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Cultural Activity Associated with Prehistoric Mammoth Butchering and Processing

Abstract. *Stacked mammoth bones at the Colby site in northern Wyoming reflect human cultural activity that is believed to have been peripheral to the butchering and processing of the animals. A projectile point found beneath the first bones placed in the pile leaves no doubt of human involvement in the stacking of the bones, but the significance of this kind of cultural activity is open to several interpretations.*

Several archeological sites in North America leave no doubt of the prehistoric association of man and mammoth (*1–4*). The nature of the association is still largely conjectural because of insufficient data. As a result we are still not sure of the actual means of containment and killing of the animals, although some suggestions have been made (*5*).

Methods of butchering mammoths and of processing the carcasses are also poorly known, as are the seasonal aspects of prehistoric mammoth procurement. Sites and tool assemblages suitable for the study of these activities are every bit as rare, if not more so, than the kill sites. We have inadequate data on the normal life-span of mammoths or on their breeding seasons to be able to perform animal population studies such as have been attempted for bison (*6–7*).

A site in northern Wyoming has now provided some evidence of the cultural activities peripheral to mammoth procurement, butchering, and processing. Because of erosion, only a remnant of what once must have been a much larger site has been preserved. The site (known as the Colby site from its discoverer) is in the Bighorn Basin, an intermontane basin between the Bighorn and Absaroka mountains, a few kilometers east of the Bighorn River (107°52′W; 44°02′N) and at an elevation of 1298 m. At present it is an arid, badlands country (yearly precipitation averages 17 cm) with sparse vegetation; it is characterized by rapid erosion although much of the surrounding area is now under irrigation. The exposed geological formation at the site is the Willwood Formation of Eocene age, a variegated shale that decomposes rapidly. Color varies from light tan to a dull green and a light purple. A common occurrence throughout is bentonite, and as a result gumbo conditions are concomitant with wet weather. The site is in an old arroyo which is centered in a small dendritic drainage basin and is located approximately 500 m from its source (Fig. 1).

There is no doubt that the topography of the site area has changed since the cultural activity occurred there (*8*). The mammoth remains were found in the bottom of an arroyo now filled with alluvium. The present arroyo that drains the area runs parallel to and several meters to the east of the old one for a known distance of nearly 400 m (Fig. 1). Why the original channel became filled is not clear, but human activities at the site may have been influential. The alluvium in the old arroyo varied from about 1 to 3 m in depth and up to 6 m wide north of the reservoir where the mammoth remains were recovered. Other parts of the old arroyo south of the reservoir have not been investigated, but the alluvium there is deeper. The old arroyo was apparently much deeper with nearly perpendicular sides at the time of the site activities and it is in marked contrast to the present arroyo which is shallow with gently sloping sides.

Fig. 1. Aerial view of the Colby site area looking northwest. Dashed line indicates approximate location of the old arroyo and arrow indicates position of mammoth bone pile. Dashed line (including the area of the reservoir) covers a distance of approximately 370 m.

The old alluvial-filled arroyo contains parts of at least six mammoths. Since only part of the arroyo has been investigated (Fig. 2) the total is expected to be several more. The species has been identified as *Mammuthus (Parelephas) columbi columbi* (*9*). The purpose of this report is to present evidence of deliberate stacking or piling of the mammoth bones after butchering and processing by humans.

The pile of stacked mammoth bones was excavated in the spring of 1975 and contained 219 separate pieces of bone. Most pieces were complete except that unossified epiphyses were usually separated from diaphyses on bones of immature animals. A scapula and humerus of a nearly mature animal along with 11 ribs remained in articulated position. Scapulae, five in number, were the commonest bones in the pile, indicating the presence of at least three animals. The skull and articulated mandible of a mammoth were placed on top of the pile (Fig. 3). That this last animal was a juvenile is indicated by the condition of the molar teeth. At the time of death the M^1 was in full wear, while the M^2 was visible but none of its plates was in wear. The tusks are 46 cm long and 5.1 cm in diameter at the base. The atlas was close to the articulated position and may have been attached to the skull at the time it was put on the pile. A mammoth vertebra from the site was radiocarbon dated and found to be 11,200 ± 200 years old (RL-392).

Cultural activity was indicated by the presence of several artifacts. A humerus from an ungulate of the size of a deer or mountain sheep was found which had a longitudinal strip of bone removed from its anterior side; both ends of the hum-

erus were cut off and rounded to form a possible scraping tool. The bone has warped and deteriorated, so that absolute species identification is impossible. A camel radius, even though somewhat deteriorated, demonstrates an unmistakable green bone break and strongly resembles bison bone choppers common to bison kill sites except that the latter were usually made from the tibia (*10*). A granite boulder, which appears to have been deliberately broken to form a functional chopping edge, may have been a butchering tool. Stone of this nature is not common to the immediate vicinity of the site.

The most convincing evidence of human association with the pile of mammoth bones was a complete fluted projectile point (Fig. 4c) lying directly under what was probably the first bone placed in the pile. This first bone was half of a pelvis placed on the ilium with the pubic symphysis upward. The articulated scapula-humerus was on one side and another scapula was braced against the opposite side. The remaining bones must have been placed around these three main elements and were subsequently scattered somewhat by slight undercutting of one side of the bone pile by gully erosion before the filling of the old arroyo took place (Fig. 3).

The projectile point is complete. Fluting is evident, although flaking subsequent to the fluting process removed much of the original flute scar. The appearance of this projectile point suggests that it was reshaped from an earlier projectile from which the distal end had been broken. The functional nature of the projectile point is indicated by slight matching concavities on both blade edges at the distal end to provide an elongated, needle-sharp point which, as demonstrated in experiments with replicas of similar projectiles used on bison, improves the qualities of penetration. Experiments also demonstrate that sharp points such as this rarely survive more than one use. The blade edges show grinding for about half their length, and there is evidence of grinding around the entire base.

There was another area with numerous bones in the old arroyo, and these bones may also have been stacked. Based on the number of scapulae present, this pile contained parts of three other mammoths. The skull and mandible of a young adult mammoth were present among these bones, along with more than a hundred other bones (*11*). The age of the young adult mammoth is indicated by the right M^2 having been in full wear and the first three plates of M^3 having been in wear when the animal was killed (*9*). In addition to this, the old arroyo above the reservoir has been investigated in a number of locations and in each location mammoth bones have been found. There are indications that other areas with numerous bones may also be present in the old arroyo.

Three other projectile points were re-

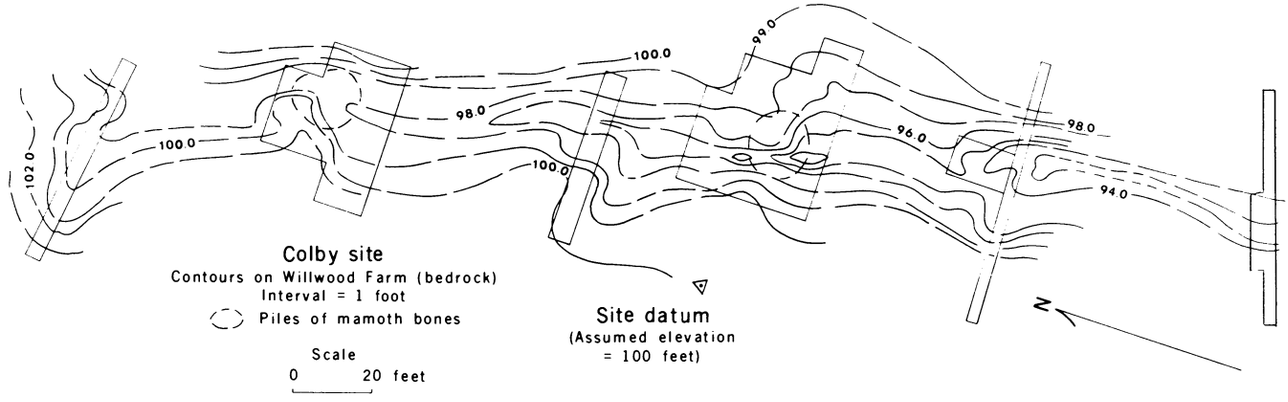

Fig. 2. Contours on the old arroyo at the Colby site showing excavated areas and locations of mammoth bone piles. The pile in Fig. 3 is the one nearest the site datum. Scale is in feet; 1 foot = 0.3048 m; 20 feet = 6.096 m.

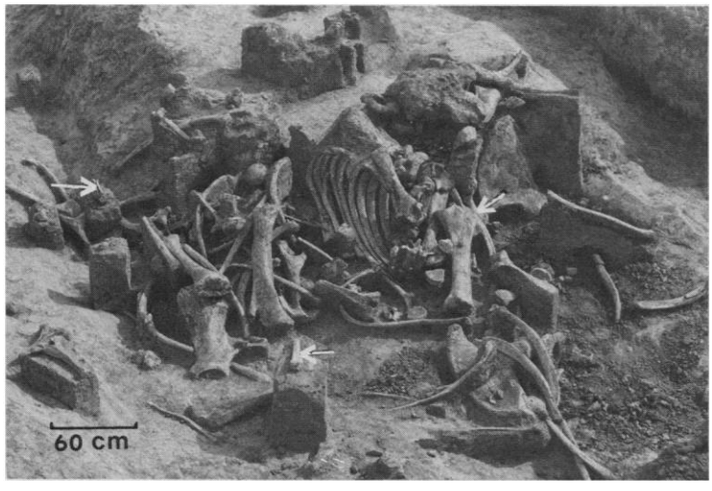

Fig. 3 (left). The stacked pile of mammoth bones. Left and center arrows indicate bone tools. Right arrow indicates pelvis overlying projectile point. Parts of at least three animals are present. A skull and articulated mandible are on top of the pile.

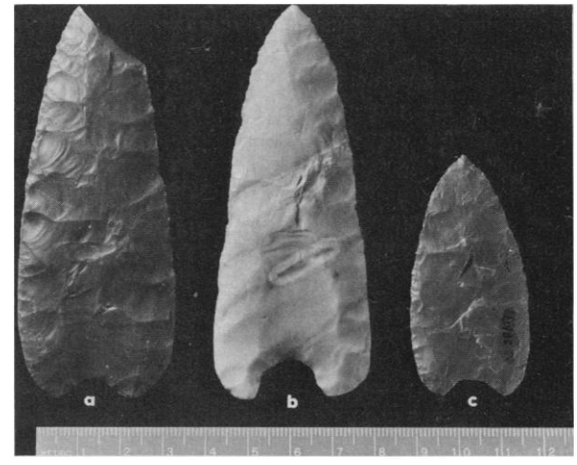

Fig. 4 (right). Projectile points recovered at the Colby mammoth site.

covered at the site. One (Fig. 4b) was found eroding out of the old arroyo deposits and is much larger than the one recovered under the bone pile. Two others were recovered with mammoth bone but in what are believed to be slump deposits that fell into the old arroyo from the banks and were subsequently covered with alluvium. This suggests that much of the human activities occurred outside the old arroyo. One of the latter projectile points (Fig. 4a) is similar in shape but larger than the one from under the bone pile while the other is similar in shape and in size. All projectile points were made of local flaking stone available in the Bighorn Mountains. They are also somewhat different typologically from the Clovis projectile points recovered in other sites where mammoths have been associated with human activities (*1, 3, 4*).

Several interpretations are possible concerning the placement of the projectile point under the mammoth pelvis. The projectile point may have been lost during normal site activities and bones just happened to have been piled on top of it. On the other hand, it may have been lodged in the tissues of the bones that were stacked. Another possibility is that it was an offering deliberately placed at the bottom of the bone pile. While speculation of this nature can be continued indefinitely, the presence of the projectile point along with the other artifacts leaves no doubt of the human involvement in the placement of the bone pile.

There is little, if any, evidence of the techniques used for killing, butchering, and processing the mammoths at the Colby site. The bones are too deteriorated to retain cutting and chopping marks, although some may have been deliberately broken. The artifacts found in the area are not commensurate with the requirements for butchering many large animals. Also, large numbers of flakes from tool-sharpening, which might be expected at a site used for mammoth butchering and processing, are not present, suggesting the possibility that mammoths were not cut up in the same way as bison (*7–10*). However, it is postulated that the main human activities occurred outside the old arroyo bottom, and that the areas where these activities occurred have since been eroded downward several meters and moved downstream.

The stacking could have occurred as the bones were stripped of flesh or it could have occurred months or even a year or so later. Bone stacking was common in Paleo-Indian bison kills (*10, 12*), so the same practice in mammoth sites is not surprising. Whether it represents human activity of little consequence or something with deeper cultural significance is unknown. In conclusion, the mammoth bone piles in the old arroyo at the Colby site are believed to have resulted from activities that were only indirectly related to the butchering of the animals and the processing of the meat, although they might have been placed there to protect freshly killed meat from carnivores.

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Sex-Specific Cannibalism in the Rotifer *Asplanchna sieboldi*

Abstract. *In one clone, large-morphotype females rarely exhibit tactile feeding responses to their ingestible, male clonemates but readily attack small-morphotype female clonemates and males of another, taxonomically distinct, clone. In the latter clone, cannibal females lack such selectivity, but their males are well protected from capture by very large, lateral body-wall outgrowths.*

Asplanchna sieboldi is a predatory, planktonic rotifer which reproduces either by female parthenogenesis or bisexually. Females are trimorphic, and morphotype transformations require two or more parthenogenetic generations. The relatively small (550 to 700 μm) saccate females produce larger (800 to 1200 μm) cruciform females only when the diet contains tocopherol (vitamin E) (*1*). Cruciforms have four protrusible, more or less pronounced, body-wall outgrowths and may produce even larger (800 to 1700 μm) bell-shaped or campanulate females when the diet contains tocopherol as well as congeneric or other large prey (*2, 3*). Cruciforms and especially campanulates are cannibalistic (*2–4*).

Males, which are characteristically produced by certain (mictic) cruciform females (*3*), are relatively small (400 to 850 μm) and lack food-capturing and digestive systems (Fig. 1). They regularly co-occur with cruciform and campanulate females (*3, 5, 6*) and thus are susceptible to cannibalism, perhaps especially when the male moves around the surface of the female during mating. However, males, just like cruciform females, have extensible, lateral body-wall outgrowths which can effectively protect them from capture by attacking conspecifics and which almost certainly evolved in response to cannibalism (*5*). The study reported here shows that males of at least one clone are protected by another mechanism: they do not elicit tactile feeding responses in cannibalistic, female clonemates.

Saccate, cruciform, and campanulate females from the taxonomically distinct clones B and C (*7*) were maintained at 26°C (*3, 4*). Males of both clones were obtained by inducing saccate-to-cruciform transformations with tocopherol-containing diets (*8*). Cruciform and campanulate predators were starved for 2 to 6 hours before an experiment and then placed singly in 1-ml-capacity depressions with prey. Male and female prey were tested together in one depression; male prey from the two clones were tested in separate depressions. Each predator was responsive, made at least several contacts with both prey types, and was removed once it ingested a prey item. Predators were observed continuously at a magnification of 18 diameters with a stereomicroscope. The predators, which appear to swim randomly, may or may not respond to contact with a potential prey. Responses seem to be mediated by cephalic contact chemoreceptors (*4*). A response involves directed movements of the head, usually accompanied by open-