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## GRIZZLY BEAR PREDATION ON A BISON CALF IN YELLOWSTONE NATIONAL PARK

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Ungulate meat is one of the most concentrated sources of digestible energy and protein available to grizzly bears (*Ursus arctos horribilis*) in the Yellowstone ecosystem (Mealey 1975, Pritchard and Robbins 1990, Craighead et al. 1995). Grizzly bears obtain ungulate meat primarily through scavenging winter-killed elk (*Cervus elaphus*) and bison (*Bison bison*) carrion (Craighead et al. 1995, Mattson 1997), usurping wolves (*Canis lupus*) from their ungulate kills (D. Smith, Yellowstone National Park, Wyoming, USA, unpublished data), and by predation on elk

calves (Mattson 1997). Although predation on elk calves in Yellowstone National Park (YNP), by both grizzly bears and American black bears (*U. americanus*), has been well documented (e.g., Howell 1921, Johnson 1951, Cole 1972, Craighead and Mitchell 1982, Gunther and Renkin 1990), we found no records in the literature documenting bear predation on bison calves. Although Skinner (1927) reported that grizzly bears preyed on bison calves, he gave no description to document that he actually saw it occur.

We describe a successful predatory attack on a bison calf by a grizzly bear in YNP, Wyoming. The event was observed by the senior author and observed and photographed by both a professional cinematographer (Landis Wildlife Films, Gardiner, Montana, USA) and a still photographer (Chadwick and Sartore 2001). The film footage allowed repeated review by both authors, enabling us to clearly describe the event. We also had an experienced bison biologist review the videotaped film of the predation event.

The kill took place in Hayden Valley in central YNP. Hayden Valley is a large (>8,500 ha) nearly treeless valley surrounded by the forested Central Plateau. Flora in the valley consists of sagebrush (*Artemisia* spp.) and a variety of forbs, grasses, and sedges (*Carex* spp.) (Meagher 1973). Numerous graminoid-dominated wetlands are present in the valley. Lodgepole pine (*Pinus contorta*) forest types that occur on infertile rhyolite soils dominate the forested plateau surrounding Hayden Valley (Despain 1990). Spruce (*Picea engelmannii*)–fir (*Abies lasiocarpa*) stands are interspersed throughout the lodgepole pine zone in areas of more favorable moisture regimes such as pond margins, north slopes, and drainages (Graham 1978). Bison are active in Hayden Valley during all months of the year and breed and calve in the valley (Meagher 1973). Grizzly bears are active in the valley throughout the non-denning season from March through November.

The senior author observed the event from a vehicle pullout along the Grand Loop Road in Hayden Valley at approximately 730 hours on 26 June 2000. Observations were made with a 40x spotting scope and 8x binoculars. An adult female grizzly bear accompanied by 2 cubs-of-the-year was foraging approximately 2.5 km away, on a southwest facing slope on the northeast side of the Yellowstone River. The bear moved through the sagebrush in a searching pattern commonly observed when bears are hunting for newborn elk calves, as described by Gunther and Renkin (1990) and French and French (1990). Several cow elk were scattered along the tree-line 200–300 meters upslope from the bears. The 3 bears were working their way down slope toward the river as they apparently searched the sagebrush for elk calves. We observed a cow bison and her calf walking southeast along a bench on the northeast side of the river below the bears.

No other bison were visible in the area. Although hills blocked the view in some areas, the landscape could be observed for >500 m in all directions, and for a km or more in most directions. When the cow and calf approached the base of the slope below where the bears were foraging, they began to trot past, the cow in the lead. The adult grizzly, approximately 200 meters upslope from the bison, stood on her hind legs and looked at the cow and calf as they trotted past. The bear then dropped down to all 4 legs and ran down the slope pursuing the bison, leaving her cubs behind. As soon as the bear began running downslope, the cow and calf began to run away. The cow changed position and ran behind her calf, keeping herself between the bear and her calf. Within seconds, the bear had closed the distance and was within a few meters of the fleeing cow and calf. The chase proceeded west toward the bank of the river and reached a swale approximately 1 km from the observers where sagebrush and the low swale partially obscured our view. As the bear started to pass the cow in pursuit of the calf, the cow whirled around and confronted the bear. However, the bear veered past the cow and continued chasing the calf. When the 3 animals emerged from the swale, the calf was running in front followed by the bear and then the cow. As the bear drew near the calf, the calf turned and ran in tighter and tighter circles. The chase moved back into the swale again, partially obscuring our view. While in the swale, the bear made contact with the calf and knocked it down. It made contact again and appeared to bite the calf before jumping out of the way of the charging cow, which lowered its head and tried to hook at the bear with its horns. The bear reappeared from the swale holding the calf in its mouth with the cow chasing it. The bear stopped, dropped the calf, and stood its ground over the calf while facing the cow. The cow momentarily stopped pursuing it, but remained 20–30 meters away, circling and occasionally rushing in and hooking its horns at the bear. However, the cow always retreated quickly when the bear did not run. After the cow stopped charging at the bear, the bear began to eat the calf. The cow stayed 20–30 meters away and occasionally nibbled grass. After the bear had been feeding on the calf for approximately 15 minutes, the cow abruptly ran north and did not return.

The bear fed on the calf for about 30 minutes, then spent approximately 10 minutes covering the carcass with dirt, grass, and sagebrush branches. By this time, the cubs had moved across the slope approximately 300 meters to the east and far uphill from the kill site. The cubs stood up often and looked around. The bear then moved directly east upslope to her cubs and led them up a long draw and into a forested area and out of sight. The bear and 2 cubs returned to the carcass at approximately 1945 hours that evening. The bear uncovered it and fed on it steadily un-

til 2130 hours, when it became too dark to make further observations. The cubs investigated and played around the carcass most of the time their mother was feeding on it.

Most bison calves in YNP are born in early May, and calving is generally over by the end of May, although a few calves are born as late as September (Meagher 1973). Based on horn size, body size, and coloration, the bison calf killed by the grizzly bear was 7–8 weeks old (M. Meagher, YNP, Wyoming, USA, personal communication, 2001). It is uncommon for bison cows with calves of that age to be away from mixed herds (females, other calves, juvenile males, and often one or more mature males). Bison cows, especially with calves, are rarely separate from a mixed herd even in winter (Fuller 1960, Meagher 1973, Shaw and Meagher 1999). However there are exceptions. In the harsh winter environment in Yellowstone's Pelican Valley, bison groups often disperse as snow deepens and scatter as individuals or a few animals together, moving into geothermal areas that provide the survival margin in the deep snows (Meagher 1970, 1973, 1986). An isolated cow with a calf is not rare in these conditions. Also, beginning in 1982, the Yellowstone bison population has been undergoing major changes in distribution and numbers (Taper et al. 2000). As part of this, group size and cohesiveness has changed, with mixed herds decreasing in size earlier in the breeding season and bison aggregations much more spread out. By the summer of 1996, there appeared to be a breaking of the more usual bison social bonds, even before the end of the growing season (M. Meagher, personal communication, 2001). These changes may have contributed to the presence of the apparently solitary bison cow with her calf and left them vulnerable to predation.

Injury, disease, or malnutrition could also have left the bison cow and calf vulnerable to predation. However, multiple reviews of the videotaped film did not suggest that the bison cow was impaired in any way. She did not limp or appear to be uneven in her gaits. Her agility appeared unimpaired as she changed directions and turned to face the bear. Her physical condition appeared to be prime, with none of the end-of-winter boniness of ribs and iliac crest often observed. The condition of her coat and timing of the molt were also consistent with those of a bison in good condition. Nutrition influences hair condition and timing of the molt in mammals (Robbins 1983). At the time of the observation, bison are often still shedding winter coats, which may cling in ragged lighter-colored patches on top of newly-growing pelage. But a bison in poor condition may have much of the winter coat still attached, and look generally unthrifty (M. Meagher, personal communication, 2001). Nothing in the appearance of the bison cow's coat indicated that it was malnourished.

Craighead et al. (1995) studied grizzly bear behavior in YNP from 1959–70 and documented grizzly bears killing malnourished adult bison in spring but did not observe predation on bison calves. The Interagency Grizzly Bear Study Team (IGBST) has conducted research on grizzly bears in YNP since 1973 and has not documented predation on bison calves during that 29-year period (M. Haroldson, IGBST, Bozeman, Montana, USA, personal communication, 2001). Long-term (37 years) bison research and monitoring in YNP also has not documented bear predation on bison calves (Meagher 1973; M. Meagher, personal communication, 2001). Extensive reviews of recent bison literature (Meagher 1986, Reynolds et al. 1982, Shaw and Meagher 1999) found no evidence of grizzly bear predation on adult bison or calves (but see Wyman 2002). In an exhaustive review of historical sources, Roe (1970) found a credible account of one successful grizzly bear kill of a bison cow, but none on calves. Given the extensive documentation in the literature of grizzly bear predation on elk calves, we believe that predation on bison calves is an infrequent, opportunistic event or it would have been reported previously.

Bison behavior coupled with the risks associated with predation on bison calves may preclude more extensive use of this resource by bears. We hypothesize that the bison cow and calf were vulnerable to predation due to being isolated from a herd or mixed group. Most bison are highly gregarious (Meagher 1973, Shaw and Meagher 1999). Situations where cows with calves are isolated from herds or mixed groups as in the incident we described are uncommon except for a short period during and immediately after calving (Reynolds et al. 1982). In groups, adult bison are very formidable in protecting their calves. Gunther (1991) described an incident where an adult grizzly bear approached 19 bison including 5 calves. As the bear approached, the adult bison bunched together into a tight group and stood adjacent to each other facing the bear. The calves ran behind the adult bison for protection. The bear stopped its approach, sat down and looked at the bison, then turned and walked away.

Even when isolated from herds, the protective behavior of adult cow bison combined with their size (318–545 kg), sprinting ability (66 km/h, Meagher 1986), agility, and horns (Meagher 1973) make them quite formidable when protecting their calves, even if the defense is only a bluff. In addition, not all behavioral threats made by bison during interspecific interactions are bluffs. McHugh (1958) observed defensive behavior against humans, horses, ravens (*Corvus corax*), a pronghorn (*Antilocapra americana*), and a porcupine (*Erethizon dorsatum*). YNP files contain one account of a jogger injured by a cow bison with a new calf and multiple accounts of park visitors being injured by bull bison almost every year (M.

Meagher, personal communication, 2001). In addition, there have been several incidents of horses being gored by bison in the park. We hypothesize that the frequency of attempted grizzly bear predation on bison calves is likely limited by threats from the bison and the potential for injury to predatory bears.

A review of the literature describing wolf–bison interaction may provide some insight into anti-predator defense tactics bison use against large predators and explain why the bison cow turned to confront the bear rather than continue fleeing. Of 45 observed encounters between groups of YNP bison and wolves, the bison reacted by tightly grouping 38 times (Smith et al. 2000). In 32 of the 45 observed incidents, the bison stood and faced the wolves. Of 14 known successful predation events, 8 involved bison that were impaired. Videotape of wolf–bison interactions (D. Smith, personal communication, 2001) indicated that wolves attempted to take healthy bison when the bison were plunging in line in deep snow. As the bison reached solid open ground, the target individual would turn and face the wolves, which then backed off. In Canada's Wood Buffalo National Park, wolves often singled out individuals separated from herds (Haynes 1982, Carbyn et al. 1993). We can only infer that grizzly bears are capable of judging their opportunities and reacting accordingly to a separated cow with a calf, especially when the bison are at a disadvantage downslope from the bears. In spite of the speed at which bison can sprint, they typically react to large predators such as wolves by standing their ground (Smith et al. 2000). This tactic has also been observed to be successful for muskoxen (*Ovibos moschatus*; Gunn 1982), moose (*Alces alces*; Mech 1966) and elk (D. Smith, personal communication, 2001) in deterring predatory wolves and for bison mixed groups against grizzly bears (Gunther 1991). This type of reaction to a threat to her calf, even if a bluff, might explain the solitary cow's apparent effort to keep herself between her calf and the bear when initially fleeing and then to confront the bear when it caught up to her and her calf.

The incident we described involved a female grizzly bear with cubs, suggesting that some cubs have at least limited opportunity to learn this behavior from their mothers. Although we believe that bear predation on bison calves is rare, this incident indicates that grizzly bears are capable of taking advantage of favorable circumstances to kill and consume bison calves.

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