



Pleistocene mammals from Zuni Pueblo, west-central New Mexico

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PLEISTOCENE MAMMALS FROM ZUNI PUEBLO, WEST-CENTRAL NEW MEXICO

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ABSTRACT.—Pleistocene mammals are known from two localities on Zuni Pueblo in McKinley County, west-central New Mexico, Black Rock and Trapped Rock Draw. The Black Rock locality yielded fossils of the beaver *Castor canadensis*, the horse *Equus* sp., an indeterminate camelid, the woodland muskox *Bootherium bombifrons*, the bison *Bison* sp. and the Columbian mammoth, *Mammuthus columbi*. The American mastodont *Mammot americanum* is the only species known from the Trapped Rock Draw locality. The Black Rock locality is Rancholabrean and is from sediments that overlay the Black Rock basalt flow, which has an Ar/Ar age of 0.164 ± 0.035 Ma. The Trapped Rock Draw locality probably is also of late Pleistocene age. Most of the Pleistocene mammals from Zuni Pueblo are typical representatives of New Mexico's Rancholabrean megafauna, but the records of *Castor canadensis*, *Bootherium bombifrons* and *Mammot americanum* are relatively rare for the state. They suggest wet, cool and/or forested conditions at Zuni Pueblo during part of the Rancholabrean.

INTRODUCTION

Few Pleistocene mammals are known from west-central New Mexico, and there is only one documented locality from McKinley County, at Black Rock on the Zuni Pueblo (Gidley, 1906; Hay, 1924; Harris, 1993). Gidley (1906) reported a small collection of Pleistocene mammals found during construction of an irrigation dam on the Zuni River at Black Rock (Fig. 1). Although he mentioned "...teeth and bone fragments of *Elephas columbi* and other characteristic Pleistocene species..." Gidley (1906, p. 165) only described the incomplete and abraded skull of a muskox that he named *Liops zuniensis*, new genus and species. Since then, little has been added to our knowledge of Pleistocene mammals from Zuni Pueblo, with the exception of the recent discovery of a jaw of the American mastodont, *Mammot americanum*. Indeed, there are currently only two known Pleistocene mammal localities on Zuni Pueblo, Gidley's (1906) locality at Black Rock and the mastodon site, which is in Trapped Rock Draw south of the town of Zuni (Fig. 1). Here, we review the fossil mammals from these sites and discuss their significance. NMMNH = New Mexico Museum of Natural History, Albuquerque; USNM = National Museum of Natural History, Smithsonian Institution, Washington, D.C.

LOCALITIES

Gidley (1906) described his locality as "...the new irrigation dam at Black Rocks, 4½ miles east of Zuni, New Mexico." Although Gidley (1906, p. 165) and all subsequent authors (e.g., Hay, 1924; McDonald and Ray, 1989; Harris, 1993) called this locality "Black Rocks," according to the Zuni 7.5-minute USGS topographic map, the correct name for this locality is "Black Rock." The dam at Black Rock is in the SE¼ sec. 13, T10N, R19W, McKinley County (Fig. 1). Built in 1904-1907, the dam ruptured in 1909 and was subsequently repaired (Bryan, 1928a). Kirk Bryan was hired to evaluate an enlargement of the dam in 1928, and his unpublished report (Bryan, 1928b, p. 14) states that "during the construction of the dam the bones of a mastodon were found in this material [gravel, yellowish sand and reddish sandy clay and clayey sand] that lay in a depression in the basalt at the spillway site." We believe this is a reference to the fossil specimens that Gidley (1906) reported, even though no remains of a "mastodon" were actually

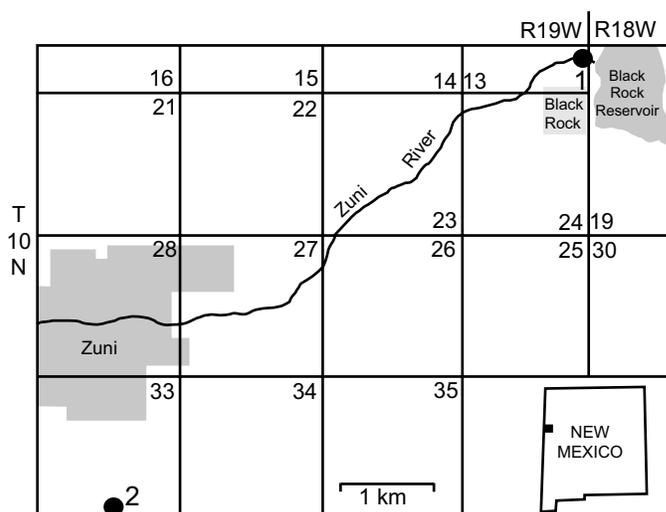


FIGURE 1. Map of part of Zuni Pueblo showing Pleistocene mammal localities: 1 = Black Rock Dam, 2 = Trapped Rock Draw.

found at Black Rock. Thus, Gidley's fossils came from alluvium above the basalt in which the Black Rock irrigation dam is footed.

The Black Rock site is NMMNH locality 5191, and was approximately at UTM zone 12, 701806E, 3885412N, NAD 27 (SE¼ SE¼ sec. 13, T10N, R19W, Zuni 7.5 minute Quad). The bone-bearing horizon was above the Pescado Lobe of the North Plains Basalt, also known as the Black Rock Flow (Basalt) (Laughlin et al., 1993a). Laughlin et al. (1979) published a K/Ar age of 0.70 ± 0.55 Ma (note the large error bar) for this flow, but a more recent Ar/Ar age for the Black Rock Flow is 0.164 ± 0.035 Ma (Laughlin et al., 1993b). This younger age is considered more reliable by Laughlin et al. (1993b), so it establishes a maximum age of 0.164 Ma for the Black Rock Pleistocene mammals.

The mastodon locality is NMMNH locality 5192, which is at UTM zone 12, 696355E, 3880139N, NAD 27 (SW¼ SE¼ sec. 33, T10N, R19W, Zuni 7.5 minute Quad). The jaw was found in the western cutbank of Trapped Rock Draw in trough-crossbedded gravels of a coarse alluvium approximately 12 m below the upland surface. The fossil itself, and depth in the alluvium suggest a late Pleistocene (Rancholabrean) age, but unlike at Black Rock, no other age data are available.

PLEISTOCENE MAMMALS

Black Rock local fauna

Castor canadensis Kuhl

Two isolated upper molars of a castorid, USNM 494456 (Fig. 2A-F), have not been mentioned previously from the Black Rock locality (e.g., Gidley, 1906; Hay, 1924). These high-crowned, curved teeth have a complex occlusal pattern with four transverse lobes, and are indistinguishable from comparable teeth of the living beaver, *Castor canadensis*. Crown height of the teeth (in mm) is 22-23 mm. Length x width (in mm) of the teeth are 6.4 x 8.9 and 9.2 x 8.3.

The only other New Mexico fossil record of *C. canadensis* is from an early Pleistocene (early Irvingtonian) fauna in the Mesilla basin, Doña Ana County, southernmost New Mexico (Vanderhill, 1986; Harris, 1993). *C. canadensis* is very rare in New Mexico late Pleistocene (Rancholabrean) faunas because most deposits of this age occur in caves, which are unlikely to preserve fossils of a large aquatic mammal, such as a beaver. In New Mexico, beavers

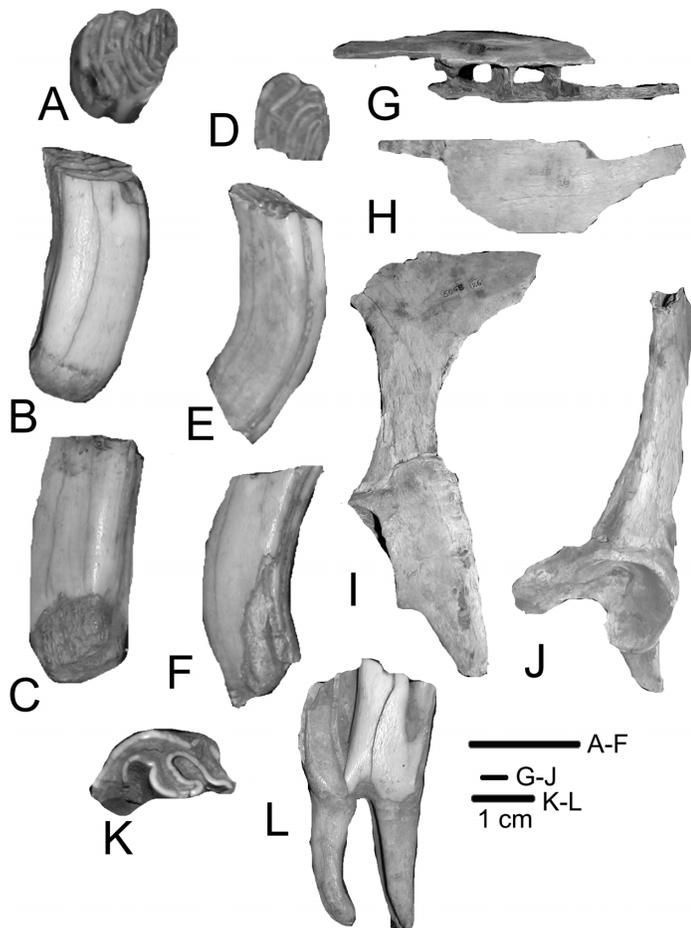


FIGURE 2. Pleistocene mammals from Black Rock Dam. A-F, *Castor canadensis*, USNM 494456, two upper molars. G-J, *Equus* sp., USNM 5098, edentulous jaw fragment (G-H) and incomplete innominate (I-J). K-L, *Bison* sp., USNM 494457, right p2.

are now found along permanent streams in riparian habitats, primarily in montane areas (Findley et al., 1975).

Equus sp.

USNM 5098 consists of skull fragments, an edentulous dentary fragment and an incomplete innominate of a horse (Fig. 2G-J). Hay (1924, p. 138) mentioned the edentulous jaw and innominate of *Equus* from Black Rock. The innominate has an acetabular diameter of ~60 mm, and the molar alveoli of the dentary have length x width (in mm) of 26 x 20 and 28 x 19. We can only identify this specimen as *Equus* sp.

Camelidae

USNM 5099 is listed in the USNM catalogue as a metapodial and a scapula of a camel. We could not locate this specimen in the USNM collection. Hay (1924, p. 164) mentioned a "...part of a scapula of an undetermined camel" from Black Rock.

Bootherium bombifrons (Harlan)

USNM 5100 is the holotype incomplete skull of *Liops zuniensis* (Fig. 3). Gidley (1906) named the new genus *Liops* (type species = *L. zuniensis*), but the generic name was preoccupied. Cossman (1907) thus replaced the name with *Gidleya*, and Gidley (1908) himself replaced it with *Lissops*. Subsequent authors mostly used the name *Gidleya zuniensis*, but Kurtén and Anderson (1980) synonymized *G. zuniensis* with *Symbos cavifrons*. McDonald and Ray (1989, p. 67) placed all previous species in the genera *Bootherium*, *Gidleya*, and *Symbos* in the species *Bootherium bombifrons* (Harlan), the oldest available name for the woodland muskox. Black Rock is the only record of the woodland muskox from New Mexico (McDonald and Ray, 1989; Harris, 1993). *B. bombifrons* is absent from the entire desert southwest, including western Texas, southern New Mexico, Arizona, and southern California (McDonald and Ray, 1989, figs. 63, 64). The closest record of *B. bombifrons* is from Montezuma County in southwestern Colorado (McDonald et al., 1987).

Bison sp.

USNM 494457 is a right p2 of *Bison* (Fig. 2K-L). Measurements (in mm) are length = 22.3, width = 13.2 and crown height = 22.6 mm. Species of *Bison* are differentiated on the basis of horncores, so a species-level identification of the bison tooth from Black Rock is not possible. However, the presence of the genus *Bison* is important in establishing a Rancholabrean age for the Black Rock local fauna. This is the only fossil record of *Bison* from the Colorado Plateau in northwestern New Mexico (Effinger and Lucas, 1990).

Mammuthus columbi (Falconer)

Mammoth specimens from the Black Rock locality are catalogued as USNM 5096, a right M3 and USNM 5097, much of a lower jaw, including a right m3 and part of a left m3, plus four rib fragments (Fig. 4). Measurements (in mm) of USNM 5096, right M3 are: number of plates = 17+, length = 295+, width = 98, height = 243, lamellar frequency (number of plates/100 mm) = 6, average plate thickness = 11.5, and average enamel thickness = 2.8. The m3 of USNM 5097 has the following measurements (in

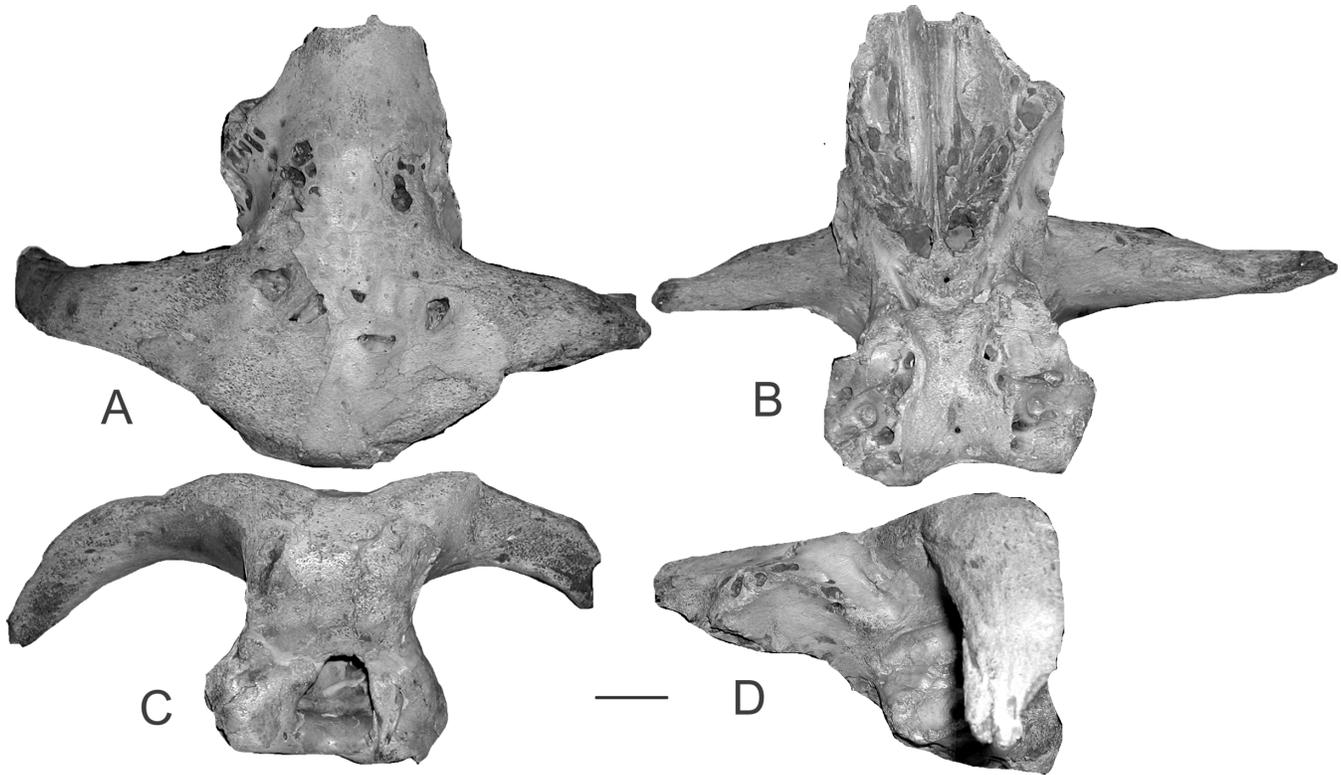


FIGURE 3. *Bootherium bombifrons* (holotype of *Liops zuniensis*) from Black Rock Dam, USNM 5100, incomplete skull in dorsal (A), ventral (B), posterior (C) and left lateral (D) views. Bar scale = 5 cm.

mm): number of plates = 16+, length = 230+, width = 75, height = 160, lamellar frequency = 7, average plate thickness = 6.8, average enamel thickness = 2.8. The lower jaw fragments of USNM 5097 reveal a short vertical symphysis with a small spout and a vertical ascending ramus. These features, and the measurements of the teeth compare well with the large sample of *M. columbi* from Hot Springs, South Dakota (Dutrow, 1980; Agenbroad, 1994) and with other New Mexican specimens assigned to *M. columbi* (e.g., Lucas and Effinger, 1991; Morgan et al., 2001a). This confirms Gidley's (1906) identification of "*Elephas columbi*" at Black Rock.

Trapped Rock Draw

Mammot americanum (Kerr)

Much of the lower jaw of the mastodon in Trapped Rock Draw remains in the field at the time of this writing. Nevertheless, we were able to examine and study the partial left dentary, which includes part of m2 and a complete m3 (Fig. 5). This specimen is currently housed in the collections of the Zuni Cultural Resource Enterprise in Black Rock, New Mexico, and will eventually be displayed in a museum on the Zuni Pueblo.

Measurements (in mm) of the teeth are: m2 width = 82, m3 length = 178, m3 width = 93 and depth of ramus under the m2/m3 juncture = 165. The m3 has four lophids and a talonid (tubercle), ptychodont enamel and is well worn. Each lophid on m3 consists of two cuspids separated by a median sulcus. There are no median pillars, pretrite or posttrite cuspids, and the talonid is a small, transverse lophid. The size and morphology of the Black

Rock mastodont jaw closely match other specimens of *Mammot americanum* from New Mexico, especially a left dentary with m2-m3 (NMMNH P-25098) from a gravel pit near Lemitar in Socorro County (Lucas and Morgan, 1997, figs. 1A-B).

Mammot americanum is rare in New Mexico and the southwestern United States, especially when compared to the numerous records of mammoths from this region (Lucas and Effinger, 1991; Lucas and Morgan, 1997). The Trapped Rock Draw mandible is the sixth record of *M. americanum* from New Mexico, and the first record from the Colorado Plateau in the northwestern part of the state. Of the four previously published records of the American mastodont from New Mexico (Lucas and Morgan, 1997), two are in the Sandia Mountains (Sandia Cave and Tree Spring) and two are in the middle Rio Grande Valley (Los Lunas and Lemitar). A fifth record, an isolated left m3 from near Piñon in Otero County in southeastern New Mexico, was previously unpublished.

DISCUSSION

Black Rock was one of the first Pleistocene vertebrate faunas reported from New Mexico (Gidley, 1906), although until now, the only specimen from this site that has been illustrated and adequately described is the type specimen of *Liops zuniensis* (= *Bootherium bombifrons*). Gidley (1906) also mentioned the presence of *Elephas* (= *Mammuthus*) *columbi* from Black Rock. Hay (1924) added two more mammals to the Black Rock fauna, the horse *Equus* and an indeterminate camelid. We examined the fossils from Black Rock in the USNM collection and added two

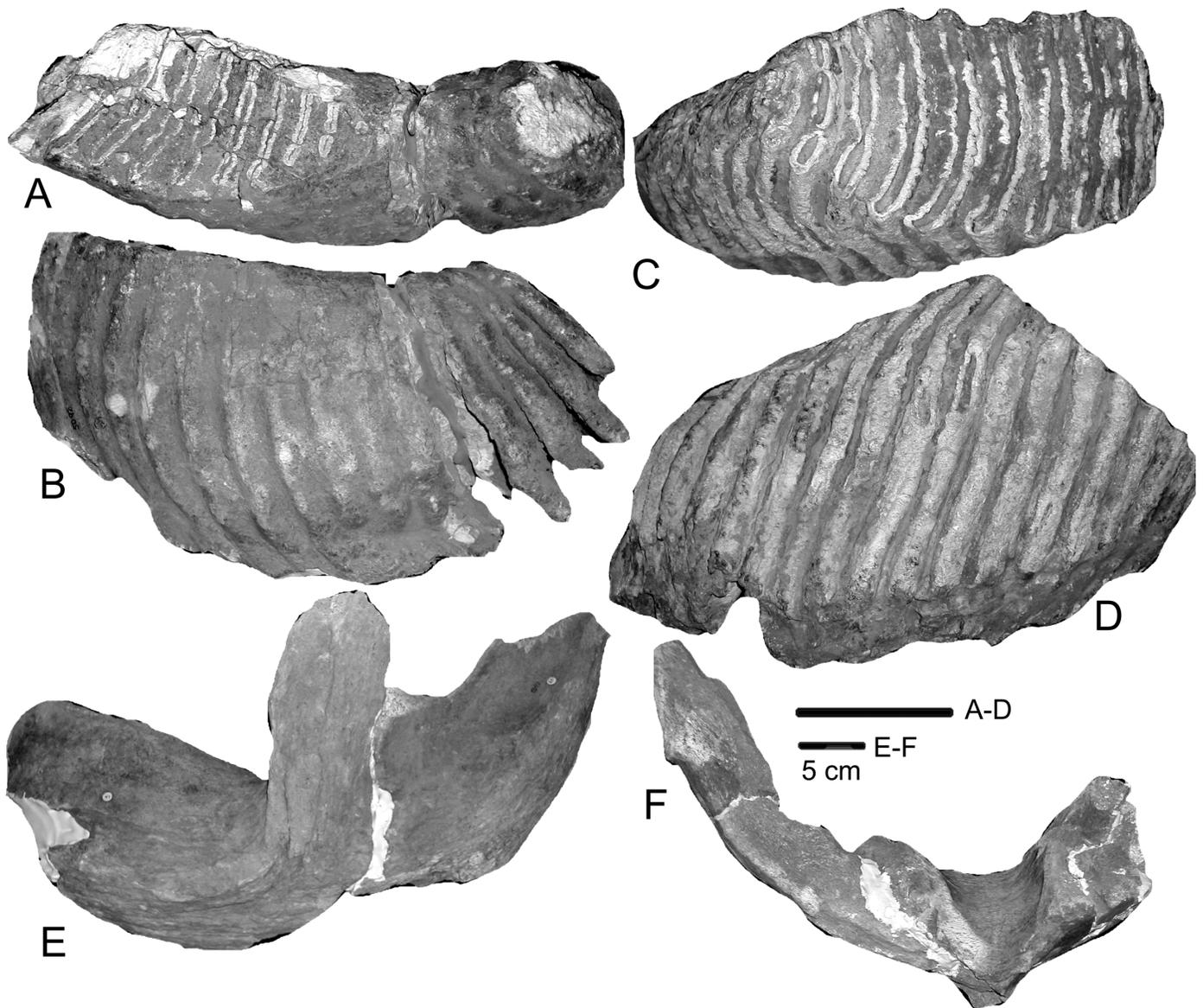


FIGURE 4. *Mammuthus columbi* from Black Rock Dam. A-B, USNM 5097, right m3. C-D, USNM 5096, right M3. E-F, USNM 5097, incomplete lower jaw.

more species of mammals, *Castor canadensis* and *Bison* sp., bringing the total fauna to six species. We identified a seventh species, *Mammuth americanum*, from nearby Trapped Rock Draw.

Although the assemblage of Pleistocene mammals from Zuni Pueblo is small, it is significant for several reasons. Pleistocene vertebrate faunas are uncommon on the Colorado Plateau in northwestern New Mexico. Fossils of the mountain sheep *Ovis canadensis* and *Mammuthus columbi* were collected from gravels in the bank of the San Juan River about 7 km east of Bloomfield in northeastern San Juan County (Stovall, 1946; Lucas and Effinger, 1991). O'Neill (1992) reported several species of extinct Pleistocene megafauna, including *Equus*, *Bison*, and the peccary *Platygonus* cf. *P. compressus*, from Sheep Camp Shelter in southeastern San Juan County. Sheep Camp Shelter is an archaeological site; however, there is no evidence that the extinct mammals were associated with the cultural remains from this site (O'Neill, 1992). A skull and

partial skeleton of *Platygonus compressus*, along with the fossils of the dire wolf *Canis dirus* and *Bison*, are known from the late Rancholabrean Oven Site, which is now submerged beneath Navajo Lake in the extreme northeastern corner of San Juan County just south of the Colorado border (Lucas and Smartt, 1995).

There are two references in geological road logs to proboscidean tusks, presumably mammoth, from Pleistocene deposits in McKinley County, but the fossils could not be located to confirm these records. At mile 133.5 of their road log, located just east of NM route 371 about 10 km northeast of Thoreau, Wells et al. (1983, p. 11) noted that "In an arroyo east of road, a mammoth tusk was found by J. Robertson (U.S.G.S.)" [Jacques Robertson of the USGS in Denver]. At their stop 1-3b, located about 6 km east of Gallup on the north side of Interstate 40 near the confluence of the Puerco River and the South Fork of the Puerco River, Hawley and Love (1991, p. 114) mentioned that "One large frag-

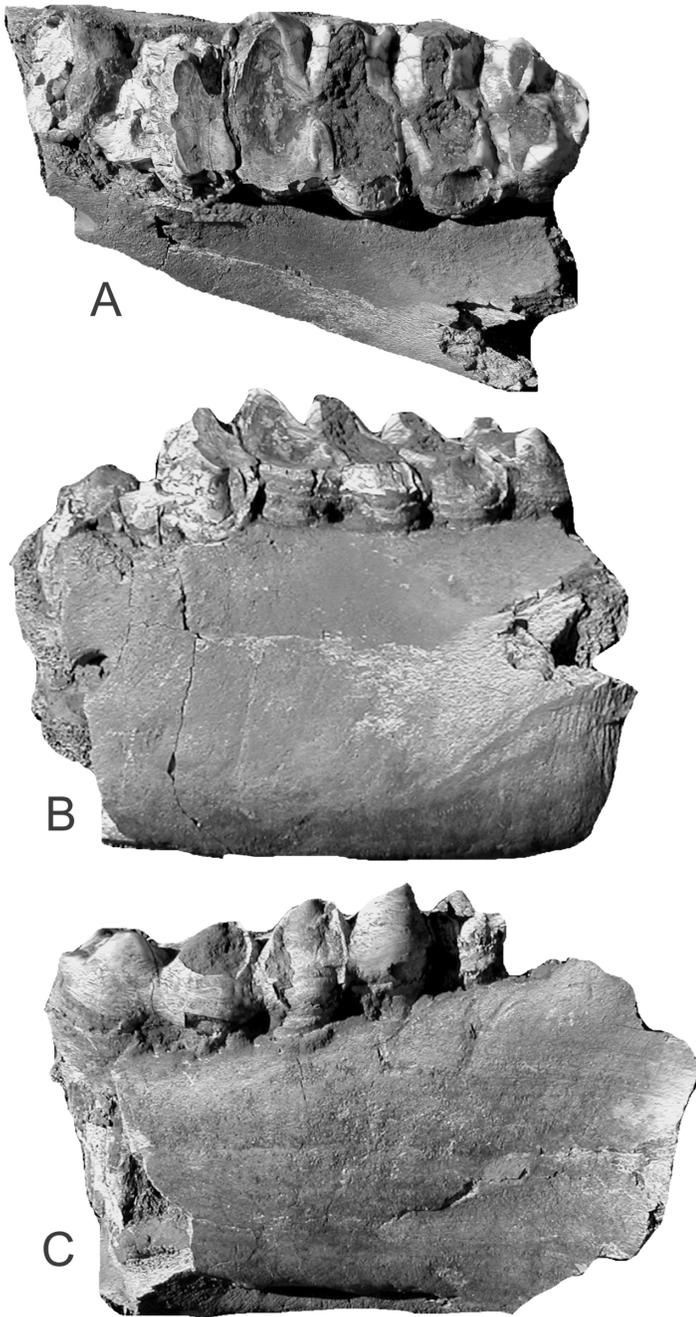


FIGURE 5. *Mammut americanum* from Trapped Rock Draw, incomplete left dentary with m2-3 in occlusal (A), labial (B) and lingual (C) views. Bar scale = 5 cm.

ment of a proboscidean tusk was noted in the uppermost part of the fluvial facies.”

The Black Rock local fauna contains a typical assemblage of large grazing mammals, including *Equus*, camel, *Bison*, and *Mammothus columbi*. These are the four most common large mammals encountered in Pleistocene sites throughout New Mexico (Harris, 1993; Morgan et al., 2001b). Two additional species from Black Rock, *Bootherium bombifrons* and *Castor canadensis*, are absent from other New Mexico late Pleistocene faunas. The presence of

Mammut americanum at Trapped Rock Draw adds a third uncommon species to the Pleistocene mammalian assemblage from Zuni Pueblo. The beaver, woodland muskox, and American mastodon suggest the presence of both permanent water and forests in the vicinity of Zuni Pueblo during the late Pleistocene, whereas the rest of the mammalian fauna is indicative of grassland or savanna habitats. The ancestral Zuni River apparently was a fairly large permanent stream that supported a diverse riparian forest.

The Black Rock local fauna overlies a basalt Ar/Ar dated at ~0.164 Ma, which provides a rare direct association of Rancholabrean mammals with a radioisotopic date. Two mammals from Black Rock provide some additional information on the age of the fauna. The presence of *Bison* establishes a Rancholabrean age, as the first appearance of this genus in North America as an immigrant from Eurasia defines the beginning of the Rancholabrean land-mammal “age” (Lundelius et al., 1987). However, the timing of the first appearance of *Bison*, and hence the lower boundary of the Rancholabrean, is poorly dated, with estimates ranging from about 0.15 to 0.5 Ma (Lundelius et al., 1987; Repenning, 1987; McDonald and Morgan, 2000). Although there are several questionable late Irvingtonian records of *Bootherium bombifrons*, this species is essentially restricted to Rancholabrean sites in North America and is most typical of late Wisconsin age faunas (McDonald and Ray, 1989). The date of 0.164 Ma on the Black Rock basalt establishes a maximum age for this fauna, and the presence of *Bison* and *Bootherium bombifrons* clearly indicates referral of the Black Rock local fauna to the Rancholabrean land-mammal “age.”

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