HUMAN–BEAR INTERACTIONS IN GREAT SMOKY MOUNTAINS NATIONAL PARK

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Abstract: An ethological investigation of panhandler black bears (*Ursus americanus*), conducted in Great Smoky Mountains National Park from 1976 through 1978, focused on agonistic behavior exhibited by these bears in their interactions with park visitors. Seven different types of aggression were recorded. Apparent precipitating factors for such behavior were divided into 20 categories, e.g., handfeeding, petting, photographing, crowding. Of 392 panhandling sessions, 43.9% involved at least one incidence of agonistic behavior; overall, 624 aggressive acts were recorded. Some types of aggression were more likely to occur, and certain precipitating factors were likely to result in specific types of agonistic behavior. Less than 6% of all aggression led to actual physical contact with visitors. Some individual bears reacted more aggressively than others in their interactions with people. In general, more aggressive behavior was shown by males. Management implications include the need for visitor education, enforcement of National Park Service regulations, removal of garbage, and priorities in relocation of bears.

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Interactions between black bears and humans occur frequently in many national parks in the United States. Such encounters seem unavoidable because the recent upsurge in popularity of these areas has led to an influx of hundreds of thousands of visitors annually into regions that serve as sanctuaries for these animals. However, the concern of park managers and scientists is based upon the fact that some bears exhibit behavior which is atypical of the species. They have learned to associate people (as well as their camping equipment and vehicles) with food, a process which is accelerated by the willingness of many people to offer them handouts. These bears, euphemistically known as panhandlers, forsake their shy and secretive nature and soon begin to beg along roadsides, raid picnic tables, break into coolers, and rip open backpacks. The size and strength of these animals coupled with the general naivete of many park visitors creates a potentially hazardous situation.

Black bears are highly intelligent, possessing both a genetic and learned ability to utilize resources and deal with environmental change (Burghardt and Burghardt 1972, Jonkel 1978). They are basically opportunistic omnivores and are likely to exploit any new food resource that becomes available. Black bears exhibit a plasticity in their sociality with conspecifics (Hornocker 1962, Craighead and Craighead 1971, Stonorov and Stokes 1972, Egbert and Stokes 1976, Rogers 1977, Hemmer 1978) and may also have an adaptability for contact with humans. This hypothesis is supported by their deferring to people as "super bears" in many encounters (Jonkel 1978). Because they are very adaptable animals, it is likely that from an ursid perspective they are coping advantageously with human infringement upon what was once their domain.

The Great Smoky Mountains National Park (GSMNP or Park), where this research was conducted, has high visitor use, a high population density of black bears, and a history of problems with panhandling bears. National Park Service (NPS) records show that visitation increased steadily from 1953, reached more than 9,000,000 in 1977, and decreased slightly thereafter (NPS, unpubl. rep., Environmental assessment of the alternatives for the general management plan, GSMNP, Gatlinburg, Tenn., 1976). Surveys of visitors in the GSMNP revealed that they were generally naive in their dealings with bears and demonstrated the need for more education (Burghardt et al. 1972, Pelton et al. 1976). The density of black bears is relatively high, averaging 1 bear per 2.7 km^2 in the northwest quarter of the Park where ecological and biological studies have been ongoing since 1970 (Pelton and Marcum 1975, Eagar 1977). Beeman and Pelton (1976) estimated that panhandlers are only a small percentage of the population there; however, their importance far outweighs their numbers because they are responsible for the perennial problems of property damage and personal injury. Singer and Bratton (1977) reported 107 incidents of injury and 715 of property damage from 1964 through 1976. NPS records listed property damage at 83 incidents in 1977 and 189 in 1978, with

injuries totalling 8 and 16 for those years, respectively.

It is unlikely, given present policies and available personnel, that a total separation of people and bears is possible in some national parks. Even if all bears panhandling within a particular year were removed (a difficult task when one considers backcountry as well as frontcountry sites), others would eventually learn the habit unless visitors stopped leaving behind garbage as well as actively enticing bears with food. There are also questions (both managerial and ethical) of what to do with these animals after they are captured. However, the magnitude of problems that presently exist can be reduced if management plans are based upon scientific knowledge about the nature of these human–bear interactions. An ethological investigation of panhandling black bears was conducted in the GSMNP from 1976 through 1978. This paper focuses on the different types of agonistic behavior exhibited by bears, what precipitated these acts, and how individual differences in bears were reflected in these encounters.

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PROCEDURES

Minimal interference with the behavior of both bears and people was imperative in a study of this nature. The impracticality of being unseen by either bears or visitors coupled with the requirement of being close enough to accurately observe and record what transpired necessitated the use of an obtrusive approach. Bears quickly acclimated to the presence of the research team and exhibited no begging behavior unless visitors were present. This further attests to their excellent cognitive ability which was reported in earlier studies (Kuckuk 1937, Wormer 1966, Bacon 1973). Likewise visitors expressed little concern over our presence and only rarely asked if we were NPS employees with authority to reprimand them for their actions.

A pilot study to determine proper techniques and gain familiarity with the interactions of bears and humans was conducted in 1976; actual data collection occurred from June through September of 1977 and 1978. Periods of data collection were concentrated in the daylight hours because these represented times when bears were most likely to interact with visitors.

Observations were recorded primarily along the transmountain road (U.S. 441 between Gatlinburg, Tennessee, and Cherokee, North Carolina); supportive data were also collected in picnic areas (Chimney Tops and Collins Creek) and campgrounds (Elkmont, Smokemont, Cades Cove, and Cosby).

Both written and photographic records (35-mm slides, 8-mm movies, and video tapes) were maintained of interactions between bears and visitors. Panhandling sessions were operationally defined as beginning when both bears and researchers were present and as terminating when bears retreated from sight for more than 5 minutes. The following information was recorded for all agonistic behavior exhibited by bears: type of aggression, time of occurrence, latency from the beginning of the session, apparent precipitating factor, and whether actual physical contact was made.

Efforts were made to concentrate data collection on those bears who panhandled regularly but also to record sessions on infrequent panhandlers whenever possible. This allowed us to become very familiar with the behavioral patterns of a few individuals but to observe a sufficient number of animals so that any idiosyncracies of the first group would be more evident. It also elucidated the changes in behavior as bears interacted more often with people. For data analysis bears were divided into two groups: Group I—those who panhandled regularly and had more than 15 recorded sessions, and Group II—infrequent panhandlers.

Classification of Agonistic Behavior

Pruitt (1974), in a study of captive black bears, classified various types of interspecific aggression. Her system was modified slightly to include additional types of aggression observed in this study. Categories used were these:

Table 1. Types of aggressive acts exhibited by panhandling black bears, Great Smoky Mountains National Park, 1977–78.

Rank by increasing severity	Type no. and description	% of total (n = 624)
1	1. Low moan vocalization	1.1
2	2. Blow vocalization	41.2
3	7. Running toward crowd	1.3
4.5	3. Bipedal swat	3.5
4.5	5. Quadripedal swat	7.2
6	4. Charge	37.5
7	6. Bite-snap	8.2

Type 1—low moan vocalization;

Type 2—blow vocalization coupled with lip extension and head usually oriented downward;

Type 3—bipedal stance with slapping of the front paw toward an object or person, often accompanied by blow vocalization;

Type 4—charge, oriented toward a particular person or a crowd of visitors, shoulders and head lowered, neck outstretched, and ears flattened, often accompanied by blow vocalization;

Type 5—swat, oriented toward a person or the ground, while the body is in a quadripedal position, often accompanied by blow vocalization;

Type 6—snapping, biting, or actually forcing a person to the ground by using the forepaws;

Type 7—running toward a person or crowd; differs from a charge in that the head is held in the same plane as the body and the ears not flattened.

To facilitate data analysis, these types of aggression were ranked by the apparent severity or intensity of the act. This system was of necessity somewhat arbitrary and dependent upon human perception of what constituted increasing levels of aggression. However, to combat this difficulty somewhat, the rankings of 4 different people who were familiar with human–bear interactions were utilized in determining the final scheme (Table 1).

Classification of Precipitating Factors

Agonistic behavior in bears was usually precipitated by the actions of visitors. In some instances where more than one factor may have contributed, both were recorded, e.g., one visitor was handfeeding while several others were crowding. NPS personnel were included as a distinct category. Bears not only recognized their uniforms and vehicles but were also frequently chased away by them. During sessions when more than one bear was panhandling, intraspecific aggression occasionally occurred; this was categorized under "Another Bear."

RESULTS

During 1977–78, 301 panhandling sessions were recorded for 33 different bears. Whenever more than 1 bear was present during a session, each was recorded separately. This resulted in 392 observations, 172 (43.9%) of which involved at least 1 aggressive act. Ten of the 33 bears were never observed engaging in any agonistic behavior. All of these, which included 3 adults, 3 subadults, and 4 cubs, were infrequent panhandlers. Overall, 624 aggressive acts by bears were recorded.

Types of Agonistic Behavior and Precipitating Factors

Frequency tabulations for types of agonistic behavior (Table 1) and their apparent precipitating factors (Table 2) showed the predominance of a few categories. The blow vocalization and charge, with frequencies of 257 and 234, respectively, were the most likely types of aggression. Conversely, the bipedal swat, running toward a crowd, and the low moan vocalization together accounted for less than 6% of the total. Crowding by visitors was by far the most common precipitator of ursid aggression, accounting for nearly 40% of all acts. If all double precipitation factors of which crowding was a component were included, 64% of ursid aggression could be attributed wholly or partially to visitors approaching too closely. It was interesting to note that toss feeding or photographing from a distance rarely led to aggression.

The next step was to determine if certain precipitating factors were more likely to result in particular types of aggression (Table 2). A chi-square test was significant at $P = 0.0001$ ($F = 377$, df = 114). Though the data were often sparse in various categories, raising questions as to the validity of this statistical test (Gibbons 1976), the frequency distribution alone was sufficient to show clear trends. While the bipedal

Table 2. Number and type of aggressive acts precipitated by various factors during panhandling sessions by black bears, GSMNP, 1977–78.

Precipitating factor	Type of aggression							Total aggressive acts	
	1	2	3	4	5	6	7	No.	%
Crowding	4	96	1	102	19	15	7	244	39.1
Photographing-crowding		17		41	4	4	1	67	10.7
Other[a]	2	29	1	15	1	1		49	7.9
Another bear		35		4	1			40	6.4
Harassing-crowding		8	1	15	3	3		30	4.8
NPS personnel	1	25		3				29	4.6
Petting		3	6	4	6	8		27	4.3
Photograph kneeling-crowding		8		11	4			23	3.7
Petting-crowding		3		3		13		19	3.0
Harassing		8	5	2	1			16	2.6
No apparent reason		8		7	1			16	2.6
Three factors[b]		2	3	5	2	2		14	2.2
Handfeeding-crowding		6	1	2	1	3		13	2.1
Handfeeding		4	2	3	1	1		11	1.8
Photograph kneeling		1	1	9				11	1.8
Photographing		2		3		1		6	1.0
Cessation of feeding		1	1	1				3	0.5
Toss feeding		1		2				3	0.5
Toss feeding-crowding				1	1			2	0.3
Photograph with flash-crowding				1				1	0.2
Totals	7	257	22	234	45	51	8	624	

[a] All factors which were considered peculiar to a certain panhandling session (e.g., feet dangling over the wall, motorcycle engine revving, etc.) and not likely to occur in other sessions were included in this category.

[b] Since combinations of three factors were fairly infrequent, they were all included in this one category.

swat occurred only 22 times, petting and harassing were its most frequent causes. Petting alone or in combination with crowding most often resulted in bite-snap aggression; these also figured highly in quadripedal and bipedal swats. Photographing while kneeling led to agonistic behavior only 11 times, yet in 9 of these cases the result was a charge. Twenty-nine instances of aggression toward NPS personnel were recorded with the blow vocalization being the most likely form.

The next level of analysis dealt only with those incidents in which bears actually made physical contact with visitors. Contact should not, however, necessarily be equated with injury. In most cases, bears merely touched visitors with their paws or teeth without inflicting physical damage. Of 624 aggressive acts recorded during panhandling sessions, 37 (5.9%) resulted in contact; of the latter number, 8 involved injury in the form of scratches or puncture wounds. Three types of aggression were involved: the bipedal swat (4 times), the quadripedal swat (8 times), and the bite-snap (25 times). The latter not only accounted for the highest percentage of contacts (67.7%) but was also more likely to end in contact than any other type (49.0%).

When assessing visitor actions which were most likely to precipitate contact, the results were clear cut (Table 3). Crowding, petting, or a combination thereof accounted for 78.4% of all contact. Crowding alone led to contact 10 times; however, it resulted in aggression with no contact 234 times. Conversely, when petting elicited aggression, contact was made in more than 37% of the instances; likewise more than 47% of the petting-crowding combinations led to contact.

Responses of Individual Bears

Since bears react differently to panhandling situations, it was desirable to analyze the data for individual animals exhibiting agonistic behavior (Table 4). Four bears showed aggression in 100% of their sessions; however, the total number of sessions was quite low, ranging from 1 to 3. For Group I bears, those for whom more than 15 sessions were recorded, the range in percentage of sessions involving agonistic behavior was 16.2% to 76.5% ($\bar{x}$ = 47.7, SD = 20.6). As expected, Group I bears accounted for a much greater proportion (81.4%) of all aggression. The aggression indices for Group I bears ranged from 0.24 to 3.53 ($\bar{x}$ = 1.86) and for Group II bears

Table 3. Precipitating factors for aggressive acts resulting in physical contact by panhandling black bears, GSMNP, 1977–78.

Precipitating factor	No. of aggressive acts	No. resulting in contact	% resulting in contact	% of all contacts
Crowding	244	10	4.1	27.0
Petting	27	10	37.0	27.0
Petting-crowding	19	9	47.4	24.3
Harassing-crowding	30	2	6.7	5.4
Photographing	6	1	16.7	2.7
Handfeeding	11	1	9.1	2.7
Photographing-crowding	67	1	1.5	2.7
Three factors	14	1	7.1	2.7
Handfeeding-crowding	13	1	7.7	2.7
Toss feeding-crowding	2	1	50.0	2.7
Totals	433	37		

from 0.50 to 4.33 ($\bar{x}$ = 2.28). While Group II had a higher mean of aggressive acts per session, the difference was not significant (Mann Whitney U test, $U = 57$, $p > 0.20$) (Hays 1973:778–782). In evaluating sex differences for all age classes (Group I and Group II), the mean number of aggressive acts per session for males was 2.32 and for females 1.86. For group I alone the difference was even greater: 2.66 for males and 1.28 for females. However, neither difference was significant (Mann Whitney U test, $p > 0.20$).

Frequency tabulations of the different types of agonistic behavior for individual bears (Table 5) showed that the blow vocalization was the most common for 11 bears; it was the only type recorded for 2 animals. The charge ranked in second position and was most frequent for 8 bears. Only 2 other types occurred most often for any animal: bite-snap for bear No. 15 and bipedal swat for bear No. 30.

Crowding was the most common precipitating factor for all except 3 bears in Group I (Table 6). Group II bears were excluded from this analysis because the frequencies were too sparse in any category to make definitive statements. For bears No. 02 and 03, the presence of another bear most often led to agonistic behavior, and for bear No. 15 petting did so.

Table 4. Profile of agonistic behavior exhibited by individual panhandling black bears, GSMNP, 1977–78.

Group	Bear no.	Sex	Age[a]	Total no. sessions	Sessions with aggression		Aggressive acts		Agression index[b]
					No.	%	No.	%	
I	02	M	C–S	54	14	25.9	37	5.9	0.69
	01	F	A	53	28	52.8	73	11.7	1.38
	16	F	A	40	22	55.0	80	12.8	2.05
	15	F	A	37	6	16.2	9	1.4	0.24
	33	M	A	29	20	69.0	95	15.2	3.28
	04	F	A	27	12	44.4	31	5.0	1.15
	03	F	A	27	10	37.0	42	6.7	1.56
	17	M	A	17	12	70.6	60	9.6	3.53
	05	M	S	17	13	76.5	53	8.5	3.12
	19	M	S	17	5	29.4	28	4.5	1.65
II	20	M	A	9	8	88.9	34	5.5	3.78
	32	M	A	7	3	42.9	9	1.4	1.50
	18	M	S	6	4	66.7	26	4.2	4.33
	22	F	A	5	3	60.0	3	0.5	0.60
	23	M	C	5	1	20.0	7	1.1	1.40
	21	F	A	3	1	33.3	4	0.6	1.33
	11	F	A	3	3	100.0	11	1.8	3.67
	07	F	A	2	2	100.0	9	1.4	4.50
	27	M	C	2	1	50.0	1	0.2	0.50
	30	M	A	2	1	50.0	5	0.8	2.50
	29	M	S	2	1	50.0	3	0.5	1.50
	08	F	A	1	1	100.0	1	0.2	1.00
	12	F	A	1	1	100.0	3	0.5	3.00

[a] C = cub, S = subadult, A = adult.
[b] Mean number of aggressive acts per session.

Eleven bears, 10 of whom were in Group I, performed aggressive acts resulting in contact (Table 7). Bear No. 33 (an adult male) accounted for the greatest number (12), all of which were bite-snap. The most common precipitating factors for him were petting and crowding alone or in combination. Bear No. 04 was responsible for 6 aggressive acts which resulted in contact, 5 of which were also bite-snap. Again petting and crowding were primarily responsible.

DISCUSSION

Panhandling by black bears is a learned behavior. Regular interactions with people are not a part of their normal behavioral repertoire. Foregoing their generally shy and crepuscular nature to obtain food from park visitors undoubtedly produces stress. The likelihood of agonistic behavior in these encounters is increased by the misconceptions of the visitors—misconceptions that are at least partially attributable to folklore and the teddy bear syndrome so prevalent in our society. While bears may be exploiting a new food resource, they are not seeking association with humans; they are wild animals. Yet the overriding conclusion to arise from the analysis of these interactions is the restraint practiced by these bears.

While superficially the number of aggressive acts appears high, the percentage resulting in physical contact is quite small. The 7 types of agonistic behavior recorded represent a hierarchy of varying intensities. The moan and blow vocalizations are essentially threat behaviors and by their very definition are incapable of resulting in injury. Furthermore, all other types were used primarily in that context—to warn visitors that their behavior was inappropriate. Slow motion analysis of movie films indicated that bears can make contact almost any time they choose to do so. Their rotund bodies belie their agility and quickness. The great celerity with which aggressive

Table 5. Number of aggressive acts of each type exhibited by individual panhandling black bears, GSMNP, 1977–78.

Group	Bear no.	Type of aggression 1	2	3	4	5	6	7
I	02		26		10	1		
	01		33	3	28	3	2	4
	16		30	1	40	2	7	
	15		1		2	2	4	
	33		44	3	23	2	21	2
	04		4	2	14	2	9	
	03		31	2	4	2	3	
	17		12		37	10	1	
	05		6	1	35	11		
	19	4	11		9		4	
II	20	3	24		4	3		
	32		6		1	2		
	18		6		15	3		2
	22		3					
	23		6			1		
	21		2	2				
	11		7	2	2			
	07			3	6			
	27		1					
	30		2	3				
	29		1		1	1		
	08				1			
	12		1		2			

Table 6. Number of aggressive acts precipitated by various factors for 10 experienced panhandling black bears (Group I), GSMNP, 1977–78.

Precipitating factors	Bear number 02	01	16	15	33	04	03	17	05	19
Crowding	8	31	31	1	36	7	10	33	30	15
Photographing-crowding	5	6	12		10	3	3	9	4	1
Other	7	5	7		6		1	4	5	5
Another bear	9	1	3				22			4
Harassing-crowding		7	12		3			2	3	
NPS personnel	2	3	1		7		1			
Petting		1	2	3	8	4	2	1	2	
Photograph kneeling-crowding		5	2		1	1	1	6		1
Petting-crowding					11	6				2
Harassing		5	2	2	1		2			
No apparent reason	2	2	3	1		1		1	1	
Three factors			2	2	5	1		2	1	
Handfeeding-crowding	1	2			7	1		2		
Handfeeding		1	2						4	
Photograph kneeling		1	1			1			3	
Photographing	1	1				4				
Cessation of feeding		1								
Toss feeding		1				2				
Toss feeding-crowding	2									

Table 7. Precipitating factors and types of aggression in 37 instances of physical contact by 11 panhandling black bears, GSMNP, 1977–78.

Bear no.	Precipitating factor	Type of aggression	No. times occurred
33	Petting-crowding	6	4
	Crowding	6	3
	Petting	6	3
	Photographing-crowding	6	1
	Three factors	6	1
04	Petting-crowding	6	3
	Crowding	6	1
		5	1
	Photographing	6	1
19	Petting-crowding	6	2
	Crowding	6	2
01	Harassing-crowding	6	1
	Handfeeding-crowding	6	1
	Petting	3	1
05	Crowding	5	2
	Petting	5	1
30	Petting	3	3
17	Harassing-crowding	5	1
	Petting	5	1
16	Handfeeding	6	1
15	Petting	6	1
03	Crowding	5	1
02	Toss feeding-crowding	5	1

acts are performed allows visitors very little reaction time. Moreover when people are the focus of such acts, the initial response of most is momentary immobility followed by retreat. Thus it is not necessary for bears to make contact; they can disperse crowds (at least temporarily) by using all types of aggression merely as threats.

The concepts of frustration, conflict, and stress are integral to classical psychological theories of motivation (see Cofer and Appley 1967:412–465) and have provided a model for ethologists in understanding the behavior of many species. Applying these theories to human–bear interactions can lend valuable insight into the different reactions of ursids. There is for bears an approach–avoidance conflict inherent in panhandling. The food they receive from visitors provides positive reinforcement for this atypical behavior, and they endure much to obtain it. Yet often a threshold is reached where the negative aspects of the situation outweigh the positive. Visitors and bears appear to have different perceptions of the situation. Food represents the end for bears, but for visitors it is often only a means of gaining closer contact with these animals. Feeding is frequently accompanied by approaching too closely for photographs or to attempt to pet the bear. The invasion of their individual space produces much anxiety for bears; this is substantiated by crowding being the most frequent precipitator of agonistic behavior. Aggression is in fact one of the principal reaction patterns to an approach–avoidance conflict (Cofer and Appley 1967:429). Whenever the negative incentives surpass the positive, bears either cease panhandling and retreat or exhibit aggression. This threshold, like the minimal approach distance, varies not only for different bears but also for the individual at different times.

Although there is some variation, bears generally exhibit the same types of agonistic behavior with similar relative frequencies and respond to the same precipitating factors. However, the aggression indices (Table 5) are quite different. One aspect of these differences can be interpreted on the basis of how experienced bears are at panhandling. After they become accustomed to interacting with people and learn what is likely to occur, they experience less anxiety and tolerate more to obtain food. The approach–avoidance syndrome, while still present, is less pronounced. They are less likely to either retreat or respond to the stress aggressively. The 10 bears for whom no agonistic behavior was recorded were all infrequent panhandlers; they responded by fleeing. Group II bears who did exhibit agonistic behavior had a higher average aggression index than did Group I, indicating a greater readiness to respond to the anxiety with aggression.

Yet even amongst Group I bears, who were experienced panhandlers, there were pronounced behavioral differences (Table 4). This indicated that some animals were simply more aggressive than others. The lowest index (0.24) was for bear No. 15, an adult female. Since she often panhandled with 2 other bears (No. 16 and No. 17), both of whom had higher indices, it was unlikely that her sessions were simply less stressful. Furthermore, when she did exhibit agonistic tendencies, she responded with acts of higher intensity (charge, quadripedal swat, and bite-snap). Apparently her anxiety threshold was quite high,

but when it was reached, she reacted vigorously. Bear No. 02 had the second lowest index (0.69); he was a young male born in the winter of 1977. He was always accompanied by his mother until the onset of her estrus in 1978, after which he panhandled alone. It is not unexpected that a cub might be less aggressive; however, during 1977 no instances of agonistic behavior were recorded for him while they were for other cubs. As a yearling, he still was fairly docile when compared with other Group I bears in that age class (No. 15 with an index of 3.12 and No. 19 with 1.65). It was, in fact, the presence of another bear that for him most commonly precipitated agonistic behavior; in his interactions with visitors he was never very aggressive.

Males overall had higher aggression indices than females. This trend was less pronounced in the combined figures for Group I and Group II than in Group I alone (Table 5). From Darwin (1871) through the advent of modern sociobiological theories (e.g., Wilson 1975, Barash 1977), the literature has been replete with examples of and explanations for the greater aggressive tendencies of males from numerous species. Because of the usual disparity in parental investment, especially amongst mammals, males have undergone evolutionary selection for aggressiveness. They must compete with other males for mating rights to females. This is true despite the differing opinions as to whether it is the male (Herrero 1978) or the female (Orians 1969) who ultimately selects the mate. Furthermore, because they are free from the burdens of parenthood, males have more time and energy to specialize in defending those resources that are crucial to maximizing their fitness.

These sexual differences in aggression may have particular relevance to panhandling bears. Results of earlier studies indicated that the sex distribution of panhandlers was strongly biased toward males (Erickson 1964, Harger 1967, Wasem 1968, Sauer et al. 1969, Beeman and Pelton 1976). However, in the present study the sex ratio was nearly equal. Beeman and Pelton (1976), whose data were also from the GSMNP, relied upon figures from NPS records of relocated bears and not the composition of the entire panhandler segment of the population. This discrepancy has possible explanations. First, the task of relocating a female with cubs is more formidable than that of moving a single male. Second, males may be more likely to be involved in incidents of personal injury or property damage, leading to a greater likelihood of their being relocated.

MANAGEMENT IMPLICATIONS

A complete separation of bears and people is unlikely in national parks; therefore, the task of the NPS is to manage their interactions. Any program aimed at alleviating the problems must be directed at humans as well as bears.

The need for visitor education is obvious. People have many misconceptions about panhandling bears and frequently behave as if they are household pets rather than wild animals. In doing so, they subject themselves and others to potentially dangerous situations. National parks are not zoos without bars; they are sanctuaries where animals can have a natural existence and not be placed on display. This is a difference of which visitors must be made aware. They should also be informed that panhandlers are atypical of the species and that such behavior must not be encouraged. Multifaceted programs are necessary if educational efforts are to be effective. The traditional means of distributing literature and erecting signs in the parks should be supplemented by frequent audio-visual presentations and personal contact.

Closely related to visitor education are the problems of littering and enforcement of NPS regulations. It is likely that bears are attracted to areas of high visitor use by the garbage left behind. Not only should this littering be discouraged but a conscientious plan should be instituted to remove trash scattered along roadsides and in campgrounds and picnic areas. Enforcement of NPS regulations on littering, food storage, and feeding or molesting wildlife can do much to alleviate the problems with panhandling bears.

The somewhat random removal of panhandlers has been the predominant management tool of the GSMNP in addressing the problem of human– bear interactions. Yet this tactic alone has been unsuccessful. Many relocated animals home to the original site and resume panhandling. If those animals do not return, other bears frequently replace them at panhandling sites. The problem is self-perpetuating as long as visitors offer food to bears and leave garbage behind.

Various methods of aversive conditioning, if properly tested and applied, may be helpful in reducing the necessity of relocating some animals. Such practices would be most effective when bears are learning how to panhandle; it is then that the approach-avoidance syndrome is most pronounced. If the negative reinforcement outweighs the rewards, bears are less likely to acquire the habit. When relocation is necessary, priorities should be based on individual differences in bears. Those who are most aggressive, and hence more apt to be involved in incidents of property damage and/or personal injury, should be captured first. Since cubs often learn to panhandle from their mothers, relocation of family groups intact should reduce recruitment to panhandling through the family unit. Since subadults of either sex were shown to be less effective at homing than older, more experienced animals (Beeman and Pelton 1976), this age class should be the next priority. Adult bears with low levels of aggression should be the last to be relocated. Their presence may be preventing other bears from panhandling. Personal observations during this study indicated that the removal of dominant adults often resulted in the appearance of 2 or 3 younger bears at that site. Furthermore, the adults' superior homing ability means that their relocation is less likely to be successful.

To reiterate, effective management policies must focus on visitors as well as bears. The traditional practice of merely relocating panhandling bears can at best alleviate the problems temporarily. This is not to imply that the situation is without remedies nor that park managers should simply accept these interactions as a normal occurence. However, corrective efforts should employ a broader spectrum than in the past and be consistently applied.

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