

and Wolves, *Canis lupus*

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Mech, L. David, Rick T. McIntyre, and Douglas W. Smith. 2004. Unusual behavior by Bison, *Bison bison*, toward Elk, *Cervus elaphus*, and Wolves, *Canis lupus*. *Canadian Field-Naturalist* 118(1): 115-118.

Incidents are described of Bison (*Bison bison*) in Yellowstone National Park mauling and possibly killing a young Elk (*Cervus elaphus*) calf, chasing wolves (*Canis lupus*) off Elk they had just killed or were killing, and keeping the wolves away for extended periods. During one of the latter cases, the Bison knocked a wolf-wounded Elk down. Bison were also seen approaching wolves that were resting and sleeping, rousting them, following them to new resting places and repeating this behavior. These behaviors might represent some type of generalized hyper-defensiveness that functions as an anti-predator strategy.

Key Words: Bison, *Bison bison*, Wolf, *Canis lupus*, Elk, *Cervus elaphus*, Yellowstone National Park.

Bison (*Bison bison*) are known to be aggressive to other ungulates including Elk and even to kill Elk (*Cervus elaphus*) calves (Chapman 1937: 148; Rush 1942: 225; McHugh 1958: 143; Mahan 1977). Little is known about the causes and circumstances of this aggressiveness except for the scattered reports documenting it. Bison also defend themselves aggressively when attacked by Wolves (*Canis lupus*) (Carbyn and Trotter 1988; Carbyn et al. 1993; MacNulty 2002), although Bison have been reported to be indifferent to close, but non-attacking, Wolves (Catlin 1876-1: 254 cited by McHugh 1938; Goodwin 1939: 369 cited by McHugh 1938; and Soper 1941: 403; Carbyn et al. 1993).

We also have observed the same types of behavior of Bison toward wolves both when being attacked and not being attacked in Yellowstone National Park. However, we have observed other types of Bison aggressiveness toward Elk and toward Wolves that has not been reported, and we have seen another possible case of Bison killing an Elk calf. Because our observations considerably extend what is known about Bison aggressiveness and because observation of any ungulates chasing predators are rare (Berger 1979), we report them below and propose an explanation for the possible adaptiveness of the aggressiveness.

Both Elk and Bison have inhabited the park for many decades, but Wolves were reintroduced to the ecosystem in 1995 and 1996 (Bangs et al. 1998). Wolves in Yellowstone prey primarily on Elk (Mech et al. 2001) but do kill Bison as well (Smith et al. 2000). RM made the observations in the northeastern part of Yellowstone National Park through binoculars and spotting scopes with 60× power and recorded them by tape recorder; LDM independently observed and recorded with pad and pencil the observation on 20 March 2002. DWS

directed the capturing and radio-tagging of the Wolves, allowing them to be located and observed.

Observations

1. 30 May 1995 – Bison Attack Elk Calf

A recently born Elk calf that separated from its mother became mixed up in the middle of a Bison herd southwest of the Lamar Picnic Area. During the early stages of this observation, filmmaker Ray Paunovich saw a Bison knock the calf down and then repeatedly butt it to the ground.

RM watched a group of Bison encircle the calf, then lick and sniff it. The calf got up and tried to walk off, but several Bison chased it. One Bison butted the calf in the side and knocked it down. Twelve additional Bison came over to sniff it. The calf got up and ran off, but was chased and knocked down again by the Bison.

As long as the calf remained down or stood still, the Bison just sniffed and licked it, but whenever it ran off, they chased it and knocked it down. This sequence took place at least four times. A cow Bison later butted the Elk calf several times as it lay on the ground. Then the herd walked away. The calf was motionless as the Bison moved off and was possibly dead from all the butting. RM then left, but Paunovich thought he saw some movement from the calf after RM left. Whether the calf survived is unknown.

2. 6 June 2001 – Bison Displace Wolves from Kill

At 0529 hrs, RM spotted a fresh adult Elk kill with four yearling Druid Peak pack Wolves next to it southeast of the Lamar Valley Picnic Area. The carcass was intact and the Wolves must have just killed it. Three Wolves were about to start feeding.

A Bison bull walked up to the carcass and sniffed its head. The Wolves went to the rear of the carcass and

started tugging on that section as the bull continued to sniff the head area. This seemed to be the Wolves' first feeding on the kill. Three more Bison bulls approached the carcass. One Wolf at the carcass walked off a few steps with a tucked tail, then came right back and snarled at the nearest bull. The bulls walked toward the three Wolves, and the Wolves backed off. Two of the bulls sniffed the Elk's head. A Wolf sneaked back in and fed on the rear end.

Soon six bulls were at the site. They had a stand-off with the three Wolves at 0537 hrs. When one Wolf tried to approach the carcass, a bull ran at it, and the Wolf backed off. The other bulls walked toward the rest of the Wolves, and they scattered. The six bulls kept the three Wolves away from the carcass through 0554 hrs. At that time, the bulls left the site, and the Wolves moved to the carcass and fed. The three Wolves were still feeding on the kill when RM left at 0615 hrs.

In Wood Buffalo National Park, Alberta, mixed herds of Bison were observed forcing wolves away from wolf-killed Bison calves about 1 and about 4 months old (L. N. Carbyn, personal communication).

3. 3 March 2002 – Bison Attack Wounded Elk Calf

This incident was observed and video-taped by cinematographer Shane Moore in the Blacktail area of Yellowstone National Park. The tape was viewed by RM who transcribed the details summarized below.

The incident began when a herd of Bison ran 0.15 km downhill to a 9-month-old Elk calf with blood on its neck. Several Coyotes (*Canis latrans*) were nearby. The Bison herd gathered near the Elk, and over a 4-hr period, the Bison sniffed, licked, chased, and butted the Elk as the animal tried to seek refuge from the Coyotes by running into the Bison herd. The Bison butted the calf throughout the episode on 21 occasions during 40 minutes of videotaping, usually in the rear or side, and once knocked it into the air. At times the Elk was bedded or lying on its side when the Bison butted it.

Partway through the video, it was apparent that the Elk's abdomen was wounded, and an organ was hanging out. Moore believed that wound resulted from when he saw a Bison charge the Elk at full speed and hit it very hard in the side. Although the rest of the Bison herd then blocked the view, the calf stayed down for 20 minutes and when it arose, its abdomen had been ripped open.

Toward the end of the four-hour observation, the Bison drifted away from the wounded and bedded calf. As the calf continued to weaken, two Coyotes attacked it. Three additional Coyotes joined the attack, and the five Coyotes soon killed the calf.

4. 20 March 2002 – Bison Displace Wolves from Kill

Eleven members of the Druid Peak pack (11-months old and 23-months old; no adults) had been chasing Elk in the Hellroaring Creek area of Yellowstone National Park. At about 0931 hrs, the Wolves targeted a single cow Elk and pulled her down. A herd of about

39 Bison rushed to the downed Elk, chased the Wolves off, and surrounded the Elk tightly (0933 hrs). Suddenly the Elk leaped up. Two Wolves approached the Elk and nipped at it. The Elk ran through the Bison herd, and the two Wolves pursued it. After about 30 m the Elk fell. The Wolves were on it again for about 30 sec when the Bison chased them off again (0936 hrs). Later the Elk arose and almost immediately collapsed. The Elk arose a third time, ran a short distance and collapsed. She later tried to stand again but could only get up on her hind legs. A Bison butted the Elk's rear end and knocked her down, and the Bison herd surrounded the Elk again and kept the Wolves away. Each time a Wolf approached, a Bison would chase it 15-30 m. After a few minutes, the Wolves headed away up a hill and bedded (0946 hrs).

The Elk, while surrounded by Bison, kept raising her head and trying to get up. Usually the Bison stood closely around her but sometimes jumped back a few meters. The Bison remained tightly around the Elk from about 0939 hrs on. By about 1135 hrs, the Elk's head was no longer up and her body lay flat; she seemed dead. Ravens landed on or next to her, although the Bison still surrounded her closely. Bison licked or sniffed (we could not determine which) the carcass intermittently for several minutes.

The Wolves had returned at 0955 hrs and hung around 15-60 m from the Bison herd, and at various times some tried to reach the downed Elk. Each time, one or more Bison would skirmish with them and try to drive them off.

About 1253 hrs, the Bison started moving away from the Elk, and by 1305 hrs Wolves moved in. However, the Bison quickly returned and ran the Wolves off. This happened several times when Bison were both east and west of the Elk. Eventually, however, the Bison all grouped east of the Elk, and the 11 Wolves began to feed. The Bison then charged the Wolves and ran them off. Then the Wolves returned and chased the Bison away. In the next few minutes there were two additional standoffs at the carcass, and both times the Bison chased away the Wolves.

Such skirmishes continued as Wolves and Bison surged toward the Elk and each other, but gradually the Bison began to head a few meters farther east, and the Wolves became bolder. By 1313 hrs, the Wolves controlled the carcass and remained there and fed, while the Bison drifted off eastward. By 1350 hrs most of Wolves were done feeding and slept on a hill above the carcass, although individual Wolves fed later as well.

5. 22 March 2002 – Bison Roust Sleeping Wolves

In the same general area as observation 4 was made, eight of the 11 Druid Peak Pack Wolves seen on 20 March were sleeping at 0909 hrs when six Bison leading a larger herd (probably the same 39 seen there two days earlier) approached them. The Wolves arose, moved 100 m, and lay down again. Two minutes later, the Bison approached them to within 3 m, and the

Wolves again moved off 100 m and lay down. At 0918 hrs, a Bison approached one of the Wolves, which then confronted it; the other Wolves joined in harassing the Bison for 30 seconds.

The Wolves then left at 0920 hrs and moved 90° and a few hundred meters and lay down on a rocky ridge. Eventually the Bison followed and roused the Wolves from there. Several more times the Bison followed the Wolves and roused them out of their beds.

6. 16 April 2002 – Bison Bulls Displace Wolves from Kill

At 0826 hrs, RM saw 11 Druid pack Wolves (the breeding male, two yearlings, and eight 11-month-old pups) chase Elk about 1.6 km west of the Lamar Ranger Station. They pulled down a cow Elk at 0858 hrs. A few Bison bulls started moving toward them from the north. Two Bison ran into the site and chased the Wolves off. A yearling and two pups came right back to the carcass. One of the bulls returned to the site and chased off one of the Wolves.

At 0900 hrs several Wolves were feeding as four Bison bulls stood near the carcass. Two bulls charged the Wolves and drove them off, then stood close to the carcass.

At that point, five Wolves watched the carcass from 35 m away. The two bulls charged the breeding male and another Wolf, which fled eastward. The other Wolves ran to the kill and fed. The breeding male circled around and joined them.

A bull then walked to the carcass, and the feeding Wolves backed off a meter or so. The other nearby Bison approached the site. That bull charged the Wolves, and they ran off but came right back.

Both bulls then stood next to the Elk carcass and sniffed it. The bigger bull charged the Wolves, but as before the Wolves soon stopped, and the breeding male and three others returned to the site.

The two additional Bison bulls came toward the carcass from the west. One of the bulls shook his head, and some Wolves backed off a step or two. Other Wolves stood their ground and faced the bull which was about 6 m away. The bull shook his head again, but the Wolves continued to feed and ignored him.

The breeding male Wolf stepped away and ate some snow. When he returned to the carcass, a bull chased him off. The Wolf came right back. The same bull, which was the largest and most aggressive of the four bulls there, then drove all the Wolves off. The breeding male Wolf returned, and the big bull charged him. A second bull was standing a meter or so from the carcass. The big bull chased the breeding male Wolf southward, then returned to the site. The two bulls kept the Wolves from the kill until the bulls walked a short distance away at 09:12; the Wolves immediately ran in. All 11 fed or were near the site. As the two bulls walked off to the north a pup followed them.

Around 0920 hrs, three bulls approached the carcass from the northeast as the Wolves continued to

feed. One pup headed westward, but the others stood their ground. The bulls turned back before they reached the site. A fourth bull chased a Wolf to the north of the carcass. One bull then ran in toward the carcass, but the Wolves countercharged, drove him away, and resumed feeding. A fifth bull was north of the carcass but did not yet approach it.

A sixth bull approached the kill, and a pup circled around to his rear and followed him. Another pup joined the first pup behind the bull. Two more of the original bulls approached the carcass from the north. The lead bull walked by the north side of the carcass with a raised tail. As another bull approached the site, the seven feeding Wolves backed off. At 0927 hrs three bulls remained at the carcass keeping the Wolves away. The breeding male Wolf stood nearby. He and a pup left, and the breeding male bedded north of the site at 0929 hrs. Eight other Wolves stood near the carcass.

At 0930 hrs two bulls started sparring with each other and began to drift away from the carcass. The breeding male Wolf and a yearling walked to the kill and fed. In the next minute other Wolves joined them. All six bulls remained away from the site, and the Wolves fed unmolested.

Discussion

The aggressiveness shown by Bison toward Elk and toward non-attacking Wolves is puzzling but might be some kind of hyperdefensive or hyperaggressive behavior. Predator harassment by several species of ungulates has been documented, and various explanations have been offered (summarized by Berger 1979), each involving ultimate reduction of predation risk. These explanations do not account for Bison attacking Elk, however. The most common element in our observations and those reported earlier of Bison attacking Elk was the presence of a weak or downed Elk and the butting, sniffing, and mobbing of it. In the Elk incidents involving Wolves, perhaps the presence of the predators was only incidental and made the Bisons' aggressiveness appear directed at keeping Wolves away from the carcasses or injured animals.

In other words, our observations might involve two phases of hyperaggressive behavior: (1) a general aggressiveness toward various intruders, perhaps as generalized anti-predator behavior that causes the Bison to approach intruders, and (2) continued aggressiveness toward intruders that do not flee, e.g., wounded animals or animals seeking refuge in the Bisons' herd because these animals persist in remaining nearby. This would also include Wolves that are trying to feed on carcasses near the Bison herd. Bison are so large and powerful that when a herd acts aggressively, it can charge and attack any animal with impunity, including Wolves and Grizzly Bears (*Ursus arctos*). Thus it may be generally advantageous for them to advertise this ability by harassing intruders persistently without making fine distinctions as to type.

Acknowledgments

This study was supported by the Biological Resources Division, U.S. Geological Survey, and the Yellowstone Center for Resources.

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Received 11 August 2003

Accepted 4 June 2004