



# Back on the horse: Recent developments in archaeological and palaeontological research in Alberta

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## New radiocarbon dates for early use of Head-Smashed-In Buffalo Jump

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### ABSTRACT

Three new radiocarbon dates were obtained from the oldest deposits at Head-Smashed-In Buffalo Jump (DkPj-1), in southern Alberta in an effort to more accurately bracket the earliest utilization of this significant site. This paper reports on those dates (all in excess of 5000 years BP) and places the early use of the site by Mummy Cave complex cultures in a broader chronological context of bison jump use on the Great Plains.

### KEYWORDS

bison jump, radiocarbon, Mummy Cave, Great Plains

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## 1. Introduction

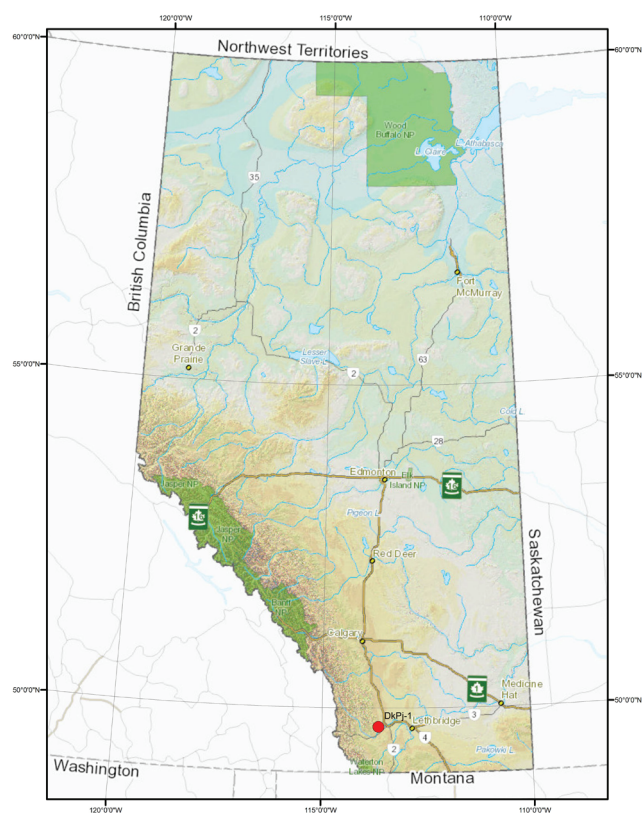
Head-Smashed-In Buffalo Jump (HSIBJ, DkPj-1) is anomalous. The earliest use of the site dates to a time when there was no other buffalo jump in use on the Great Plains was being used. For more than 40 years the earliest use of the site was based on two fairly similar radiocarbon dates, and the end of this initial use was based on two quite different dates. Given the importance of this World Heritage Site, especially of the earliest use of this site, three new radiocarbon dates were obtained from the oldest deposits at HSIBJ. This paper reports on those dates and places the early use of the site in a broader chronological context of bison jumping on the Great Plains.

## 2. Background

Head-Smashed-In Buffalo Jump, in southwestern Alberta (Figure 1), was excavated in 1965 and 1966 by Reeves, and in 1972 by Reeves with assistance from Mike Quigg (Reeves 1978, 1983). Reeves excavated at two separate locations below the sandstone cliff, termed the north and south kill sites (Figure 2). The dig at the south end of the kill site reached the staggering depth of 28-30 feet below surface (8.5-9 metres). At this depth Reeves recovered butchered bison bones and Bitterroot/

Salmon River-style projectile points which he assigned to the Mummy Cave complex (Reeves 1978). At the south kill excavation Reeves identified 16 cultural layers, with #16 being the deepest and oldest. This layer was further separated into layers 16a, b, and c, with 16c being the deepest. Reeves submitted a single radiocarbon sample from layer 16c, which yielded a date of 3450±300 BC (GSC 803). In this paper I first report Reeves' dates as he did, but then convert his BC dates to years BP by simply adding 2000 years, all dates are uncalibrated unless noted. The top of the Mummy Cave occupation at the south end of the site, layer 16a, produced a radiocarbon date of 2100±100 BC (GAK-1416) (Reeves 1978:167). These dates imply that makers of Bitterroot/Salmon River points used the jump, at least at the south kill, for more than 1300 years.

Excavations at the north end of the HSIBJ kill site exhibited much the same stratigraphic and chronological record, the major difference being that a north-trending tilt to the underlying bedrock brought the earliest deposits at the jump much closer to the surface than was the case at the south end. Reeves encountered Mummy Cave complex materials at the north end at a mere 8.5-11 feet (2.6-3.3 metres) below surface. The deepest excavation



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**Figure 1.** Location of Head-Smashed-In Buffalo Jump (DkPj-1), Alberta.

at the north end was unit 10, which was further divided into layers a, b, c, and d, with 10d being the deepest. Reeves obtained two radiocarbon dates for the Mummy Cave occupation at the north end, a sample from 10d returned a date of  $3710 \pm 100$  BC (RL 334) (5710 yr BP), and a sample from 10a, the top of the Mummy Cave deposits, yielded a date of  $3130 \pm 120$  BC (RL 333) (Reeves 1978:162). These dates suggest that Mummy Cave complex people used the jump for about 600 years, that is, some 700 years less than the dates suggested from the south excavation.

The earliest dated use of HSIBJ, that of about 5700 yr BP, is significant. The antiquity of forcing buffalo over cliffs on the Great Plains is unclear. For many years some researchers believed that the oldest buffalo jump was Bonfire Shelter, located in Texas (Dibble and Lorrain 1968). The site is firmly dated at ca. 10,000 yr BP, but its status as a jump is disputed. Some (Byerly et al. 2005, 2007) argue that the bones found in a rock shelter at the base of a high cliff were brought there from kills made below the shelter. Others (Bement 2007) defend the original interpretation that animals were driven over the top of the cliff. This matter is currently unresolved.

Temporally, the next candidate for the oldest buffalo jump is the site of Butternut Creek in northern Kansas (Hofman 2010). The site has been explored only minimally however,



**Figure 2.** Head-Smashed-In Buffalo Jump, Alberta. The north kill site area circled at the far right, the circle to the left of that is the south kill. Photograph courtesy of Head-Smashed-In Buffalo Jump.

a complete Allen point was found in a bison bone bed located at the base of a tall bluff along Butternut Creek. Hofman obtained a radiocarbon date of about 9000 yr BP from the bone bed. The cursory nature of investigations to date prevents researchers from stating with certainty that the bone bed is the result of a bison jump, although this seems the most likely explanation (J. Hofman, e-mail communication, 2016).

If either Bonfire or Butternut are indeed buffalo jumps, then they are the oldest currently known. If they are not, then HSIBJ is the oldest. The date of about ~5700 yr BP is significant, not just because it comes next after Bonfire and Butternut, but also because no other jump is known to have been in use at this time. Indeed, based on current evidence, after the early use of HSIBJ no other jump was used for a thousand years, or possibly longer.

Two recent summaries of bison hunting on the northern plains point to the anomalous situation of HSIBJ (Bamforth 2011; Brink 2017). Both authors note that no other bison jump dates to this time period, and the early use of HSIBJ conflicts with the overall pattern of intensified use of pounds and jumps only after about 3000 yr BP (Bamforth 2011). Kornfeld et al. (2010:254) also single out the unusually early use of HSIBJ, although they incorrectly report this date as 7600 yr BP (see also Walker [2016] for a recent review of bison kills on the Great Plains). The date for the beginning of buffalo jumping at HSIBJ is important for a number of reasons, yet for more than four decades it has been based on only a few radiocarbon dates that were obtained long before AMS dates were available.

### 3. New basal dates for HSIBJ

All faunal material recovered during the Reeves excavations is stored at the Royal Alberta Museum in Edmonton. Since bones were the primary organic material recovered from the excavations, these were selected for obtaining additional radiocarbon dates. Using notes, maps, and published reports from Reeves (1978), a review was made of the deepest levels of the site so as to acquire datable material that should reflect initial use of the jump. Samples are small in these deepest levels: not wanting to destroy valuable faunal pieces, we attempted to select the least diagnostic scraps. As noted above, the deepest cultural deposits from the south kill were in level 16 of Reeves' excavations. From a bag labelled 16X we selected a midsection of a humerus weighing 56.2 grams. The deepest level at the north kill was level 10. From level 10d (the deepest) we selected a midsection of a metatarsal weighing 33.0 grams, and from level 10c a rib body fragment

weighing 18.5 grams. All bones were identified as *Bison bison*. All dates are on bone collagen extracted with alkali using standard procedures employed by Beta Analytic. All dates were corrected for isotopic fractionation.

**Table 1.** Radiocarbon dates from DkPj-1, Head-Smashed-In Buffalo Jump, dating the earliest use of the site.

Beta Lab #	Ref #	Weight (g)	Material	d <sup>13</sup> C	Conventional Age yr BP	Mean Calibrated Age cal yr BP
396503	DkPjI-X16	56.18	Bone Collagen	-19.0 o/oo	5010±30	5762
396502	DkPjI-10d	33	Bone Collagen	-19.0 o/oo	5780±30	6581
396501	DkPjI-10c	18.35	Bone Collagen	-18.9 o/oo	5470±30	6266

The three new radiocarbon dates support the Middle Pre-Contact Period use of the jump as first reported by Reeves (1978). All three dates are in excess of 5000 yr BP and thus fall within the accepted time range for the middle to latter part of the Mummy Cave period (Peck 2011). Interestingly, the oldest date we obtained (5780 yr BP) was from deepest layer of the north kill, in the deepest layer of the Mummy Cave material, which is where Reeves also recorded the oldest age for the site (5710 yr BP). The two dates are nearly identical. Our second date from this same area, 5470 yr BP, was from the second deepest Mummy Cave level at the north kill, 10c. Reeves (1978) did not date this layer but he did date the top of level 10, youngest Mummy Cave, at 5130 yr BP. Stratigraphically, the dates fit perfectly; this suggests that Mummy Cave complex people used HSIBJ for a period of about 700 years from about 5800 to around 5100 <sup>14</sup>C yr BP.

The single new radiocarbon date from the south kill is the youngest of the three at 5010 <sup>14</sup>C yr BP. Reeves' dates on Mummy Cave from this portion of the site were likewise younger than at the north end. He dated initial Mummy Cave at ca. 5450 yr BP and terminal Mummy Cave at ca. 4100 yr BP (Reeves 1978). Unfortunately, it is not possible to state precisely to which of Reeves' layers of level 16 (a, b, and c) our sample from a bag labeled 16X is directly comparable to. However, the new date is clearly closer to Reeves' initial Mummy Cave. The implications regarding terminal Mummy Cave will be discussed below. Consistently earlier dates from the deepest levels of the north kill may indicate that this part of the HSIBJ kill site was in fact the earliest portion of the cliff to be used as a kill site, and that some hundreds of years later the more southern part of the cliff was incorporated.

We can be confident that HSIBJ was being used as a buffalo jump as much as 6500 cal yr BP, at a time when no other known jump was in use. Why this one site came into use at such an early date when nearly all other sites date to several thousand years later is not known, but may relate to arguments presented by Brink (2008) that HSIBJ has all the components that make it a nearly perfect location and configuration for bringing herds of bison to the cliff. If some place had to be the mother of all jumps, HSIBJ had the requisite components.

#### 4. The gap

Subsequent to the Mummy Cave period use of the jump, HSIBJ was abandoned for a period of time. Reeves (1978, 1983) speculates that this may be due to the arrival of new people in the region who did not possess the knowledge and techniques of driving bison over cliffs. The timing and duration of the gap in use of HSIBJ is uncertain due to two conflicting radiocarbon dates obtained by Reeves. As reported above, the south excavation date suggests Mummy Cave lasted until about 4100 yr BP, while terminal Mummy Cave is dated at the north end at about 5100 yr BP. This thousand year difference is unexplained. The next unambiguous use of the jump is associated with makers of Pelican Lake points beginning ca. 1090±120 BC (3090 yr BP; GAK 1475) (Reeves 1978:162). If Reeves' date for terminal Mummy Cave use of the site from the north end (5100 yr BP) is correct then there is a gap of some 2000 years where the site was not used. If the terminal Mummy Cave date from the south end (4100 yr BP) is correct, then the hiatus in site use is about 1000 years.

A resumption of use of Head-Smashed-In Buffalo Jump during Pelican Lake times, some 3000 years ago, fits with the overall scheme of bison jump use on the northern Plains in that this date places HSIBJ at the early cusp of the intensification of communal bison hunting that appears in this region around 2500 years ago (Bamforth 2011; Reeves 1990; Walker 2016). Head-Smashed-In is still an outlier in that resumption of use of the site dating to 3090 years BP date is earlier than initial use of most other buffalo jumps. Whatever the date, early resumption of bison jump use at HSIBJ should not come as a surprise given that the site already established that it is prone to early use by knowledgeable communal bison hunters. The three new radiocarbon dates reported here do not address the end of Mummy Cave use of HSIBJ, nor the duration of the gap in the use of the jump. Additional dating of relevant deposits is required to address this issue.

#### 5. Discussion

New radiocarbon dates from the lowest levels of the kill site at HSIBJ confirm Reeves' (1978) statement that the site was first used in excess of 6000 years ago. Two new dates pertain to use of the north kill by Mummy Cave complex cultures. One new date from the deepest level (10d) of the north kill (5780 yr BP) is nearly identical to Reeves' date for the same layer. A second new date from the layer (10c) just above the deepest layer is a few hundred years younger (5470 yr BP) than the oldest date and a few hundred years older than Reeves' date for the uppermost Mummy Cave (5130 yr BP, level 10a). A single new date of 5010 yr BP from the south kill area cannot be directly compared to Reeves' dates because it was not associated with an alphabetic layer of level 16, but the sample originates from level 16 and is similar to Reeves' date of 5450 yr BP for initial Mummy Cave use of the south kill.

Noteworthy is that both Reeves' dates and those reported here indicate the earliest use of HSIBJ may have taken place at the north kill location. While the difference is not great, perhaps 250 years, it is a consistent trend. The distance between the two kill locations is only about 80 metres. Butchering of carcasses that piled up at either location may well have spread across the length of the bedrock bench that holds the kill deposits. As such, it is difficult to state with certainty that the two areas Reeves excavated were discrete kill locations. Still, consistently early dates from the north area suggest that the development of a drive complex leading to a cliff edge at HSIBJ may have first targeted bringing animals to the more northern portion of the cliff.

Dates for cultural use of the site are far from numerous enough or precise enough to address the question of periodicity of site use; however, there are now four dates from the deepest part of the north kill. The dates are in stratigraphic and chronological order: from bottom to top they are 5780, 5710, 5470 and 5130 yr BP. These four dates span a depth of from about 2.4 to 3.3 metres below surface in level 10 of the north kill, and span a period of 650 years. Frequent kill events, such as seasonal or yearly, would not be discernable by radiocarbon analysis. Many kill events could be compressed into the four radiocarbon dates from level 10 of the north kill. Still, the span of 650 years in less than 1 metre of deposit suggests that kills might not have been especially frequent. Perhaps they were generational events.

How long the site was used by makers of Mummy Cave projectile points is not yet fully understood. It may have been as long as 2000 years, spanning roughly 5800 to 3800

yr BP, based on Reeves' (1978) dates and the three new dates. Alternatively, using just the dates from the north kill, it could have been as short as ~750 years. Subsequently, the site was abandoned. We can only speculate as to why this happened, but Reeves (1978) is likely correct when he says that new people-makers of McKean Complex points arrived in the region. These people did not know how to operate the jump, or did not care to.

These results are significant additions to the history of bison killing on the northern Plains. As noted above, HSIBJ is already one of the oldest buffalo jumps known. Early use of the jump has been an enigma to Plains scholars (Bamforth 2011). Three new dates in excess of 5000 yr BP unquestionably establish the early age of bison killing events at HSIBJ.

Resumption of bison jump use about ~3100 years ago at HSIBJ is early but not out of line with the initiation of other jumps on the northern Plains. As currently known, the next oldest jump after HSIBJ is the Kobold site in central Montana (Frison 1970). That site is a definite jump where several different cliffs were used multiple times. It is dated to roughly about 3000 years old (Kornfeld et al. 2010:257). The use of wooden corrals (pounds) appears earlier, though not as early as initial use of the jump at HSIBJ (Brink 2017; Walker 2016). The earliest known use of trapping bison in pounds is at the Scoggin site in Wyoming and dates to about 5200 yr BP (Lobdell 1974; Niven and Hill 1998). Head-Smashed-In Buffalo Jump continues to stand out as one of the most exceptional sites on the northern Plains.

## 6. Acknowledgements

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