SOME POPULATION CHARACTERISTICS OF TWO BLACK BEAR POPULATIONS IN IDAHO

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Abstract: Two geographically discrete populations of black bears (*Ursus americanus*) in Idaho were studied during 1973-76. The Council population, located in west-central Idaho, has a history of heavy hunting pressure, accessibility, and liberal hunting seasons. The Lowell population in north-central Idaho has relatively light hunting pressure, poor accessibility, and liberal hunting seasons. An analysis of the male and female age structures indicated that adult males were more susceptible to hunting than other segments of the population. Sex composition differed significantly between subadult and adult segments of the 2 populations, but not between populations. Mean litter size was 1.9 at Council and 1.7 at Lowell. Productivity (number of young produced per year) appears to be density-independent and a function of habitat quality and the number of adult females present in the population.

Although several recent reports concern population parameters of bears, no data have been published comparing density, age and sex compositon, and reproductive biology of exploited and unexploited populations of black bears (Jonkel and Cowan 1971, Kemp 1972, Craighead et al. 1974, Pearson 1975). In 1973, the Idaho Department of Fish and Game initiated a black bear study in the area of Council, Idaho. The objectives of this study were to ascertain the density, sex and age structure, movements, breeding biology, denning ecology, and food habits of an exploited black bear population in the southwestern part of the state. A second black bear study was begun in 1975 in the Lowell area of Idaho in conjunction with a mortality study of calf elk (*Cervus elaphus*). The objectives of this second study were to determine the density, sex and age composition, reproductive biology, and food habits of an unexploited black bear population. Some population characteristics of these geographically discrete black bear populations are reported here.

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STUDY AREA

Black bear populations occur primarily in the northern two-thirds of the state, with isolated populations in eastern Idaho along the Montana and Wyoming state lines (Fig. 1).

The Council study area is located approximately 16 km southeast of Council, Idaho. The predominant geographic features of the area are Council Mountain and West Mountain Ridge. Elevations range from 1,040 m to over 2,470 m on Council Mountain. The area trapped was approximately 130 km^2.

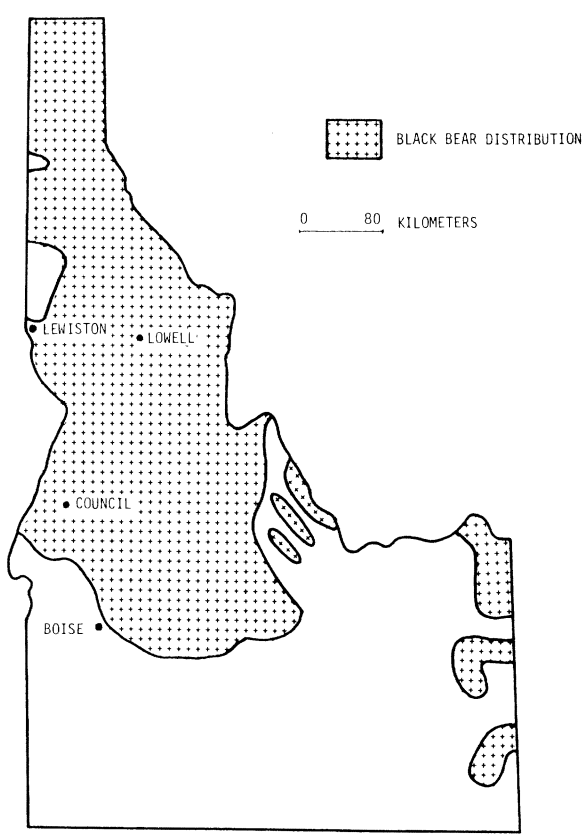

Fig. 1. Map of Idaho showing location of Council and Lowell study areas and distribution of black bears in the state.

Timber stands on the area range from dense to open with some natural bare areas. Dominant tree species are grand fir (*Abies grandis*), subalpine fir (*A. lasiocarpa*), Engelmann spruce (*Picea engelmannii*), ponderosa pine (*Pinus ponderosa*), and Douglas fir (*Pseudotsuga menziesii*). Logging and cattle grazing are the major land uses in the area.

The Council area was chosen for study because of a concern for the status of its black bear population. This area has a history of heavy hunting pressure, accessibility, and liberal hunting seasons.

The Lowell study area encompasses 260 km^2 and is located approximately 160 km east of Lewiston, Idaho. The predominant feature of this area is Coolwater Ridge, which bisects the area from west to east. Elevations range from 460 m to 2,135 m.

The Lowell area has a long history of fire dating back to the 1750s and, as a result, contains vast areas of seral brushfields. Most timber stands are relatively dense and contain ponderosa pine, Douglas fir, and grand fir at lower elevations. Engelmann spruce, subaline fir, and western red cedar (*Thuja plicata*) are found at higher elevations and on the more mesic sites. Cattle grazing is the major land use in the area. Only 1 road enters the study area. The Lowell area has light hunting pressure, poor accessibility, and liberal hunting seasons.

The climates of the 2 areas are influenced primarily by maritime air from the Pacific Ocean and are characterized by moderately long, cold, wet winters and dry, hot summers. Precipitation averages 81 cm.

METHODS

Several black bears were captured on the Lowell area in 1975 by tranquilizing them with a Cap-chur gun and dart from a Hiller 12-E helicopter. Most bears, however, were captured with Aldrich spring-activated snares in or adjacent to cubby sets baited with spawned-out salmon (*Oncorhynchus tshawytscha*) or steelhead (*Salmo gairdneri*). The snares were usually attached to green drag logs placed beside the cubby. In 1976, all snares set on the Lowell area were attached to live trees to facilitate the removal of the bears from that study area by helicopter.

A syringe mounted on the end of a 2-m jab stick was used to inject Sernylan (phencyclidine hydrochloride; dosage rate approximately 1.3 mg/kg of body weight) into all snared bears to immobilize them. A standard 300-mg dose of Sernylan was used on adult bears shot from the helicopter.

All captured bears were tagged with numbered aluminum ear tags. In addition, they were tattooed with corresponding numbers in the right ear and upper right lip. Forty-five bears were radio-marked on the Council area. Most captured bears were weighed, and physical measurements were taken on all bears.

Bears in the Lowell study area were trapped during June and early July in 1975 and 1976; bears in the Council area were trapped from May until mid-August during 1973-76. Only those data collected at Council from May until mid-July in 1973 and 1974 were used to compare with Lowell information so that the periods of data collection on the 2 areas would be comparable.

RESULTS AND DISCUSSION

Density

Black bears in Idaho tend to move to lower elevations shortly after emerging from their dens in the spring (Amstrup and Beecham 1976). As a result, density estimates derived from spring and early-summer trapping may be slightly inflated, but any bias should be similar on the 2 areas.

Preliminary life-table data indicate substantial ingress and egress of subadults ($\leq$ 3 years of age) at Council (Beecham, unpublished data). Because this movement would influence marked-unmarked ratios and inflate population estimates, we computed the density of the relatively stable adult segment of the population by using the Lincoln Index technique. To this figure we added the number of subadults, calculated from the ratio of subadults to adults, to give a total population estimate. This technique was applied to data collected on both areas.

A total of 47 individual bears were captured 58 times at Council and 100 individuals 120 times on the Lowell study area.

The estimated density of black bears on the Council and Lowell study areas was 1 bear per 2.1 km^2 and 1 bear per 2.3 km^2, respectively. Similar densities were found in Alberta (1 per 2.6 km^2; Kemp 1972:27) and Montana (1 per 2.1-4.4 km^2; Jonkel and Cowan 1971:41) and somewhat lower densities in a Michigan study (1 per 8.8 km^2; Erickson and Petrides 1964:48).

Age Composition

Few data are available that demonstrate how the age composition of an unexploited bear population changes under the influence of increased hunting pressure. The heavily hunted Council population had a 50:50 subadult-adult ratio, whereas the relatively unhunted Lowell population showed a preponderance of adult bears in the population (Table 1). An analysis of the

Table 1. Sex and age composition of black bears captured at Council (1973-74) and Lowell (1975-76), Idaho. Numbers in parentheses are percentages.

Location	Number of males			Number of females			Total	
	Subadult	Adult	Total	Subadult	Adult	Total	Subadult	Adult
Council	14 (58)	10 (42)	24 (51)	8 (35)	15 (65)	23 (49)	22 (47)	25 (53)
Lowell	20 (36)	35 (64)	55 (55)	9 (20)	36 (80)	45 (45)	29 (29)	71 (71)

male and female age structures indicated that adult males were the most susceptible segment of the population to hunting. Ingress and egress of subadult males were primarily responsible for maintaining population numbers at Council, although some subadult females also moved into and out of the area.

Most investigators have reported subadult-adult ratios approaching 50:50 (Erickson and Petrides 1964, Jonkel and Cowan 1971, Kemp 1972).

Sex Ratios

Sex ratios reported for cub black bears have not differed significantly from 50:50 (Jonkel and Cowan 1971, Kemp 1972). Sex ratios for adult black bears, however, have ranged from 50:50 to being skewed towards males (Raybourne 1976), depending on the method of collection.

Sex ratios obtained from capture data on the Council and Lowell study areas did not differ from 50:50. Sex composition data differed significantly between subadult and adult segments of the 2 populations, but not within each component (Table 1).

Radiotracking of all sex- and age-classes of black bears at Council (Amstrup and Beecham 1976, Reynolds and Beecham 1980) revealed that subadult and adult males traveled more extensively than other age- and sex-classes of bears. This behavioral trait undoubtedly increased their vulnerability to trapping and hunting and inflated our estimates of their numbers. As a result, the actual sex ratio of both populations may slightly favor females. Our data suggest that bear hunters in Idaho are unable to distinguish between males and females in the field before killing them. Thus, any bias in our harvest data would come from differential vulnerability of the sexes.

Reproductive Biology

The reproductive potential of a specific bear population becomes increasingly important as hunter pressure and other mortality factors increase. Habitat quality appears to be a significant factor determining both minimum breeding age and litter size of black bear populations (Erickson and Nellor 1964, Jonkel and Cowan 1971).

We were able to determine the minimum breeding age for 8 females bears at Council (Reynolds and Beecham 1980). Three bears successfully bred at 3.5 years of age, 4 at 4.5 years, and 1 at 5.5 years. At Lowell, 2 female black bears bred at 3.5 years of age and 4 bred at 4.5 years; 1 female 5.5 years old had not successfully bred. Jonkel and Cowan (1971) reported females in estrus at 4.5 years of age, but no litters were produced until 6.5 years.

Mean litter size at Council was 1.9 and at Lowell was 1.7 (Table 2). Jonkel and Cowan (1971) reported that average litter sizes in Montana ranged from 1.5 to 1.8. Spencer (1955), Stickley (1961), and Erickson and Petrides (1964) all reported mean litter sizes exceeding 2.1.

Table 2. Litter size in black bear populations, Council (1973-74) and Lowell (1975-76), Idaho.

Area	*N*	Litter size			Mean
		1	2	3	
Council	11	1	10	-	1.90
Lowell	23	10	11	2	1.65
Total	34	11	21	2	1.74

Jonkel and Cowan (1971) commented that the late minimum breeding age and low mean litter size they observed in a Montana black bear population were due to poor nutritive status. We observed somewhat lower minimum breeding ages and a larger mean litter size ($P < 0.10$) at Council. We concur with Jonkel and Cowan (1971) that minimum breeding age and mean litter size are functions of habitat quality. We believe that the larger litter size observed at Council was not a compensatory response to excessive adult mortality. Craighead et al. (1974) suggested that increased reproductive rates and increased survival of subadults may compensate for excesses in adult mortality. Our data indicate that increased survival and ingress of subadult bears may partially offset adult mortality. Reproductive rates, how-

ever, appear to be independent of density (Beecham, unpublished data).

Population-regulating Mechanisms

The causes of natural mortality in bear populations remain largely unknown. If we assume that habitat is probably the ultimate factor operating to control bear populations, social intolerance with the resultant dispersal of subadults appears to be the proximate mechanism that was regulating bear populations on the study areas. Stokes (1970) and Kemp (1972) concluded the same for grizzly (*Ursus arctos*) and black bears, respectively.

Despite the difficulty of documenting specific cases of subadult mortality, limited evidence indicates that adult males do kill other bears. Pearson (1975) reported 2 separate cases where an aged grizzly bear and a subadult (4.5 years) were killed by other grizzlies. Jonkel and Cowan (1971) documented the killing of a yearling black bear in 1 of their traps by a large black bear or a grizzly bear. In 1975, shortly after a 3.5-year-old female black bear was released from a trap, it was killed and partially eaten by a large black bear at Lowell. Although predation by adult bears on subadults has been documented, we feel that dispersal of subadults, primarily males, is the more important regulating mechanism operative in the black bear population at Lowell. Capture rates of untagged, ingressing subadult males at Council support this conclusion (Beecham, unpublished data).

Pearson (1975) captured 2 male grizzly bears with large, infected wounds that he felt could have been inflicted only by another grizzly. Fresh wounds and scarring were commonly observed on adult male black bears captured at Lowell but were recorded only occasionally for adult males at Council. We believe this strife is a function of the aggressiveness of older-aged bears rather than the result of spatial mechanisms operative in the respective populations. Radiotracking of adult bears at Council supports this conclusion by demonstrating an average overlap of 85 percent in the home ranges of several adult males (Reynolds and Beecham 1980).

MANAGEMENT CONSIDERATIONS

Our data indicate that the productivity (number of young born per year) of a black bear population is density-independent and is a function of habitat quality and the number of adult females present in the population. Therefore, the game manager cannot expect increased productivity as a compensatory factor resulting from the heavy harvest of a black bear population.

Second, without reservoir areas nearby to produce highly mobile subadult bears, heavy hunting pressure can be expected to reduce bear densities.

Third, a decrease in the average age of the bear population indicates decreased opportunity to provide trophy bears. Adult male black bears on the Council and Lowell study areas appear more aggressive and are more mobile than their female counterparts and are therefore more vulnerable to hunting.

We concur with Craighead et al. (1974) in recommending conservative bag limits and bear hunting seasons.

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