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GRIZZLY BEAR PREDATION ON A BULL BISON IN YELLOWSTONE NATIONAL PARK

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Grizzly bears (*Ursus arctos horribilis*) will eat meat whenever it is available to them (Mattson 1997). Ungulate meat is more prominent in the diet of grizzly bears from the Yellowstone area than other interior brown bear populations in North America (Craighead and Mitchell 1982, Mattson et al. 1991, Mattson 1997). Nitrogen (N_{15}) isotope analysis of hair collected from grizzly bears in the Greater Yellowstone Area suggests that meat comprises almost half of the annual energy intake of adult females and over half for adult males (Jacoby et al. 1999). Grizzly bears obtain ungulate meat primarily through scavenging winter-killed (Green et al. 1997) and wolf-killed (*Canis lupus*; D. Smith, Yellowstone National Park [YNP], Wyoming, USA, personal communication, 2001) elk (*Cervus elaphus*) and bison (*Bison bison*) carcasses, and by predation on elk calves (Gunther and Renkin 1990). Grizzly bear predation on adult elk and moose (*Alces alces*) has also been reported (Schleyer 1983). However, reports of predation on adult bison are rare.

In an extensive review of the historical literature on bison, Roe (1951, 1970) found only one reference documenting grizzly bear predation on bison. Review of more recent bison literature adds no additional evidence that grizzly bears prey on adult bison (Meagher 1973, 1978; Reynolds et al. 1982; Shaw and Meagher 1998). Studies of grizzly bear behavior and food habits in YNP have not documented grizzly bear predation on adult bison (Mealey 1975, Schleyer 1983, Gunther and Renkin 1990, Mattson et al. 1991, Schullery 1992, Mattson 1997, Knight et al. 1999), except for the occasional killing of severely malnourished bison in spring (Craighead et al. 1995).

I observed a predatory attack by an adult female grizzly bear on a young adult bull bison near the Yellowstone River outlet in east-central YNP, Wyoming. The Yellowstone River outlet is surrounded by spruce–fir (*Picea* spp.–*Abies* spp.) and lodgepole pine (*Pinus contorta*) forest types (Despain 1990). The area is used extensively by grizzly bears (National Park Service 1984). Bison, mostly bulls, are active in the area from late April through December, with small groups of bison sometimes over-wintering in the area.

I observed the incident from the road on the west side of the Yellowstone River near the outlet of Yellowstone Lake (elevation 2,371 m) on the morning of 23 September 2000. I was observing a grizzly bear with 2 cubs-of-the-year that were digging for pocket gophers (*Thomomys talpoides*) in a meadow 300–400 m from the Lake Lodge. This family group had been frequenting the area throughout the summer. At approximately 1200 hours, the bears began walking northeast along the shore of Yellowstone Lake toward the Yellowstone River outlet at Fishing Bridge. At approximately 1300, the bears emerged onto the road at Fishing Bridge Junction and crossed to the north side. The bears continued walking north in a direction that would have taken them past a young adult bull bison lying under a tree 15 meters from the road. The bison stood up abruptly when the bears were approximately 5 meters away. When the bison stood up, the bears appeared startled. The adult female, then the cubs, stood up on their hind legs and looked at the bison. The bison stood in an alert posture with his tail raised and head down. After a few seconds, the adult bear lunged toward the bison. The bison immediately turned away and began trotting east, up slope along a bench directly above the road heading toward Fishing Bridge. The adult bear loped after the bison at less than full speed.

I drove east along the road, observing the movement of the bears and bison approximately 15 meters away. After trotting about 50 m, the bison broke into a full run. The adult bear then chased the bison at full speed. At the crest of the hill above the Yellowstone River, the bear swiped its paw across the hindquarters of the bison, knocking the bison's back legs out from under it. The bison began to slide down the steep embankment of the hill on its back. After striking a tree with considerable force on its front quarters, the inverted bison continued to slide toward a pedestrian boardwalk at the base of the hill. The grizzly leaped onto the stomach of the inverted bison and skidded down the hill on top of it while attempting to bite at the bison's neck. The bear and bison came to a stop at the base of the hill on the pedestrian boardwalk. The bear continued to bite and pull at the bison's neck while the bison tried to get to its feet. The bison managed to stand and struggled to remain standing, but the bear continued to pull the bison back down to the ground. When the bison did stand, its hind legs buckled under its own weight. The bear took advantage of this and jumped onto the back of the bison, biting and clawing at its back, inflicting a number of bite and claw wounds around the bison's hump and lower back. With a quick head motion, the bull managed to free itself from the bear and stand up a second

time. At this time, I observed that the bison's left front leg was broken. This injury may have occurred when the bison slammed into the tree while sliding down the steep hill. The bison continued attempts to stand and fought off the bear with its head and horns for several minutes. The bear stood up on its hind legs and swiped at the bull's head with its paws. The bison reacted by rearing up, which caused it to slide backward into a ditch adjacent to the Fishing Bridge boardwalk. Being in the ditch appeared to put the bison in a better position to fend off the bear with its head and horns.

At this time the 2 cubs, which had been observing their mother from on top of the hill, came down and reunited with her near the bison. The bison continued to struggle to keep up-right and bled profusely from its back and hind-quarters. The adult bear attacked the bison several more times, but the bison was able to use its head and horns to repel the attacks. The cubs did not participate in these attacks but remained nearby. On 5 occasions the bears left the area and were no longer visible to me, then came back and the adult attacked the bull again, but was unable to kill it. The interval between attacks increased from approximately 5 minutes to several hours between return visits.

At approximately 1800 the bears left and did not return, enabling me to investigate the bison in the ditch. The bison was startled upon my approach and attempted to climb out of the ditch. It fell down and was unable to pull itself out of the mud. Due to the proximity of the bison to the main road and concerns for the safety of visitors and a construction crew working on the road bridge adjacent to the attack site, park management decided to dispatch the bison and move the carcass. After shooting the bison, the carcass was moved 0.9 km away to a location remote from public use areas. Managers hoped that the bear family group would follow the scent trail to where the carcass was disposed and scavenge the remains.

The next morning (24 September), an adult female grizzly with 2 cubs returned to the area where the attack occurred. The 3 bears were identical in size and color to the bears that had encountered the bison the previous day, and I believe they were the same family group. The adult female grizzly paced, circled, and sniffed the ground as she searched the site where she had attacked the bison the day before. Several visitors saw the bears from the main road and approached them in an attempt to get pictures. As they approached, the adult bear bluff charged them and chased them back toward the road. Due to the danger that an adult female grizzly accompanied by 2 cubs posed to park visitors and bridge construction workers, the bears were hazed out of the area with cracker shells. I monitored the area where the bison carcass was moved to, but never observed the female with cubs or their tracks in the

snow at the new location. Three days later, I observed a large adult male grizzly scavenging on the carcass. I observed that bear at the carcass for 5 consecutive days and then did not see it again. In that time, the grizzly consumed most of the bison. After the grizzly stopped returning to the carcass, a large male black bear (*Ursus americanus*) began frequenting the carcass and scavenging the remains. The black bear returned to the carcass to scavenge for several days until the carcass was entirely consumed. I did not see the female and her 2 cubs in the area again for the remainder of the season.

Tooth eruption and wear from the bison's mandible indicated it was 3½ years old (M. Meagher, YNP, Wyoming, USA, personal communication, 2001). Femur bone marrow was grayish-pink in color, indicating that the bull may have been in the early stages of marrow fat depletion, although not yet severely malnourished (Cheatum 1949). Visually, the bison had looked slightly thin, but there was no other evidence of poor health or injury prior to the attack or when I observed it fleeing from the bear.

Based on the paucity of documentation in the literature, grizzly bear predation on adult bison is likely very rare. However, the incident I observed indicates that grizzly bears can opportunistically pursue and kill adult bison under conditions where the bear has an advantage. In this case, the bison was alone and lacked the group protection afforded by a herd; it was also young and likely lacking in experience. The bison attempted to flee rather than stand its ground. Large ungulates such as bison (Smith et al. 2000), moose (Mech 1966), and elk (D. Smith, YNP, personal communication, 2001), are often more successful at deterring predatory attacks by confronting predators rather than fleeing. Although human safety concerns required euthanizing the bison and moving its carcass, the extent of the injuries already inflicted on the bison lead me to conclude that given more time and less human interference, the grizzly would undoubtedly have killed the bull.

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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