SOME DEMOGRAPHIC COMPARISONS OF WILD AND PANHANDLER BEARS IN THE SMOKY MOUNTAINS

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Abstract: Body measurements, sex, weight, age, and reproductive condition were collected from 1,210 captures of wild and 492 captures of panhandler black bears (*Ursus americanus*) trapped in the Smoky Mountains (SM) from 1968 to 1988. Gender was associated with the bear's status (i.e., panhandler/wild) (panhandler: 60% male, wild: 54% male, $P = 0.056$). Wild male bears were significantly older than panhandler males (3.9 vs 2.9 yr, $P = 0.0001$); wild female bears were older than panhandler females (4.9 vs 3.7 yr, $P = 0.004$). Male and female panhandlers were significantly heavier than their wild counterparts ($P < 0.05$), and panhandler bears grew faster than wild bears. The number of lactating females was significantly associated with status ($P < 0.001$); 56% of the panhandler and only 33% of the wild females were lactating.

Panhandlers were more fertile and larger than wild bears likely reflecting the panhandlers' better access to and use of high-energy, human foods particularly during years of natural food shortage. Small amounts of these foods, the availability of which varies with panhandler bear management, appear to make differences in body size. Dispersal and the large home range size of the males and subadults probably explain the propensity of these bears to become panhandlers. The above findings as well as differences in demographic characteristics among wild bears within the Smoky Mountains are further discussed as they relate to the nutritional qualities of the environment.

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Black bears in southeastern North America have lost approximately 90% of their original range (Pelton 1986). Many bear populations that remain in the southeast exist in contiguous areas of natural forest. These areas are largely public lands: state and national forests and parks, national wildlife refuges, and state game lands. The forests of the Smoky Mountains (SM) and neighboring ranges, conserved largely by Great Smoky Mountains National Park (Park or GSMNP) and Cherokee, Nantahala, Chattahochee, and Pisgah National Forests, harbor a significant number of black bears, some of which come into direct and frequent contact with humans.

Because of a variety of factors, including the violation of National Park Service regulations regarding food and bears (Pelton 1975, Singer and Bratton 1980), visitor density (Singer and Bratton 1980, Keay and Van Wagtendonk 1983), bear density, and habitat condition (Harms 1979), panhandler (problem bear) activity in the SM is common. Park officials, in recent years, report an average of 158 incidents/year (SD = 76.7, $n = 11$) of personal property damage caused by black bears (W.J. Cook, Natl. Park Serv., unpubl. data).

Panhandlers in GSMNP have been characterized in previous studies (Beeman and Pelton 1976, 1980; Eiler 1981; Tate 1983; Tate and Pelton 1983). Here and elsewhere, many researchers have indicated that black bears utilizing high-energy, human food grow faster and mature earlier (Rausch 1961, Rogers 1976, Rogers et al. 1976, Alt 1980, Eiler 1981, Tate 1983, Tate and Pelton 1983, Rogers 1987). Differences in characteristics between these bears and black bears that survive on natural foods only (wild bears) likely reflect habitat quality.

In this paper, the demographic characteristics of a relatively large sample of wild and panhandler bears were compared and related to the nutritional qualities of habitat in the Smoky Mountains.

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STUDY AREA

Data were collected in Great Smoky Mountains National Park (Fig. 1) from 1968-1989. It consists of 2,074 km^2 divided nearly equally between Tennessee and North Carolina. Nearly 10 million people visit this Park annually. The Park is characterized by steep ridges, narrow valleys, coves, and fast-flowing streams (King and Stupka 1950). Elevation ranges from 230-2,035 m (Pelton et al. 1980). Average annual temperatures vary from 14 C at low elevations to 8 C on upper slopes (Garshelis and Pelton 1980). Considered a temperate rain

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forest (Thornthwaite 1948), the Park receives 140 cm of precipitation at low elevations and 230 cm at high elevations (Stephens 1969). Six major forest types are recognized (Shanks 1954): cove hardwood, hemlock (*Tsuga canadensis*), northern hardwood, open oak-pine (*Quercus* spp.-*Pinus* spp.), closed oak, and spruce-fir (*Picea rubens-Abies fraseri*). Understory vegetation is dominated by mountain laurel (*Kalmia latifolia*), rhododendron (*Rhododendron* spp.), blueberries (*Vaccinium* spp.) and huckleberries (*Gaylussacia* spp.).

The Pisgah National Forest (PNF) study area comprises 114 km^2 (Beringer 1986) in North Carolina (Fig. 1). This area, northeast of GSMNP, is similar to the Park in terms of climate and geology. Elevations commonly range 439-1,411 m (Beringer 1986). Of the nearly 2,000 plant species identified in this national forest, several predominate the overstory including white, northern red, scarlet and chestnut oaks (*Quercus* spp.), hickory (*Carya* spp.) and yellow-poplar (*Liriodendron tulipifera*); nearly 90% of the study area is in hardwoods with oak or oak-associates comprising 74% (U.S. Forest Service 1981). In 1971, the area was designated as the Harmon Den Bear Sanctuary with hunting restricted to that of small game (excluding raccoon) and deer (Beringer 1986). Bear poaching within and around the sanctuary likely is a significant source of mortality. Logging operations, managed by the U.S. Forest Service, continue today although not with the same intensity as in the early 1900's (Beringer 1986). The University of Tennessee has conducted black bear research in Pisgah National Forest since 1982.

In the same mountain range, but to the southwest of the Park, lies the Cherokee National Forest (CNF) study area (Fig. 1). It is situated within the Tellico Ranger District, Tennessee, and constitutes about 760 km^2 (Clevenger 1986). It also is similar in geology and climate to that of the Park. Elevations range from 450-1,550 m, and the area is generally characterized by steep mountains and fast-flowing streams (Clevenger 1986). It is 99% forested with 5 major plant communities recognized: cove hardwood, northern hardwood, oak-hickory, pine, and mesic hemlock (Clevenger 1986). The forest cover was significantly altered by logging and associated fires, until the Forest Service purchased the land in the 1930's (Clevenger 1986). A 124-km^2 segment of the study area serves as a bear refuge reserved for small game hunting (Clevenger 1986). Black bear data were collected in the Cherokee study area from 1972-1984.

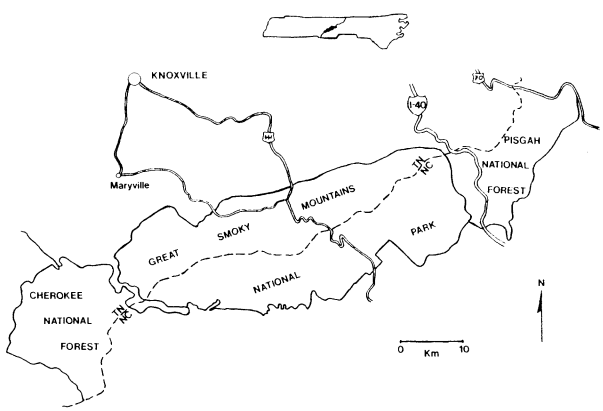

Fig. 1. Location of Great Smoky Mountains National Park and Cherokee and Pisgah National Forests in eastern Tennessee and western North Carolina.

METHODS

Wild and panhandler bears were captured from spring through fall, 1968-1988, with snares or culvert traps. Trapping and marking techniques described by Johnson and Pelton (1980*a*, *b*) were used. In most cases, a 20:10:2 mg/ml mixture of rompun, ketaset, and carbocaine was used to sedate the bears, though, in earlier years, other immobilizing drugs were employed (Cook 1982). A premolar extracted from each bear was sectioned and stained (Eagle and Pelton 1978) for age determination (Willey 1974). Bears whose ages were >3 years were considered adults. Females were examined for evidence of lactation, and to aid in its detection, oxytocin or pitocin was administered. Body weights were measured with spring scales (300- and 500-lb capacity); these weights were later converted to kilograms. In addition to the body measurements outlined in LeCount (1986), the following were measured: head width at the zygomatic arch; head length - from the tip of the nose to the apex of the sagittal crest; forearm circumference - at the point immediately distal to the elbow.

Litter size was determined from visual observations at capture and during winter den investigations. Sonagram analysis also was used to assess litter size (Wathen 1983).

Field data were organized and statistically analyzed with the statistical analysis systems (SAS Institute 1985). To incorporate all the data, recaptures were used in the analysis; analyses incorporating data just on individual bears were similar in terms of significant results (McLean unpubl. data; see Table 1). Mast index values (C.J. Whitehead. 1969. Oak mast yields on wildlife management areas in Tennessee. Tenn. Game and Fish, Unpubl. Rep. 11pp.) were generated from mast data collected annually (Tennessee Wildlife Resources Agency, unpubl. data). Age of primiparity was determined from reproductive histories. Chi-square served to assess the

Table 1. Mean values of body measurements of adult wild and panhandler black bears handled in the Smoky Mountains, 1968-1988.

Body measurement	Wild bears[a]		Panhandler bears	
	Male	Female	Male	Female
Weight (kg)	73.8[b] (29.3, 335)[c]	50.1 (13.6, 352)	102.3* (40.9, 101)	60.3* (14.0, 84)
Total length (cm)	156.5 (17.9, 311)	142.7 (14.0, 339)	167.2* (17.9, 82)	152.7* (11.2, 79)
Neck (cm)	55.0 (10.2, 309)	45.5 (5.8, 335)	58.4* (11.0, 74)	47.5* (5.7, 79)
Chest (cm)	86.1 (14.3, 308)	75.2 (9.4, 336)	93.6* (18.9, 73)	79.3* (11.0, 79)
Shoulder (cm)	81.0 (11.0, 309)	73.0 (7.1, 340)	85.4* (9.1, 72)	76.6* (6.3, 77)
Forearm (cm)	32.7 (5.2, 308)	28.1 (3.2, 335)	33.7 (5.2, 75)	29.7* (5.9, 79)
Head width (cm)	27.5 (4.8, 239)	24.8 (3.8, 273)	28.2 (4.8, 57)	26.3* (2.4, 73)
Head length (cm)	33.4 (3.6, 312)	30.7 (1.9, 341)	34.3* (3.5, 83)	30.4 (2.7, 80)

[a] Includes 1 or 2 individuals not classified as Park or national forest bears.
[b] By individual: weight of wild males = 67.3 ± 26.64 kg (n = 201) and panhandler males = 91.8 ± 42.40 kg (n = 42), P = 0.0001.
[c] (SD, n)
* Denotes significant ($P < 0.05$) difference from the wild counterpart.

degree of association between 2 or more variables. The t-test served to compare means of the body measurements and ages. Based on mean weights for wild and panhandler bears, the analysis of covariance was used to model the growth rates of bears.

RESULTS

Data from 1,210[†] (604 individual) wild and 492[†] (274 individual) panhandler black bear captures were examined. Most (83%, n = 1,413) of the bears were handled in Great Smoky Mountains National Park, and less than 5% of the wild and 15% of the panhandler bears were recaptured in the same year.

The status (wild or panhandler) of the bear and its gender were associated (X^2 = 3.7, 1 df, P = 0.056). Of the wild bear captures, 54% (n = 557) were males, whereas 60% (n = 289) of the panhandler captures were males.

Status also was significantly ($P < 0.001$) associated with maturity (subadult or adult). Of the male captures, 29% (n = 152) of the wild and 47% (n = 101) of the panhandler bears were subadults (X^2 = 22.9, 1 df). Of the female captures, 19% (n = 86) of the wild and 37% (n = 54) of the panhandler bears were subadults (X^2 = 17.9, 1 df).

The mean ages of wild (4.4 ± 2.64 [SD] yr, n = 559) and panhandler (3.2 ± 2.93 yr, n = 194) black bears were significantly different ($P \leq 0.004$). Wild males had an average age of 3.9 ± 2.09 years (n = 323), and the mean age of panhandler males was 2.9 ± 2.40 years (n = 115). Wild females averaged 4.9 ± 3.16 years (n = 236), and panhandlers 3.7 ± 3.52 years (n = 79). Maximum ages were 15.5 years for wild males, 12.5 for panhandler males, 22.5 for wild females, and 16.5 for panhandler females.

Adult panhandlers were significantly heavier and longer and had larger necks, chests, and heights at the shoulder than their wild counterparts (Table 1). Subadults were significantly heavier than wild bears (Table 2).

Wild bears of the national forests were bigger than Park bears (Table 3). Adults in Cherokee and Pisgah National Forests were significantly heavier (Table 3). Subadults were significantly heavier, and males were significantly larger in all body measurements (Table 4).

Panhandlers grew faster than their wild counterparts (Fig. 2). Panhandler males grew the fastest; wild females the slowest. The growth of females leveled off, whereas males continued to grow; wild females reached their greatest weight (25 kg) at age 9, and panhandler females

Table 2. Mean values of body measurements of subadult wild and panhandler black bears handled in the Smoky Mountains, 1968-1988.

Body measurement	Wild bears[a]		Panhandler bears	
	Male	Female	Male	Female
Weight (kg)	36.4 (21.5, 165)[b]	27.7 (14.6, 107)	57.6* (47.9, 147)	35.5* (24.1, 98)
Total length (cm)	125.4 (23.0, 148)	117.1 (20.4, 97)	126.9 (30.0, 115)	119.4 (29.8, 85)
Neck (cm)	40.0 (9.4, 145)	36.0 (8.2, 99)	40.5 (12.2, 113)	36.6 (9.7, 83)
Chest (cm)	65.4 (15.1, 146)	60.2 (14.9, 96)	67.1 (20.0, 114)	60.9 (18.4, 84)
Shoulder (cm)	63.8 (12.9, 146)	58.9 (12.3, 93)	62.7 (14.6, 104)	61.2 (15.5, 81)
Forearm (cm)	25.7 (5.7, 145)	22.9 (4.8, 95)	25.7 (6.3, 110)	22.6 (5.5, 83)
Head width (cm)	21.8 (4.5, 126)	19.5 (4.3, 80)	22.6 (4.3, 95)	21.4* (4.3, 79)
Head length (cm)	28.5 (4.1, 147)	26.7 (3.5, 96)	27.7 (5.0, 115)	25.6 (4.9, 84)

[a] Includes 1 or 2 individuals not classified as Park or national forest bears.
[b] (SD, n)
* Denotes a significant ($P < 0.05$) difference from the wild counterpart.

[†] These numbers represent totals; sample size for each analysis will vary based on data available.

Table 3. Mean values of body measurements of adult wild black bears handled in GSMNP and the national forests, 1972-1988.

Body measurement	GSMNP		CNF and PNF	
	Male	Female	Male	Female
Weight (kg)	71.6 (26.2, 275)[a]	48.5 (11.7, 279)	84.0* (39.3, 60)	55.4* (16.5, 72)
Total length (cm)	156.1 (16.8, 261)	142.7 (10.2, 278)	158.5 (22.8, 50)	142.6 (24.8, 61)
Neck (cm)	54.6 (9.7, 264)	44.8 (4.8, 276)	57.3 (12.4, 45)	48.6* (8.5, 59)
Chest (cm)	86.4 (14.0, 262)	74.9 (9.3, 278)	85.0 (15.9, 46)	76.9 (10.1, 58)
Shoulder (cm)	81.5 (10.5, 259)	73.5 (6.4, 279)	78.6 (12.9, 50)	70.8 (9.5, 61)
Forearm (cm)	32.8 (5.0, 264)	27.9 (2.5, 277)	32.0 (6.1, 44)	29.1 (5.3, 58)
Head width (cm)	27.8 (4.5, 206)	24.7 (2.9, 227)	25.9 (6.1, 33)	25.5 (6.6, 46)
Head length (cm)	33.2 (3.4, 262)	30.5 (1.6, 280)	34.3 (4.5, 50)	31.3* (2.9, 61)

[a] (SD, *n*)
* Denotes a significant ($P < 0.05$) difference from the GSMNP counterpart.

Table 4. Mean values of body measurements of subadult wild black bears handled in GSMNP and the national forests, 1972-1988.

Body measurement	GSMNP		CNF and PNF	
	Male	Female	Male	Female
Weight (kg)	32.4 (20.9, 115)[a]	26.1 (15.6, 66)	44.7* (20.3, 49)	29.8 (12.6, 40)
Total length (cm)	120.8 (22.8, 106)	116.2 (22.5, 61)	137.0* (19.4, 42)	118.7 (16.5, 36)
Neck (cm)	37.8 (8.1, 105)	34.4 (8.6, 63)	46.0* (10.2, 40)	38.7* (6.7, 36)
Chest (cm)	61.8 (13.4, 105)	57.6 (15.1, 60)	73.7* (14.9, 40)	64.6* (13.7, 36)
Shoulder (cm)	63.2 (12.3, 105)	58.9 (11.5, 57)	65.5* (14.4, 41)	58.9 (13.7, 36)
Forearm (cm)	24.5 (5.1, 105)	22.3 (4.5, 59)	28.4* (5.8, 39)	24.0 (5.2, 36)
Head width (cm)	21.1 (3.9, 93)	20.4 (3.8, 52)	23.8* (5.5, 33)	17.9* (4.7, 28)
Head length (cm)	27.5 (3.7, 105)	26.2 (3.5, 60)	31.1* (3.9, 42)	27.6 (3.4, 36)

[a] (SD, *n*)
* Denotes a significant ($P < 0.05$) difference from the GSMNP counterpart.

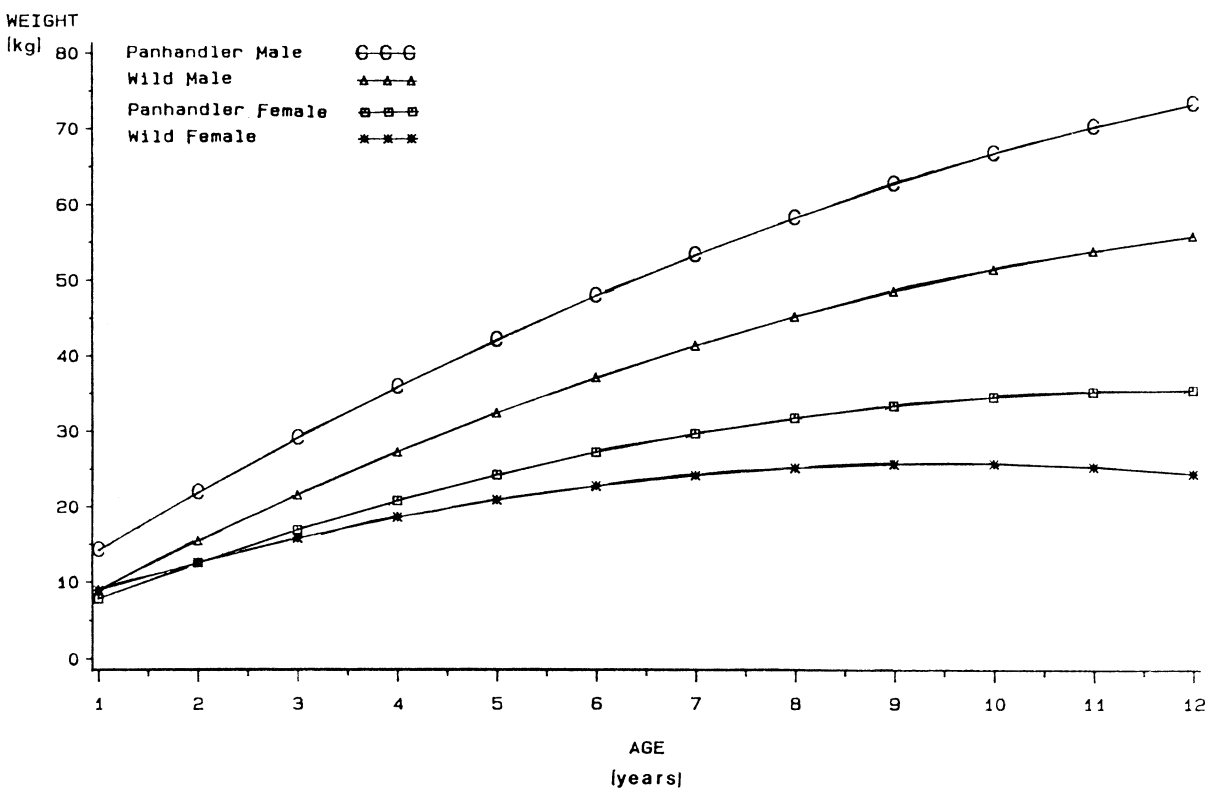

Fig. 2. The growth rates of male and female, wild and panhandler black bears in the Smoky Mountains, 1968-1988.

appeared to attain their maximum weight (35 kg) at age 12. Contrasts performed with the analysis of covariance revealed that growth of panhandlers was significantly ($P < 0.05$) different from their wild counterparts for all ages above age 2. Autocorrelation did not confound this analysis (Durbin-Watson $D = 2.24$, $P > 0.05$).

Panhandler females were more fertile than wild bears. The number of lactating females was significantly associated with status ($X^2 = 12.026$, 1 df, $P \leq 0.001$). Fifty-six percent ($n = 34$) of the panhandlers were lactating, whereas only 33% ($n = 146$) of the wild females were. In addition, 19% ($n = 17$) of the panhandler and only 2% ($n = 5$) of the wild females were observed with litters of 3 or 4 young. The mean minimum age of primiparity for panhandlers (3.5 ± 0.71 yr, $n = 2$) was less than that for wild females (4.2 ± 1.04 yr, $n = 21$).

Fertility varied by study area. Fifty percent ($n = 41$) of the adult bears in the national forests and only 29% ($n = 105$) of the Park females were lactating ($X^2 = 13.228$, 1 df, $P = 0.001$). Moreover, the mean minimum age of primiparity for females in the national forests (3.60 ± 0.699 yr, $n = 10$) was significantly ($P = 0.004$) less than that for Park females (4.82 ± 0.982 yr, $n = 11$).

DISCUSSION

Males predominated among panhandler bears; this is consistent with most studies of problem bears. In an earlier study of homing of bears in the SM (Beeman and Pelton 1976), 87% of the relocated bears were males. Other studies indicated a similar preponderance of males (Erickson et al. 1964, Harger 1967, Wasem 1968, Sauer et al. 1969, Beeman 1975, Piekielek and Burton 1975, Payne 1978, Beeman and Pelton 1980, Singer and Bratton 1980, McArthur 1981, Tait and Pelton 1983).

Male predominance may be explained by the transient nature of males and the greater likelihood that males rather than females with cubs would be relocated (Tait and Pelton 1983). Males have larger home ranges (see Rogers 1987: 19) and, for a variety of possible reasons including aggression (Pelton 1982, Tait and Pelton 1983), food shortage (Rogers 1987), and avoidance of inbreeding (Packer 1979, Greenwood 1980, Rogers 1987), they disperse farther than females (Rogers 1987).

Lower survival among panhandlers likely contributes to their young age structure. Females are more vulnerable to poaching due to their proximity to roadsides. Beeman and Pelton (1976) suggested that a young male age structure resulted from the removal of adult males by Park officials. Males are vulnerable to legal harvest and poaching mainly due to their large home ranges (Pelton 1982), portions of which often lie near or outside the protective boundaries of the Park. Jonkel and Cowan (1971) and Rogers (1987) indicated that subadult males disperse farther than females. Subadult males, in search of areas of few dominant males and plentiful food, are likely to encounter a panhandling opportunity and become more vulnerable, particularly in concentrations of human activity and foods (Rogers 1987).

Panhandlers were not only bigger than wild black bears but grew faster; 2 other studies comparing panhandler and wild bears in the Park had similar findings. Tate (1983) found that male ($n = 45$) and female ($n = 17$) panhandlers weighed significantly ($P < 0.02$) more than their wild counterparts of the same age. Using growth curve models based on Brody (1964), Eiler (1981) compared the weights of 54 male and 25 female panhandlers with 174 wild males and 158 wild females and found that panhandlers weighed more than their wild counterparts of the same age.

Such differences in size and growth reflect the panhandlers access to and consumption of high-energy, human foods. These foods supplement the bear's natural diet and are high in sugars and other carbohydrates that are readily converted to and stored as fats (Tate 1983). Rausch (1961) reported that well-fed, captive black bears developed more rapidly than wild ones. Rogers (1976) also reported that captive bears raised on rich diets developed more rapidly than bears on natural ones. In Michigan, subadult bears feeding at dumps made superior weight gains over bears that fed exclusively on natural foods (Rogers et al. 1976, Rogers 1987). Bears in Pennsylvania, reputedly the fastest growing of any wild black bears (Rogers 1987), attain greater weights because of relatively abundant and consistent natural foods and sources of food (garbage, corn fields, bird feeders, apiaries) deliberately or inadvertently furnished by humans (Alt 1980).

Problem bears were more productive than wild black bears. In the same study area, Tate (1983) revealed that litters of 3 or 4 cubs among panhandlers were common and that some panhandler females mated at 2.5 years. Although our sample of primiparous females was small ($n = 2$), panhandler females first had young at age 3.5, and a high percentage of all female panhandlers were observed with litters of 3 or 4 young.

Improved fertility among panhandler bears or bears that supplement their natural diets with high-energy, human food is common. Rogers (1976) reported that both sexes of captive bears fed on rich diets reached maturity at 2.5 years. He also found that black bears that supplement their diets with garbage tend to have litters at a

younger age (Rogers 1987). Female bears in Michigan frequenting sources of garbage had significantly larger litters than females that did not visit such sources (Rogers et al. 1976). In Pennsylvania, where black bears commonly exploit garbage dumps and corn fields, the average litter size is 2.9 (Alt 1982); 38% of the 2-year-old females taken in the fall harvest were pregnant and the first litter of females averaged 2.39 cubs and subsequent litters averaged 3.23 cubs (Kordek and Lindzey 1980). These natality rates are the highest of any reported for wild black bears (Rogers 1983).

Differences in demographic characteristics of wild and panhandler bears likely reflect habitat quality. The larger size and faster growth rates of panhandlers in the Great Smokies corroborate the contribution of high-energy, human foods, and suggest the failure of natural foods to provide adequate nutrition. Wild black bears in the Great Smokies rely on oak mast, which is often cyclic in production (Zahner 1989). Wathen (1983) and Eiler et al. (1989) indicated that reproductive success of black bears follows years of abundant white oak mast. Beecham (1980) suggested that females in poorer habitat grew more slowly than females in areas replete with food. Over 90% of the females studied in Massachusetts produced young following years of good oak mast; only 29% produced young following years of bad mast production (Elowe 1987). The high growth and fertility rates of black bears in Pennsylvania, where food is consistently abundant, differ dramatically from those in bears in the Great Smokies; rough estimation indicates that even the largest and fastest growing black bear in the Great Smokies (male panhandler) grows to a maximum weight that is about 30% less than that of the average-sized male in Pennsylvania.

Differences in size of wild bears within the Smoky Mountains probably were due to differences in fall mast production. Mast distribution in these mountains is patchy, and previous studies suggest a greater and more even distribution of fall mast in the national forests than in the Park (Brody 1984, Eiler et al. 1989). A comparison of mean mast index values, representing at least 10 years, for the Park (2.45 ± 0.66, $n = 10$) and Cherokee National Forest (3.29 ± 1.18, $n = 15$) indicates that mast production in the national forest is significantly greater ($P = 0.033$). In Pisgah National Forest, the percent of the canopy in oak, estimated at 60-80% (Beringer 1986), is considerably greater than the 30-40% (K. Langdon, Natl. Park Serv., pers. commun.) estimated for the Park.

Habitat quality also may dictate the amount of panhandler activity. In the Park, panhandlers constitute only 5-10% of the bear population (Beeman and Pelton 1980), and they eat predominantly natural foods (Beeman and Pelton 1980, Tate 1983). Increases in the production of these foods would not only boost the carrying capacity of the local habitat, but, conceivably, decrease the amount of panhandler activity. In Yosemite National Park, problem black bears are large (Guse 1970) and comprise 50-80% of the total population (J.A. Keay, Natl. Park Serv., pers. commun.). They may depend on artificial foods, which constitute at least 15% of their diets (Graber and White 1983); this and problem bear abundance may indicate that the Yosemite bear population has exceeded the carrying capacity of the natural habitat.

Differences in demographic characteristics between wild and panhandler bears also may reflect the effects of human food, the availability of which varies with panhandler bear management. The relatively few, but highly visible, panhandlers in the Park, which consumed relatively small amounts of food over a short period of time, were not intensively managed until about 1976. Through public education, sanitization of campgrounds and trash cans, relocation of problem bears, and other management, the incidence of panhandling in the Park decreased; by the late 1970's and early 1980's, panhandlers became less of a problem than a decade earlier. In comparing the demographic characteristics of panhandler and wild bears for the 2 periods, before 1976 and after 1980, significant differences were detected. The differences in weight, and neck and chest circumferences between wild and panhandler bears handled before 1976 were significantly ($P \leq 0.002$) greater than those differences between wild and panhandler bears captured after 1980. For example, before 1976, the mean weights of male subadult panhandler and wild bears were 110.6 ± 59.5 kg ($n = 36$) and 39.2 ± 19.2 kg ($n = 15$), respectively; these weights were significantly different ($P < 0.0001$). However, there was no significant difference in the mean weights of subadult males that were handled after 1979 ($P = 0.68$); the average weight of panhandlers was 36.0 ± 26.8 kg ($n = 80$) and the wild bears' mean weight was 37.6 ± 23.5 kg ($n = 108$). Apparently, then, the panhandlers' access to and consumption of small amounts of human food before 1976 made appreciable differences in terms of their size.

In conclusion, the analysis indicates significant differences in the demographic characteristics of wild and panhandler bears. These differences likely reflect the influence of high-energy, human foods, habitat quality, and the effects of bear management. Given these factors, forestry practices and land management should promote the production of natural foods, particularly hard mast. To ensure the protection of Park visitors and their property, unnatural foods must be kept from bears. Managers

should expect more panhandler activity especially given changes in habitat due to the unreliability of hard mast in the Great Smokies, the loss of the American chestnut (*Castanea dentata*) as a significant mast producer (Zahner 1989), and an impending gypsy moth (*Lymantria dispar*) infestation.

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