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INJURY TO PEOPLE INFLICTED BY BLACK, GRIZZLY OR POLAR BEARS: RECENT TRENDS AND NEW INSIGHTS¹

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Abstract: We update or extend data presented by Herrero (1985). Injury rates were low, 1980-1985. The highest rates were 317,700 and 328,645 park visitors per injury inflicted by black or grizzly bear in Kluane and Denali National Parks. Injury rates calculated against number of backcountry user nights were significantly higher for all parks where injuries occurred, but this exaggerates the danger from bears in backcountry areas since day use is not included. In certain national parks such as Glacier (Montana) there appears to have been an increase in grizzly bear-inflicted injury to persons travelling off-trail. The potential danger from grizzly bears that are habituated to people and/or have learned to feed on people's food or garbage is stressed by focussing on 8 fatal, predatory attacks on people in Glacier (Montana), Yellowstone, and Banff National Parks between 1967-1986. Habituated grizzly bears may also attract photographers who may be injured or killed by such bears. Carrying dead ungulates or imitating the sounds of prey may attract grizzly bears and this may lead to human injury. Five cases of grizzly bear-inflicted injury (including 2 deaths) were identified in which this appeared to have been a common circumstance. Additional evidence is cited supporting the idea that grizzly bear injuries inflicted during sudden encounters are most likely to occur in habitat where grizzly bears have been attracted by natural foods during the time when the injury occurred. A thorough search for records dated between about 1965-1985 of polar bear-inflicted injury revealed only 20 injurious incidents. In 15 or 16 of these the bear's motivation appeared to have been predation. Six people were killed in such incidents. At least 251 polar bears were killed during aggressive encounters. Only 5 or 6 aggressive interactions (3 or 4 leading to human injury) were attributed to females apparently defending their young. Female polar bears appear to be less aggressive toward people in defense of young than are grizzly bears, but more aggressive than black bears.

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The fascination that people have for bears is a very ancient and continuous thread in the tapestry of history. The grizzly bear (*Ursus arctos*) is de facto the people's choice as North America's wilderness animal. It cannot adapt to the domestication of its habitat. The grizzly symbolizes the power, uncertainty and challenge of wild places. They occasionally injure or kill people but much more often they are killed by people to the point of population demise or decline. They have been classified as a threatened species in the lower 48 States since 1973. In southern Canada they are in decline in both British Columbia and Alberta (Tompa 1984, McCrory and Herrero 1987, Nagy et al. in press). The polar bear (*Ursus maritimus*) is the Arctic's true great white hunter. It is the largest non-aquatic carnivore on earth, and is by far the most predacious of all living bears. Very rarely human beings become prey. The black bear (*Ursus americanus*) is normally tolerant of people and reclusively dwells in the forest. It too will occasionally injure people and much more rarely will prey on them.

All 3 species of bears are characterized by their typical tolerance of people, and low rate of injury inflicted to people (Herrero 1985, Middaugh 1987, Fleck and Herrero 1988). Despite this, bear-inflicted injuries occur, often making headlines, which indicates people's fascination with such events. Despite the obvious interest in and potential practical application of studies of circumstances associated with bear-inflicted injury, few such studies exist. As development and recreational activities expand further into previously wild areas, human injuries

will increase. The potential for injury increases with simple exposure of bears to greater numbers of people (Martinka 1982). In parallel with this, more bears are killed or otherwise removed.

The manager of bears has the dual responsibility of maintaining bear populations and taking reasonable measures toward people's safety. The public, as evidenced by legislation such as the Endangered Species Act, wants bears to be conserved. Management agencies are under increasing pressure to execute state-of-the-art management procedures. Failure to do so if interpreted as being negligent and, linked with bear-inflicted human injury, may result in a lawsuit. It is important to know the circumstances associated with bear-inflicted injuries not only to maintain acceptable levels of human injuries, but also because outside of parks and protected areas many bears are killed each year in what are termed Defense of Life and Property (DLP) kills. These are prevalent in Alaska related to grizzly bears (Miller and Chihuly 1987) and the Canadian Arctic related to polar bears (Fleck and Herrero 1988).

Knowledge of the circumstances associated with bear-inflicted injury can be used to inform people on how to avoid confrontations (Herrero 1985). Sometimes it is not the behavior of the persons injured in an attack that is a contributing circumstance, but rather it is the overall history of the bear in association with other people and their food and garbage (Herrero 1970, 1976, 1985, 1989). Our actions, through the environment and opportunities we create for bears, influence bear behavior toward people. Jope (in press) has pointed out that it is easier for people to modify their actions than it is for bears to modify theirs.

¹ Invited paper

Given the importance of studying aggressive and injurious interactions between bears and people, we update data on this topic and present some new ideas concerning circumstances associated with injury.

METHODS

Herrero (1985) presents a systematic analysis of the circumstances associated with grizzly- or black bear-inflicted injury to people up to 1980. In this paper we review what has occurred since then, based on contacts with various national parks and wildlife agencies throughout North America. The data are incomplete in contrast to the more comprehensive data presented in Herrero (1985). The current data are used to identify possible trends or to comment further on factors previously thought to have been associated with injury. Data on bear-inflicted mortalities that have occurred almost always are sent to the senior author. Therefore, statistics regarding bear-inflicted human fatalities are thought to be complete through and including 1988.

New data were collected as a result of a systematic survey by Fleck and Herrero (1988) of injuries inflicted by black bears, grizzly bear or polar bears in the major North American national parks. These data were interpreted in terms of total park visitation per year, and backcountry user nights per year.

A brief summary is presented of a systematic survey of the number of and circumstances associated with polar bear-inflicted injuries, and polar bear DLP deaths, from about 1965-1985 in the Northwest Territories (NWT) and Manitoba (Fleck and Herrero 1988).

This paper is not intended to stand by itself as an analysis of circumstances associated with bear-inflicted injury. It is meant to update and supplement the more comprehensive treatment in Herrero (1985).

RESULTS AND DISCUSSION

Injury Rates

We have previously stressed that all species of bears injure relatively few people (Herrero 1985, Fleck and Herrero 1988). This has recently been confirmed for Alaska (Middaugh 1987). Between 1980-1985 better quality data on front and especially backcountry user rates in national parks became available and allowed a more quantitative and comprehensive description of this situation (Fleck and Herrero 1988). Table 1 and Table 2, respectively, show the rate of injury inflicted by black, grizzly and polar bears to all visitors (Table 1) and to

backcountry campers (Table 2) in the national parks of North America. While the range of injury rate in relation to total park visitation is wide, even the highest rate, 1 injury inflicted by either black or grizzly bear per 317,700 visitors in Kluane National Park, makes it clear that bears are not highly dangerous to the average park visitor. Injury rates for backcountry campers are significantly higher and also show substantial variation between parks. Injury rates to backcountry users as a whole are overestimated by these data because day use, which may be substantial, is not included because of lack of data. Injury rates outside of national parks can seldom be calculated because of lack of data.

Martinka (1982) found that within Glacier National Park, Montana, injuries and grizzly bears removed from the population correlated perfectly and positively with number of visitors. "These data suggest a fundamental relationship between the number of park visitors (cause) and the number of confrontations (effect)." Our data do not address this hypothesis because such comparisons cannot be made between different parks since not only are numbers of visitors different but so are characteristics of the grizzly bear population. However, we believe that Martinka's (1982) observation is important in demonstrating what is meant when managers say that grizzly bear populations do best in wilderness areas. Few visitors, or regulated visitation, can decrease chances of confrontation, habituation and garbage feeding - all to the benefit of grizzly bears and visitors.

Black Bears

Herrero (1985) concluded that between 1960-1980 more than 500 people were injured by black bears; at least 90% of these injuries were minor and inflicted by bears that were conditioned to people's food and habituated to human beings. He stressed that because of the large number of black bears in North America and the very large exposure rate of people to them, injury rates were low. Table 1 shows that injury rate for black bears with respect to total visitation is now very low suggesting that this type of incident is declining as garbage and people management techniques improve with respect to bears.

Also, Herrero (1985) identified another type of black bear-inflicted injury, often leading to major injury or death. In these cases he inferred that the motivation of the attacking bear was predation. This was based on the behavior of the bear before and during the attack, often including the death and partial consumption of one or even several persons.

Subsequent to 1985 we have records of 2 additional persons, both in British Columbia, being attacked, killed

Table 1. Rates of injurious interactions with black, grizzly, and polar bears in relation to total number of people visiting Canadian and American national parks between 1980 and 1985.

| Park | Mean number visitors per year | Mean number of visitors per injury from: | | | | |
|------------------------|-------------------------------|--|---------------|----------------|-------------|-----------|
| | | Black bears | Grizzly bears | Unknown bears | Polar bears | All bears |
| Revelstoke/ Glacier | 3,899,154 | - ^a | - | * ^b | * | - |
| Riding Mt. | 864,311 | - | * | * | * | - |
| Pacific Rim | 677,247 | - | - | * | * | - |
| Nahanni | 692 | - | - | * | * | - |
| Yoho | 1,137,956 | - | 6,693,859 | * | * | 6,693,859 |
| Banff | 3,360,000 | - | 4,048,193 | * | * | 4,048,193 |
| Jasper | 1,877,700 | 2,802,537 | * | * | * | 2,802,537 |
| Great Smoky Mts. | 8,530,000 | 2,561,561 | * | * | * | 2,561,561 |
| Yellow- stone | 2,314,930 | 7,014,939 | 1,543,287 | 13,617,235 | * | 1,157,465 |
| Waterton | 673,883 | 2,042,070 | 2,042,070 | * | * | 1,021,035 |
| Glacier- USA | 1,526,724 | - | 848,180 | 8,980,729 | * | 763,362 |
| Yosemite ^c | 2,265,722 | 629,367 | * | * | * | 629,367 |
| Denali | 328,645 | - | 328,645 | * | * | 328,645 |
| Kluane | 54,009 | - | 317,700 | * | * | 317,700 |
| Auyuittuq | 241 | * | * | * | - | - |

^a - indicates no injuries or deaths by this species between 1980 and 1985, inclusive

^b * indicates species does not occur in park

^c number adjusted to represent number of visitors in the park between April and November when the bears are active

Table 2. Rates of injurious interactions with black, grizzly, and polar bears in backcountry areas of Canadian and American national parks between 1980 and 1985.

| Park | Mean number backcountry user nights per year | Mean number of backcountry user nights per backcountry injury from: | | | | |
|----------------------------|--|---|----------------|---------------|-------------|----------------|
| | | Black bears | Grizzly bears | Unknown bears | Polar bears | All bears |
| Pacific Rim | ? ^a | - ^b | * ^c | * | * | - |
| Banff | 30,230 | - | - | * | * | - |
| Jasper | 23,969 | - | - | * | * | - |
| Mt. Revelstoke/ Glacier | 1,351 | - | - | * | * | - |
| Riding Mt. | 815 | - | * | * | * | - |
| Great Smoky Mts. | 72,016 | N ^d | * | * | * | N ^d |
| Denali | 40,221 | - | 118,297 | * | * | 118,297 |
| Yosemite | 118,180 | 59,090 | * | * | * | 59,090 |
| Yellowstone | 45,090 | - | 33,902 | 265,235 | * | 30,060 |
| Kluane | 3,978 | - | 23,400 | * | * | 23,400 |
| Yoho | 2,703 | - | 15,900 | * | * | 15,900 |
| Glacier-USA | 16,784 | - | 9,873 | 98,729 | * | 9,324 |
| Waterton | 3,794 | 11,383 | 11,383 | * | * | 5,691 |
| Auyuittuq | 2,149 | * | * | * | - | - |

^a no estimates of numbers of backcountry user nights

^b - indicates no backcountry injuries by this species between 1980 and 1985, inclusive

^c * indicates species does not occur in park

^d injuries have occurred but locations of interactions not available

and partly consumed by a different black bear in separate incidents. As well we have additional records of apparent attempted predation by black bears in British Columbia (at least 4 cases, 2 resulting in major injury), Alaska (at least 1 case, this presumably resulting in major injury), Yukon Territory (at least 2 cases, no injuries) and Minnesota (2 separate attacks by the same bear both resulting in major injury). Also, 2 or more of 6 attacks that occurred in New Mexico may have been predatory. Together these incidents confirm the somewhat controversial conclusion Herrero reached in 1985 that black bears can on rare occasions attempt to or even successfully prey on people. This type of incident continues to cluster geographically in what Herrero (1985) previously termed rural and remote areas, suggesting that many potentially predacious black bears have had little exposure to human beings, hence little opportunity for bears showing this tendency to have been killed by man (Herrero 1985). The incidents that occurred in Minnesota and New Mexico were different because they involved bears apparently used to people and used to feeding on people's food or garbage in areas where human use was significant. It should be noted that no attempted or actual predatory behavior by black bears has been recognized in national parks, which are typically heavily used by people.

Food stress was apparently a common factor in 6 recent attacks in New Mexico (Albuquerque Journal 1986) and 2 in Minnesota (Rogers et al. 1988). Food stress was previously suggested as a contributing factor in a series of 5 black bear-inflicted injuries (1 fatal) in Alaska (Hatler 1967). However, if a relationship exists between food stress and black bear attacks it is a complex one. Rogers et al. (1988) point out there have been many years of major food stress for black bears without human injury resulting.

An argument Herrero (1989) has made about understanding predacious attacks by habituated and/or food-conditioned grizzly bears is also relevant. Many grizzly bears in certain American and Canadian national parks are habituated to people or conditioned to our food or garbage, yet only a few of these attempt to attack, kill and sometimes consume human beings. Herrero (1989) believes these incidents occur when a bear with a history of habituation and food-conditioning, plus a certain predisposing personality, encounters a person or persons in a vulnerable situation where the bear perceives the possible gain (food) to be worth the risk. Given this possible complex of interacting variables it should not be surprising that potentially predacious incidents by black or grizzly bears are not easy to attribute to any single variable.

Grizzly Bears

Previously, Herrero has reported that sudden encounters, in which the grizzly bear inflicting injury and the person injured apparently were not aware of each other until the bear's individual distance was violated, were a primary circumstance associated with grizzly bear-inflicted injury (Herrero 1970, 1976, 1985). Here the bear may attack, apparently as a form of defense. Such attacks are normally of short duration and they appear to terminate when the bear perceives that the threat is lessened. People are not normally killed in such incidents although Herrero (1985) previously found that at least 50% of all grizzly bear-inflicted injuries could be classified as major. The sudden encounter is the most common situation associated with grizzly bear-inflicted injury. The only new trend that we could identify regarding sudden encounters is that more of this type of injury may be occurring in off-trail areas. Both Nadeau (1987) and C. Martinka (pers. commun.) have identified this as a possible trend related to grizzly bear-inflicted injuries in Glacier National Park, Montana.

In 1987 a man hiking off-trail in the Appekunny Cirque area of Glacier National Park was killed by a grizzly bear (Board of Inquiry Report 1987). The board concluded, "He may have had a surprise encounter with a grizzly bear at the streamside." No evidence was presented to substantiate or deny this opinion. A large amount of bear diggings and scat indicated grizzly bears were foraging in the area.

Middaugh (1987) reported an increase in bear-inflicted injuries in Alaska during the period 1980-1985. Most of his reported injuries were from grizzly bears. The number of hunters injured was similar to previous decades (hunting by its nature is an off-trail activity) but the number of hikers and campers injured increased dramatically. Seven of 17 injuries to hikers or campers occurred in Denali National Park where off-trail travel is common. If the possible trend of increases in grizzly bear-inflicted injury in off-trail areas is true this would be consistent with Jope's (1982) suggestion that grizzly bears that encounter hikers in a predictable manner, such as on regularly used trails, are less likely to attack people hiking, even though they may approach people more often. As more people explore off-trail areas both for work and recreation the chance of sudden encounters would increase.

The other major circumstance that Herrero (1970, 1976, 1985, 1989) found to be associated with many grizzly bear-inflicted injuries (not usually those involving sudden encounters) was the bear having a history of feeding on people's food or garbage (food-conditioning)

or having been repeatedly exposed to people to the point that it no longer readily fled from them (habituation). In the worst cases grizzly bears having these types of experiences have been involved in what Herrero (1985, 1989) classified as probable predation on people. For example, between 1967-1986 there were 12 deaths inflicted by grizzly bears in Banff, Glacier (Montana), and Yellowstone National Parks. In all cases the bear involved was either food-conditioned and/or habituated (Herrero 1985, 1989). Nine of the victims were partially consumed. Eight of the victims Herrero classified as having died as a result of predatory attacks. All 8 of these victims were attacked at night while camping and sleeping, and were pulled away from, or with, their sleeping bags. In these incidents the behavior of the attacking bear was influenced by its previous experience with people or their food or garbage, and by the opportunity and demands of the bear's immediate situation - for example, a vulnerable person discovered by a hungry bear. These types of incidents represent a major management challenge.

Habituation can also occur without human injury. At McNeil River Falls, Alaska, the numerous grizzly (brown) bears have become accustomed to the 10 visitors that are permitted at any one time. The actions of the visitors are predictable to the bears, because the visitors' behavior is controlled by the refuge manager (Aumiller 1984). Under these well planned circumstances bear-inflicted injury to people has not occurred despite bears and people sometimes only being a few meters apart. People's food and garbage is strictly and always unavailable to the bears, hence the bears have not learned to exploit human-related foods, nor people themselves.

Herrero (1985) identified a third set of circumstances that were associated with a small proportion of grizzly bear-inflicted injuries. These cases typically involved situations where a hunter either shot the bear before it attacked or a photographer approached within a grizzly bear's individual distance and this was the apparent proximal trigger for the attack. Herrero (1985) called these "provoked attacks." Since 1985, 2 photographers, 1 in Yellowstone and another in Glacier National Park (Montana), have been killed when they closely and persistently pursued female grizzly bears. One such bear (number 59 Yellowstone, Yellowstone Board of Inquiry Report 1986) was habituated to people. The other bear (that killed C. Gibbs in Glacier National Park in 1987) was thought to be habituated to people (C. Martinka pers. commun.). The potential hazards of aggressively photographing grizzly bears while the photographer is away from a vehicle and on foot should by now be well known.

Two other grizzly bear-inflicted fatalities involved

hunters although at least 1 and possibly both were apparently not provoked by the hunters. A death that occurred in northern British Columbia involved a hunter known to want to shoot a grizzly bear. He was returning to camp by himself with a caribou cape and head fixed to his backpack when he was killed by a grizzly bear. The bear was found lying dead at the feet of the man. The sequence of events could not be determined (Hart 1988).

In 1988 a deer hunter in southeastern Alaska was attacked and killed shortly after he was blowing on a deer call. The hunter was subsequently partly consumed by the bear (Anchorage Daily News 1988). This incident has similarities to 2 separate incidents that occurred in Denali (then Mount McKinley) National Park in 1973 and 1961. In the 1973 incident, before being attacked, the person involved was making a sound like a rabbit. In the 1961 situation the man attacked was using an increment borer on a tree and this was making a squeaking sound. Imitating the sound of or showing other characteristics of possible prey can attract bears, which are opportunistic feeders. This attraction may be associated with attacks. Also in Alaska in 1988 another man was attacked while bent over and gutting a deer. He first became aware of the bear when "she was 40 feet away and in full charge" (Anchorage Daily News 1988). The man was severely mauled before the bear was killed by a companion.

Planning the location of trails and campsites in an attempt to decrease the chances of grizzly bear-human interactions has continued to evolve since it was described in Herrero (1985). In a series of projects, various techniques have been used to identify grizzly bear habitat and then recommendations were made for locating developments such as trails or campsites so as to avoid as much as possible juxtaposing people and grizzlies (Herrero et al. 1986). Supporting this approach, Nadeau (1987), working in Glacier National Park, Montana, found that habitat characteristics were significantly different at sites where "confrontations" occurred versus control sites.

In a parallel piece of work on black bears, Holcroft (1986) found that roadside campsites where black bear sightings and problems were more prevalent were also sites rated to have good quality black bear habitat as well as several other discriminating characteristics. Further direct support for the rationale behind locating developments away from grizzly bear habitat comes from Denali National Park. Here a campground and other developments are located in and around an area where moose calve. During 1980, 2 people were injured by grizzly bears in this area; during 1985, 2 more were injured (J. Dalle-Molle pers. commun.). All injuries occurred during the moose calving season. Grizzly bears are appar-

ently attracted to the area by the possibility of preying on moose, especially new-born calves. Injuries have resulted when people and grizzly bears have found themselves in close proximity.

Polar Bears

Gjertz and Persen (1987) reported that in Svalbard since 1973 50 serious polar bear-human confrontations have occurred where 46 bears were killed, and 3 people were injured, 1 fatally. Fleck and Herrero (1988) recently completed the first systematic study of aggressive polar bear interactions with people in Canada. All of the following information is taken from their report. A thorough search for records of aggressive encounters between polar bears and people found 20 injurious and 353 non-injurious aggressive interactions that occurred primarily in the NWT and Manitoba (1 death occurred in Svalbard, Norway). Most records came from the period 1965-1985. During these interactions at least 251 polar bears were killed, 14 persons were non-fatally injured and 6 persons died.

Table 3 shows our judgement of the motivation, and also the sex of the bear in these incidents. Despite small sample size and judgemental elements, all differences are statistically significant because these data do not represent a sample of incidents but rather describe the universe of such events. However, significant differences only represent reality if categorization was accurate. Two clear patterns can be seen. Predatory attacks on human beings were almost always made by male polar bears. In the 13 injurious attacks attributed to this sex class, 7 were made by sub-adult males, 4 by adult males, and 2 by polar bears which were "probably male" (size described as "large" or "huge"). Four of the predacious males were described as "thin" or "skinny" suggesting that food stress may be a contributing variable in such incidents. Young males unable to compete with adults may try to

prey on people occasionally. Gjertz and Persen (1987) found that crude information suggested that many polar bears involved in confrontations were young. During incidents classified as predacious, polar bears apparently used the same hunting patterns as for hunting their normal prey, seals. These hunting patterns have been described by Stirling (1974) as being: 1) still hunting where they sit beside a seal hole and wait before they pounce; and 2) stalk, rush, and pounce. Polar bears hunting their normal prey do not vocalize. Neither did any of the bears that injured people. Nor did they give any other warning sign prior to attack. Five of the 6 victims that died were probably killed instantly. Five polar bears consumed parts of their victims. Two of the bears that killed people were themselves killed before they presumably would have consumed their victims. One yearling male bear ended his attack on his own volition, but 11 of the other male bears continued the attack until they were killed, the victim was killed, or the victim was rescued. These data support the conclusion that polar bears, especially males, can be predators on people. The data also show that such events are rare.

In contrast to incidents classified as predatory and involving primarily male bears, female bears with young occasionally attacked people, apparently in defense of their young. Such incidents were very rare. We classified 3 attacks as being due to defense of young, with a fourth incident having elements of both defense of young and predation. In the defense of young incidents the female bear was apparently surprised by the sudden appearance of a person and to have then attacked. Two females ended the interaction on their own initiative and a third (at her den site) did not continue her attack when a man escaped. The entire data base of 373 aggressive incidents contained only 5 or 6 which could be identified as female bears acting aggressively in apparent defense of young. Five of these incidents occurred at den sites or in known denning areas. This low incident rate and the fact that all incidents occurred in or near denning areas suggest that polar bear females are less aggressive in this regard than are grizzly bear females, but more aggressive in defense of young than are black bears (see Herrero 1985).

Attractants such as garbage, animal carcasses, live animals, and/or food were involved in 8 of 20 (40%) injurious attacks and most likely also in 1 other attack that occurred at an Inuit hunting camp. In the remaining incidents we suspect that the person himself was the attractant.

Fleck and Herrero (1988) also examined 353 case records in which polar bears were perceived to have acted aggressively toward people. As mentioned many of these

Table 3. Sex and inferred motivation of polar bears who attacked and injured people.

| Inferred motivation of bear | Sex of bear | | |
|-----------------------------|-----------------|--------|---------|
| | Male | Female | Unknown |
| Predation | 13 ^a | 1 | 1 |
| Defense of young | | 3 | |
| Elements or both of above | | 1 | |
| Unknown | 1 | | |

^a Of these 13 incidents, 9 were judged to be predatory, 2 probably predatory and 2 possibly predatory

bears were killed. In 304 incidents that could be classified, 281 (92%) involved attractants and 23 (8%) apparently did not. Polar bears are opportunistic foragers and are attracted by the smell or other characteristics of potentially edible items. Because danger to people can result from such attraction, and because many polar bears have been killed in such incidents, care should be taken in storing and cooking food and garbage, and carcasses. Sex and age were determined for 251 bears that were killed during a non-injurious interaction. In both the NWT and Manitoba, sub-adult males were at least twice as likely to become involved in an aggressive interaction than any other age and sex class (Fleck and Herrero 1988). As is true for black and grizzly bears, the social status of sub-adult polar bear males places them in a subordinate position, probably making it difficult for some of them to compete for "normal" foods such as seals. Also the hunting skills of sub-adult male polar bears are not yet fully developed.

CONCLUSIONS AND SUMMARY

1. Rate of injury inflicted to human beings by black, grizzly, or polar bears is low with respect to total visitation to each national park that has these species. Injury rates are significantly higher when calculated for backcountry user nights, however, this over-estimates the danger to backcountry users as a whole. All species of bears are usually tolerant of people under many circumstances.
2. The idea is further substantiated that black bears, especially those found in rural and remote areas, will on rare occasions attempt to prey, or will prey, on people.
3. The possibility exists that in certain national parks, such as Glacier (Montana), increases in off-trail backcountry travel are leading to more people being injured off-trail.
4. Grizzly bears who have learned to feed on people's food or garbage (food-conditioning) or who have become used to people (habituation) were involved in 8 fatal, predatory attacks on people in Glacier (Montana), Yellowstone, and Banff National Parks between 1967-1986.

Also, habituated grizzly bears may attract photographers who may violate the bear's individual distance and be attacked. One fatal attack on such a photographer was attributed to a habituated grizzly bear; in another fatal attack on a photographer the bear was believed to be habituated.

Habituation need not carry a major risk of human injury if the actions of people are predictable to the bears

and opportunities to exploit people, or their food and garbage, do not exist.

5. Carrying dead ungulates or imitating the sounds of prey may attract bears and cause an attack. Five cases of grizzly bear-inflicted injury (2 fatal, 3 major injury) were identified where this was a common circumstance.
6. Additional evidence is reviewed which supports the idea that grizzly bear injuries inflicted during sudden encounters are most likely to occur in habitat where grizzly bears have been attracted by natural foods during the time when the injury occurred.
7. Most injuries inflicted by polar bears can be classified into 2 categories - actual or attempted predation on people, or defense of young. A thorough search for records of polar bear-inflicted injury revealed records of only 20 incidents that occurred between about 1965-1985. In 15 or 16 injurious incidents the bear's motivation was apparently predation. Six people were killed in such incidents. This type of incident could have been more frequent if 251 polar bears were not killed during aggressive encounters. Some of these were probably incidents of attempted predation although a more obvious contributing factor was the presence of attractants such as food, garbage, or carcasses in 281 of 304 aggressive encounters. Only 5 or 6 aggressive interactions appeared to have been due to female polar bears defending their young. Three or 4 of these incidents involved people being injured. Female polar bears appear to be less aggressive toward people in defense of young than are grizzly bears, but more aggressive than black bears.

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