Judging From Jaws

By Gene Gade

The people who used the Vore Buffalo Jump selectively transported some types of bone (ex. large marrow-rich leg bones) to their processing camps and discarded parts of less value to them. The hunters had little need for the mandibles...lower jaws...of the bison. Mandibles were often removed and discarded during the butchering process to make it easier to extract the highly valued bison tongues. That's good luck for archaeologists because mandibles can provide a lot of inferential evidence about both bison and the Native Americans who hunted them.

Predictable Cycles

Bison, like humans, are not born with permanent teeth. Their deciduous teeth (equivalent to human “milk” or “baby” teeth) are replaced at predictable times and in a known sequence over a period years. Unlike humans who can give birth at any time of year, the birth of buffalo calves is clustered within about a six-week period in April or May, the majority being born in the first two weeks of May. The bison breeding and calving cycle is thus correlated with the Great Plains climate which brings much of the year’s precipitation in the spring and early-summer and when cool-season grasses emerge from dormancy. Buffalo calves are thus born when their mothers have access to rapidly growing grass at the height of its nutritional value and when cows need a lot of energy and protein to produce milk. Calves nurse for most of a year and are weaned in spring, shortly before the next calf is due.

Bison have a nine-month gestation period, so breeding must occur in late-July or August. After breeding, bulls tend to wander off either as solitary animals or in bachelor herds. Thus, the big herds in autumn are predominantly cows, calves and juveniles. In general, Native Americans preferred cows and calves as meat. Bulls are not only more dangerous, they are very lean and tough. Females and younger animals have a higher percentage of body fat and more tender meat. It's not surprising then that bones in the VBJ are mostly cows and calves.

Mandible Matters

Much can be learned of bison biology and behavior can by studying live animals, but that knowledge can be useful when interpreting bones from animals that died hundreds of years ago. Using only jaw bones, for example, scientists can make good estimates of the age, sex, general health and probable month of death of a bison.

Like modern domestic cattle, bison have incisor teeth on their lower jaw, but lack incisors on their maxilla or upper jaw. When they graze, they position grass between their lower incisors and the hard upper palate, then bite and rip it. They chew and grind it with the molars and premolars. It's easy to tell the age of young bison by the number of incisors and permanent molars that have erupted.

The drawings below are of the left mandible of a mature bison showing the three premolars and three molars as they appear from the tongue or inside of the mouth and from top down. For at least the first three months of a calf’s life, none of the permanent teeth have emerged.

The first molar may begin to erupt in late summer or fall, but is not fully in place until the calf is about a year and a half old...October or November of its 2nd
year. Molars come in at an angle initially and slowly straighten during the process. Tooth facets that emerge first begin to wear down almost immediately while those that emerge later show almost no wear. The second molar comes out early in the bison’s second year of life and the third is not present until the animal is three. Premolars start to appear in the middle of the bison’s second summer, but the final premolar is not present until it is three.

Likewise, bison get a pair of permanent incisors in each of their first three years. A pair of “canine” teeth (that look similar to incisors) emerge in the fourth year, completing the front row of teeth.

The figure above shows the likely wear pattern on the incisors. The top left drawing is of a three-year-old that has all of its front teeth but has almost no wear on the outer canines. Upper right is a four-year-old showing some wear. Lower left shows mature healthy adult teeth and lower right shows the incisors of an aged animal.

Estimating the age of young bison can be done with confidence. However, using mandibles to determine the sex of young animals is a less precise science. There is little difference between the jaws of male and female calves. As the animals age, female bison tend to level off in size when they mature at about four years of age, while bulls continue to grow and differentiate for some years thereafter.

The photos show (both from the side and top-down views how bison molars wear down as the animal ages. As with most ruminant species, bison molars and premolars are large and characterized by low crowns and crescent-shaped cusps designed for grinding vegetation.

So what?

Using this type of knowledge combined with careful observation and measurement it is possible to make quite accurate measurement of a bison’s age. Especially within the first four years, it is possible to tell the season of a buffalo’s death. With younger animals it is often possible to estimate the age of death within a couple of weeks. This evidence allows archaeologists to say, for example, that most jumps at the Vore Site occurred in autumn, with only a few in spring.

Inferences about population demographics are possible using such evidence and logic. “If breeding seasons are seasonally limited, birthing seasons will also be. If birthing seasons are also limited, animal ages will occur in discrete clusters. If kill seasons are restricted, these discrete age groups will show up. For example, a fall kill will have animals about 8 months old (born that spring), animals 1 1/2 years old (born in the previous year) and so on through the entire population.” (Reher and Frison, 1980).

Catastrophic kills, such as buffalo jumps, in which many animals are killed at the same time, would tend
to freeze the age distribution in the population at a moment in time. That is, all of the age groups that went over the edge should be represented among the bones at the bottom of the pit in the same proportions as they were in the living herd before the jump. Mature animals in their reproductive prime should therefore make up the bulk of the animals killed at a buffalo jump. Normal attritional death due to disease, starvation and predation and so on would be expected to take the young and aged differentially.

**VBJ Research**

Charles Reher and others studied 850 bison mandibles from the original 1970’s VBJ excavations. These jaws were taken from 13 strata and a talus slope representing at least 22 different cultural levels. Here are some of the results:

1) Mandibles of calves and other young animals are not as well represented as would be expected in a live population. In fact, there are only about 20% as many calves as the birth and survival statistics of calves indicate there should be. This “missing calf” phenomenon is consistent among jumps that have been excavated, but the deviation from expected numbers of calves seems to be more pronounced in the more recent kills at the Vore Site.

Apparently, the hides and meat of the younger animals were preferred by the Native Americans and were differentially removed from the Site. Calves would certainly be easier to divide into small portions that could be carried out of the sinkhole for immediate processing or consumption. (One of the obvious differences between the VBJ and cliff-type buffalo jumps is that everything removed from the VBJ would have to be carried up a steep slope, whereas, as most sites, carcass portions could simply be dragged downhill to a processing site. Whether gravity helps or hinders is a big concern when moving tons of product manually!) Also, removing the smaller animals early created more room to butcher the larger carcasses of older bison. Also, the mature animals were used somewhat differently. Heavy, unusable portions of older beasts were left on site for dogs and scavengers and most of the meat was preserved as jerky or pemmican. Many of calves may have been consumed as fresh meat in the feasts immediately following the hunt. In any case, estimates of the number of animals trapped at the site should probably be adjusted upward to account for calves that were removed.

There are at least two other possible explanations for the missing calves in the upper VBJ layers. One is that increasing human population increased the immediate need for juvenile hides and meat. Another is that the arrival of horses in the final decades of VBJ use provided beasts of burden that allowed later Indians to drag or carry smaller carcasses out of the sinkhole.

2) At most buffalo jumps, hunts occurred in late-fall or early-winter. That certainly makes sense because the Indians needed to procure their winter food supply and avoid the spoilage problem that would have ensued if hunts had taken place in hot weather. However, data from the Vore Site indicates that hunts were not as seasonally restricted there as at some other buffalo jumps. The data seem to indicate that the “jumping season” had two seasonal peaks at Vore. As expected, fall was the dominant season of use, However, there was some use of the VBJ in the spring...during or right after the calving season. There were few, if any jumps in summer or early autumn.

2) As predicted, buffalo killed at the VBJ were predominantly cows and calves. Only 20% of the skulls are from bulls.

3) Life expectancy pf bison killed at VBJ averaged about 14 to 15 years. (Bison sometimes live 30 years or more.) This is a longer lifespan than was found at other bison kill sites such as the Glenrock and Casper sites. The interpretation of this finding is that climate and rangeland conditions were optimal during the period of VBJ use. That finding corroborates similar conclusions based on other types of evidence.

Sources:


Drawings of the bison mandible and cheek teeth was made by Larry Todd. Dr. Todd and his field school from Colorado State University excavated at the Vore Site during two summers in the early1990’s.

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![Diagram](image.png)

The drawing, by Dr. Larry Todd, is of the bottom of a bison skull (ventral view). It shows the upper jaw (maxilla) and roof of the mouth. The molars and premolars are similar to those of the mandible, but there are no incisor or canine teeth.