on drier sites. Timber stands on the area range from dense to open with many natural bare areas. Dominant tree species are ponderosa pine (*Pinus ponderosa*) and Douglas-fir (*Pseudotsuga menziesii*) at lower elevations (< 1700 m) and grand fir (*Abies grandis*), subalpine fir (*A. lasiocarpa*), and Engelmann spruce (*Picea engelmannii*) at higher elevations and on the more mesic sites. Whitebark pine (*P. albicaulis*) occurs on some ridge tops and lodgepole pine (*P. contorta*) on some burned areas.

The climate of the area is influenced primarily by maritime air from the Pacific Ocean and is characterized by moderately long, cold, wet winters and hot, dry summers. Precipitation varies

from 65 cm at lower elevations to 115 cm at higher elevations and averages 81 cm. Approximately 65% of the precipitation falls during the period from October through April, primarily as snow. Mean annual temperature at Council is 9 C and 0 C during November through March.

Commercial timber production and cattle grazing are the major land use practices affecting the area. Recreational use is moderate and occurs primarily during the summer and fall.

## METHODS

Bears were captured during the summer months with Aldrich foot snares, immobilized with intramuscular injections of phencyclidine hydrochloride (dosage rate approximately 1.3 mg/kg of body weight), and 45 individuals were fitted with radio-transmitters (Amstrup and Beecham 1976; Reynolds and Beecham 1980). Equipment and tracking techniques were described by Seidensticker et al. (1970). Locations of bear dens were plotted on U.S. Geological Survey topographic maps (scale 1:62,500) gridded in 0.65-km<sup>2</sup> areas.

We located dens by monitoring activity patterns and locations of bears equipped with radio-transmitters during October and November. When bears were located repeatedly at a particular site and their level of activity showed a significant drop we assumed the bears were denning and the sites were marked by attaching surveyors' tape to nearby trees.

The dens were revisited in December or March to record the physical and vegetative characteristics of each den and den site. Specific den measurements recorded were average height and width of entrances and height, width, and length of tunnels and chambers. Den site measurements recorded were ground slope in degrees (clinometer), percent canopy of coniferous trees over the den (densiometer), aspect, and elevation (taken from topographic maps). No significant difference was noted ( $P > 0.05$ ) between the dimensions of freshly and previously excavated dens, so these data were combined for analyses. Physical measurements were taken on the bears, their radio-collars were replaced or removed, and they were returned to dens.

The probability level accepted as significant for all statistical comparisons was 0.05. The

Table 1. Range in dates that black bears entered their dens in west-central Idaho, 1973–76. Sample size in parentheses.

Year	Adult males	Adult females	Yearlings
1973	30 Oct – 1 Nov (2)	28 Oct – 20 Nov (5)	
1974	11 Nov (1)	9 Oct – 8 Nov (3)	27 Nov (1)
1975	27 Oct – 25 Nov (8)	6 Nov – 24 Nov (7)	
1976	2 Nov – 7 Nov (2)	15 Oct – 8 Nov (7)	10 Oct – 16 Nov (7)

Kruskal-Wallis ( $K$ ) test was used to test for differences in mean denning dates; the Student's  $t$  test ( $t$ ) or chi-square goodness-of-fit test ( $\chi^2$ ) were used for all parametric tests as indicated.

## DENNING CHRONOLOGY

Prior to entering dens, bears became less active and often showed marked lethargic behavior. Females ( $n = 13$ ) moved to and spent an average of 8 days in the vicinity of their dens prior to actual denning, while males ( $n = 9$ ) spent an average of only 3 days ( $t = 2.24$ ,  $P < 0.05$ ) in the vicinity of their dens before denning. Distance traveled by 14 females to den sites was shorter ( $\bar{x} = 1.3$  km) than that of 10 males ( $\bar{x} = 6$  km,  $t = 3.97$ ,  $P < 0.05$ ). The fact that males moved greater distances to den sites and did not linger near their dens prior to entry was probably the reason we seldom observed pronounced lethargic behavior in males as we did among females. Rogers (1977) reported similar behavior by males in Minnesota. He also reported that males denned in the same small portion of their range each year; however, males in our study used dens that were widely dispersed throughout their home ranges.

Radio signal integrity indicated that upon entering dens bears continued to exhibit activity. This activity was probably limited to frequent adjustments of body position. If we disturbed them during this period, den abandonment was likely. As length of time in the den increased, activity decreased and the bears became less likely to abandon their dens when disturbed. Eleven of 19 bears abandoned dens when disturbed shortly after entry ( $< 1$  week), but only 2 bears did so after occupying them for an extended period.

Dates that bears entered dens varied among bears and years (Table 1). Denning began about mid-October and extended through mid-April.

In 1975 and 1976 (years with the greatest contrast in availability of fall foods and weather conditions) mean dates bears entered dens (1975, 14

November; 1976, 30 October) differed significantly ( $t = 4.44$ ,  $P < 0.05$ ). Phenological development of preferred food plants was approximately 2 weeks later in 1975 than in 1976 and resulted in a difference in availability of fall foods between the years (Reynolds and Beecham 1980). As a result, bears foraged later in 1975, even though several centimeters of snow had accumulated. In contrast, in 1976 all instrumented bears denned earlier when daily temperatures were still mild (mean daily maximum temperature during the period bears entered dens was 9 C in 1975, 16 C in 1976) and snow accumulation was negligible. We concluded that availability of fall food was a key element affecting the onset of denning in Idaho bears. Similarly, Erickson and Youatt (1961) reported that prolonged feeding delayed denning of captive bears but when feeding was terminated denning occurred promptly.

Commencement of denning by adult males and females differed between years when females were and were not pregnant. In 1975, females (no instrumented females were pregnant) denned an average of 8 days later ( $K = 8.65$ ,  $P < 0.01$ ) than that of males. The mean denning dates for yearling females and males were not significantly different from those of adults of the same sex ( $K = -0.048$ ,  $P > 0.05$ , for females;  $K = 0.007$ ,  $P > 0.05$ , for males). Our findings agree with those of Lindzey and Meslow (1976a) who also reported that pregnant females denned before males. Lindzey and Meslow (1976a) did not report on nonpregnant females. Erickson (1964) reported that female and juvenile black bears denned before adult males in Michigan, and Pearson (1975) stated that adult male grizzly bears remained active longer than other sex and age groups in the Yukon Territory.

The date bears began denning in Idaho was comparable to dates reported by Erickson (1964; unpubl. rep., Alaska Fed. Aid Proj. W-6-R-5, 1965) in Michigan and Alaska, Jonkel and Cowan (1971) in Montana, and Poelker and Hartwell (1973) and Lindzey and Meslow (1976a) in Washington. Rogers (1977) reported that bears in Minnesota began denning as early as 2 September.

Data on emergence from dens were obtained only in 1974 and 1976. In 1974, bears emerged from dens between 11 April and 30 April; 2 females accompanied by yearlings were the last to

Table 2. Den types used by black bears in west-central Idaho during 1973–77 by sex, age, and reproductive class.

Den type	Sex		Age (years)		Reproductive class			
					Adult females			Males and subadult females
	M	F	≤3	≥4	Single	With cubs	With yearlings	
Ground <sup>a</sup>	16	35	12	39	4	12	15	20
Tree	7	6	4	9	2	2	2	7
Rock cavity		2		2	1	1		
Log	2	1	1	2			1	2
Totals	25	44	17	52	7	15	18	29

<sup>a</sup> 4 dens that were reused are included as separate entries.

emerge (Amstrup and Beecham 1976). In 1976, 2 adult males and 1 female with yearlings emerged between 23 March and 10 April. Three adult males and 5 females with yearlings emerged between 10 April and 8 May.

Data were insufficient to make statistically valid comparisons between time of emergence among bears; however, we observed that females with cubs of the year tended to be the last to leave their dens and that bears denned at lower elevations emerged before those denned at higher elevations. The period of emergence from dens in this study was comparable to dates reported for Maine (Spencer 1955), Alaska (Erickson, unpubl. rep., Alaska Fed. Aid Proj. W-6-R-5, 1965), North Carolina (Hamilton and Marchinton 1980), Minnesota (Rogers 1977), and Tennessee (Johnson 1978). Lindzey and Meslow (1976a), and LeCount (1980) reported earlier emergence dates for western Washington and Arizona, respectively. Jonkel and Cowan (1971) reported slightly later dates for northwestern Montana.

## DEN LOCATIONS

Thirty-one radio-instrumented black bears (16 females, 15 males) were located and handled 83 times in 65 different dens during 1973–77. Bears showed no selectivity ( $P > 0.05$ ) for den type by sex, age, or reproductive class (Table 2). Five individuals were observed denning in excavated ground dens as well as tree dens. Forty-seven (72%) of 65 dens located in this study were ground dens excavated into a hillside or under the base of a tree, stump, shrub, or fallen tree. Thirteen (20%) dens were located in the base of hollow trees and 5 (8%) in hollow logs or rock cavities.

Black bears den in a variety of locations throughout their range. Jonkel and Cowan (1971) and Johnson (1978) reported that black bears denned primarily in hollow trees in Montana and Great Smoky Mountains National Park, respectively. Erickson (1964) and Lindzey and Meslow (1976b), however, found that black bears used excavated dens more frequently than other den types in Michigan and Washington. Black bears have also used man-made structures for denning such as drainage culverts (Barnes and Bray 1966) and deserted buildings (Erickson 1964, Jonkel and Cowan 1971). In contrast, grizzly bears used only excavated dens (Craighead and Craighead 1972; Lentfer et al. 1972; Pearson 1975; W.A. Troyer and J.B. Faro, unpubl. ms., 1975; Reynolds et al. 1976; R.H. Russell et al., Can. Wildl. Serv., unpubl. ms., 1978; Vroom et al. 1980; Servheen and Klaver 1983).

Grand fir was the most common tree species (64%) used by black bears for denning. Subalpine fir and Douglas-fir were used 27% and 9% of the time, respectively. Eleven (85%) of the tree dens were located in the base of live trees; 2 (15%) in the base of dead trees. The mean diameter of 10 tree dens measured was 111.5 cm (range 44.6–191.0 cm). Tree dens were located at significantly ( $t = 5.29$ ,  $P < 0.01$ ) higher elevations ( $\bar{x} = 1815$  m) than ground dens ( $\bar{x} = 1450$  m), possibly because of tree distribution. Ponderosa pine, the dominant species below 1500 m elevation, did not contain suitable cavities for denning, while Douglas-fir and subalpine fir were predominant above 1500 m.

Black bears denned at various elevations, aspects, and slopes, and under a variety of canopy coverages. Some selection for elevation was noted. Dens located below 1800 m were located in dense pockets of brush (primarily ninebark, *Physocarpus malvaceus*); 9 (69%) dens above 1800 m were found in open areas or timbered stands containing no shrub understory vegetation. Heavy snow accumulation at higher elevations probably provided adequate concealment for bears denned there, while bears denned at lower elevations (< 1800 m) sought additional protection by denning in thick brush pockets. No differences were found ( $t = 0.36$ ,  $P > 0.20$ ) in elevations at which adult males and females denned.

Thirty-nine (62%) of 63 dens for which aspect was recorded were located on west, northwest, or

north aspects (Fig. 1). In the Council area, timber stands at low and mid-elevations (< 1800 m) were found primarily on northwest and north aspects. These exposures characteristically accumulated snow depths that persisted until late April or May because of shading. Bears may have selected denning sites on these aspects because of the insulative effect of a continuous snow cover or because soil moisture conditions were favorable for shrub understory development that provided adequate concealment and shelter. Differences ( $X^2 = 1.01$ ;  $P > 0.05$ ) were not found in aspects used by adult males and females or by single bears and females accompanied by young ( $X^2 = 6.91$ ;  $P > 0.05$ ).

Lindzey and Meslow (1976b) reported that aspect did not influence den site selection for black bears in Washington. Johnson (1978) reported that 73% of the tree dens he located in the Great Smoky Mountains National Park were on northwesterly aspects; the same trend existed for ground dens but their slope aspects were more scattered. Craighead and Craighead (1972) and Lentfer et al. (1972) indicated that grizzly bears in Yellowstone National Park and Kodiak Island selected northerly aspects, while Troyer and Faro (unpubl. ms., 1975) and Reynolds et al. (1976) found grizzly bears denned most often on southern aspects in other areas of Alaska. Pearson (1975) found that grizzly bears did not den on north aspects in the Yukon Territory, but other aspects were equally used.

Ground dens, with a mean slope ( $\pm$ SD) of  $23^\circ \pm 9$ , occurred on steeper slopes ( $t = 2.35$ ,  $P < 0.02$ ) than tree dens ( $\bar{x} = 17^\circ \pm 7$ ), but no differences ( $t = 0.55$ ,  $P > 0.20$ ) were found in slope steepness between dens used by adult males ( $\bar{x} = 20^\circ \pm 8$ ) and adult females ( $\bar{x} = 22^\circ \pm 9$ ) or between dens occupied by single bears ( $\bar{x} = 20^\circ \pm 9$ ) and females with cubs ( $\bar{x} = 23^\circ \pm 9$ ,  $t = 1.34$ ,  $P > 0.10$ ). Thirty-one (52%) of 60 black bear dens were on slopes of  $20^\circ$  to  $40^\circ$ . The steep slopes associated with ground dens was probably a function of their better soil moisture drainage characteristics, an unimportant factor in tree dens. Johnson (1978) also reported that black bears in Tennessee denned on steep slopes ( $\bar{x} = 33^\circ$ ) and that ground dens were on steeper slopes ( $\bar{x} = 36^\circ$ ) than tree dens ( $\bar{x} = 31^\circ$ ). Most grizzly bears preferred to den on slopes of  $20^\circ$  to  $40^\circ$  (Lentfer et al. 1972; Pearson

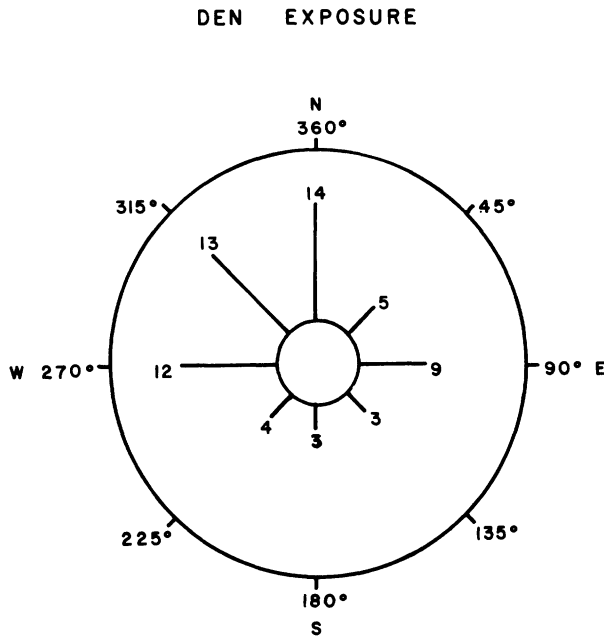


Fig. 1. Aspects of 63 dens examined in west-central Idaho, 1973-77.

1975; Troyer and Faro, unpubl. ms., 1975; Reynolds et al. 1976; Russell et al., unpubl. ms., 1978; Vroom et al. 1980; Servheen and Klaver 1983).

The mean canopy coverage ( $\pm$ SD) for 62 dens measured was 41%  $\pm$  2% with a range of 0-97%.

**DEN DESCRIPTIONS**

Differences were not observed in den dimensions of 45 ground and 11 tree dens for specific sex or age groups (Table 3), except that adult males dug larger entrances than other bears ( $t =$

2.07,  $P < 0.05$  for height and  $t = 2.33$ ,  $P < 0.05$  for width). Although adult male black bears were larger than females (Beecham 1980), females accompanied by young also required large dens, comparable to the size required by adult males. Females with young, however, did not require large entrances. These data indicated that bears dug entrances and den cavities only large enough to accommodate their body size.

Twenty (45%) of 44 ground dens had tunnels leading from the entrance to the den chamber. Two dens contained 2 cavities each and 3 dens had 2 entrances each. Eight (17%) of 47 ground dens examined had small tunnels leading away from the main chamber. These tunnels averaged 22 cm in height and 31.5 cm in width, indicating that bears may have enlarged portions of old coyote (*Canis latrans*) or badger (*Taxidea taxus*) dens for their use. Matson (1954) reported that a female black bear in Pennsylvania apparently denned in a renovated woodchuck (*Marmota monax*) or fox (*Vulpes* or *Urocyon* sp.) den.

The physical size of bear dens varied depending on the type of den used and the substrate. Pearson (1975) suggested that the most important factor regulating size of excavated grizzly bear dens in the Yukon Territory was amount of air space within the den that must be warmed by the bear and the physical size of the bear. Craighead et al. (1971), however, found that bears were surrounded by a relatively confined microclimate and implied that den size was not important in thermal regulation of the den environment. Lindzey and Meslow (1976b) examined 11 black bear dens in Washington and observed no difference in den size between adult

Table 3. Mean dimensions ( $\bar{x} \pm$  SD, in cm) of excavated and tree dens used by black bears in west-central Idaho, 1973-77.

Den type	Entrance			Tunnel				Cavity			
	N	Height	Width	N	Height	Width	Length	N	Height	Width	Depth
Tree dens	13	39 $\pm$ 15	36 $\pm$ 7 <sup>a</sup>					13	226 $\pm$ 87 <sup>a</sup>	96 $\pm$ 16	89 $\pm$ 37 <sup>a</sup>
Ground dens	46	44 $\pm$ 12	57 $\pm$ 22	20	42 $\pm$ 9	63 $\pm$ 18	96 $\pm$ 90	46	72 $\pm$ 17	104 $\pm$ 27	111 $\pm$ 24
Ground dens used by:											
Adult males	7	54 $\pm$ 11 <sup>b</sup>	71 $\pm$ 19 <sup>b</sup>	3	46 $\pm$ 4	69 $\pm$ 2	49 $\pm$ 13	7	69 $\pm$ 8	103 $\pm$ 28	119 $\pm$ 32
Adult females	28	44 $\pm$ 11	51 $\pm$ 19	13	41 $\pm$ 10	63 $\pm$ 18	67 $\pm$ 35	27	78 $\pm$ 17	107 $\pm$ 27	108 $\pm$ 21

<sup>a</sup> Entrance width, and cavity height and depth, significantly different ( $P < 0.05$ ) between tree dens and ground dens.

<sup>b</sup> Entrance height and width significantly different ( $P < 0.05$ ) between adult males and females.

females and yearlings. Craighead and Craighead (1972), however, reported that female grizzly bears with young dug wider dens than bears that denned alone.

Thirty-five (85%) of 41 excavated dens examined contained nest materials. Twenty-nine nests were constructed from brush or boughs dragged into the den from the vicinity of the den; 6 were constructed from grass. Wood fragments were used as nest material in 12 tree and 2 log dens; 1 tree and 1 log den contained evergreen boughs brought in from the outside. Erickson (1964), Jonkel and Cowan (1971), and Lindzey and Meslow (1976*b*) reported that 30%, 30%, and 80% of dens they examined contained nest material, respectively. All dens examined by Johnson (1978) in Tennessee contained nest material.

No significant difference ( $X^2 = 0.07$ ,  $P > 0.10$ ) was found between the proportion of males and females that lined their dens with nest materials. One adult female lined 3 of 4 dens she used during the study. Jonkel and Cowan (1971) observed that some bears blocked the entrance to their den with nest material. We observed the same behavior at some tree and rock dens, but not at excavated ground dens. Johnson (1978) reported that black bears in Tennessee made no attempt to block den entrances with nest materials.

## DEN SELECTION AND USE

It appeared that black bears in west-central Idaho had knowledge of the location of several dens within their respective home ranges for use during hibernation. Investigator disturbance resulted in one adult female occupying at least 8 different dens over a period of 5 winters.

Thirty-nine dens were monitored in late November and early December of 1976 and 1977 for reuse. Two of these dens were occupied by bears other than the bear originally found at those sites; both cases involved yearling offspring of the female originally found in the den. Two additional ground dens were reused by the bears originally known to have occupied them. These dens were not, however, reused in consecutive years. No instances of co-occupancy were observed. The tendency of bears to reuse den sites varied among areas and appeared related to the durability of dens. Craighead and Craighead

Table 4. Mean respiration, temperature, and heart rates of active and dormant black bears captured in west-central Idaho, 1973–77.

Season	Respiration (breaths/min)		Temperature (C)		Heart rate (beats/min)	
	<i>N</i>	$\bar{x} \pm SD$	<i>N</i>	$\bar{x} \pm SD$	<i>N</i>	$\bar{x} \pm SD$
Active (May – October)	338	16 ± 9	388	38 ± 1	333	135 ± 27
Dormant						
November	14	6 ± 2	12	36 ± 1	15	88 ± 28
December	6	8 ± 6	12	34 ± 3	7	94 ± 49
March	27	7 ± 4	37	37 ± 1	32	89 ± 33

(1972) and Lentfer et al. (1972) observed 1 instance each of den reuse in Yellowstone National Park and Alaska. They attributed lack of reuse to the propensity of dens to collapse during spring thaw. Jonkel and Cowan (1971) and Pearson (1975) also observed low instances of den reuse in Montana and the Yukon Territory. Reynolds et al. (1976) and Johnson (1978) observed no instances of den reuse in Alaska and the Great Smoky Mountains National Park.

Lindzey and Meslow (1976*b*) suggested that the similarity in chamber size and entrance height of dens occupied by adult females and yearlings may reflect the tendency of bears to use dens constructed previously. Yearlings, especially females, may use dens constructed by their mothers. Although our data indicated that bears did not use dens extensively during the active season (May–October), we suggest that they do visit them periodically and that the offspring may learn their location during these visits. Servheen and Klaver (1983) found that grizzly bears in northwestern Montana visited their dens occasionally during the summer months.

## PHYSIOLOGY OF DENNED BEARS

Physiological data collected from denned bears (Table 4) and observations of their behavior immediately before and after the denning period suggested that they experienced a metabolic shift, prior to denning, which resulted in their becoming more lethargic. It appeared that the metabolic shift was reversed sometime prior to emergence and that full activity levels were reached several weeks later. We observed no evidence that any body wastes were eliminated during the denning period.

Black bears in west-central Idaho had mean rectal temperatures ( $\pm$ SD) of  $36.1 \pm 1.9$  C after being immobilized and removed from their dens. Craighead et al. (1971) reported that the telemetered rectal temperature of an undrugged black bear in February was approximately  $35.3 \text{ C} \pm 0.6$  C for day-night variation. They also stated that the mean temperature of this bear in March was slightly higher, and suggested that disturbing the bear a second time caused the higher recording. Our data suggested that body temperature dropped as the period of dormancy progressed and then rose again before emergence. An observed side effect of phencyclidine hydrochloride was elevated body temperature (Seal et al. 1970), but the similarity between body temperatures measured by Craighead et al. (1971) in an undrugged black bear and the temperatures we measured suggested that phencyclidine hydrochloride had no appreciable effect during November, December, and March when ambient temperatures were lower than body temperature.

We examined foot pads of 49 bears on 82 occasions during winter dormancy (13 in November, 13 in December, and 56 in March). We observed no instances of foot pad shedding except during March, when 3 bears had completely shed foot pads, 3 showed no apparent shedding, and 50 were in various stages of shedding pads. Digital pads were shed before plantar pads and front pads were usually more completely shed than rear plantar pads. No foot pad shedding occurred in newborn cubs, but all other age classes were represented.

Rogers (1974) described the shedding of foot pads by black bears during denning periods in Minnesota and suggested that tender paws may be a factor restricting early spring movements. Foot pad shedding may hamper bear movements immediately after emergence from the den, but we believe that the restricted movements (Amstrup and Beecham 1976, Reynolds and Beecham 1980) were probably influenced by the bears' physiological condition more than by tender paws.

## CONCLUSIONS

The availability of dens did not appear to limit black bear population size in west-central Idaho,

and most bears did not require large areas of remote habitat for denning. The importance of concealment, however, was reflected in the tendency of bears denning at mid- to low elevations (<1800 m) to select den sites in thick brush pockets, while those denning at higher elevations often used relatively open areas. Protection from exposure to inclement conditions also appeared important because most bears denned on aspects where snow persisted for long periods. The lack of data on the availability of aspects, however, precludes any definitive conclusions.

Although the availability of suitable trees for denning was certainly reduced by extensive logging operations on the study area, soil conditions were conducive to the construction of ground dens. However, in areas where soil conditions are not suitable for excavating hibernacula, black bears may be dependent on old-growth timber stands for denning sites. The black bear dens we examined were not restricted in distribution to any core areas either within the home range of an individual bear or in the study area. As a result, management of specific areas as core denning areas is not feasible in the study area, although it may have application in areas where bears extensively use trees for denning.

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