

PLEISTOCENE-RECENT FAUNA OF THE ISLETA CAVES, BERNALILLO COUNTY, NEW MEXICO

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ABSTRACT. Forty-two kinds of mammals and six kinds of reptiles were identified from two caves in Bernalillo County, New Mexico. Presence of *Tremarctotherium*, *Camelops*, and *Tanupolama* date the initiation of deposition as Pleistocene. Seven mammals (*Sylvilagus floridanus*, *Marmota flaviventris*, *Neotoma cinerea*, *Microtus* sp., *Lagurus* cf. *curtatus*, *Vulpes fulva*, and *V. velox*) now occur only in more mesic conditions than are present at the caves today. The extinct and extralimital fauna is believed to date from a time when climatic conditions resembled those of southeastern Wyoming and adjacent Colorado; vegetation probably consisted of sagebrush grassland with few or no trees present. The evidence suggests degeneration of these conditions directly to those of historic times without an intervening arid, warm Altithermal period.

INTRODUCTION

West of the Indian Pueblo of Isleta, a Quaternary lava flow lies on the highlands between the Rio Grande and the Rio Puerco. Two caves within the lava have yielded remains of a large fauna deposited during the late Pleistocene and post-Pleistocene. As yet, the fauna has not been subjected to exhaustive study, but its size and nature is such that we feel our preliminary results should be made available at this time.

The caves are about 8 miles west of Isleta, Bernalillo County, New Mexico, N $\frac{1}{2}$ sec. 31, T. 8 N., R. 1 E., N.M.P.M., at an approximate elevation of 5630 feet. Sparse, arid grassland surrounds the caves today; a few stunted junipers (*Juniperus monosperma*) survive on some of the lava slopes. A forty year record of precipitation from near Los Lunas, a few miles to the southeast, shows an annual precipitation of 8.31 inches (Hardy, 1941).

The larger cave, Isleta 1, formed a natural pitfall, originally opening to the surface only through a hole in the roof of a large chamber. Guano miners have extended a tunnel laterally from the surface of the ground into the chamber's northern side. Hibben (1941) describes Isleta 1 as follows:

"The major cave chamber itself is of considerable size, measuring some 20 meters in its greatest dimension north to south. Leading off from the main chamber are two passageways . . . extending southeast and southwest. The southeastern one, especially, extends for a considerable distance—some 100 meters"

Isleta 2, about a quarter mile south of Isleta 1 is a flask-shaped chamber, averaging some 25 feet in diameter. The opening, about 6 feet in length, is in the roof of the chamber, toward the southern side. From the present surface of the fill to present ground surface is approximately 8 feet. Both caves appear to be the result of gases entrapped in the lava or of drainage of liquid lava from beneath a solidified crust.

A short list of mammals from Isleta 1 was published in 1941 (Hibben). Genera listed by Hibben and not seen by us are reported as listed. In the mid-1940's, extensive excavations were made by the Department of Anthropology,

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University of New Mexico. Small collections were made on several occasions by biology students and by the authors. Much of the Anthropology Department's material was turned over to the Museum of Southwestern Biology several years ago: we have borrowed other material from the Los Angeles County Museum. Most notes on the stratigraphic relationships of the bone material were lost before accession of the material by the Museum of Southwestern Biology.

RESULTS

Forty-two kinds of mammals and six of reptiles have been identified from material seen by us; in addition, Hibben (1941) reported the presence of mammoth. The small amount of bird material has not yet been identified. Many of the more than 3000 items have been identified only to genus because of time limitations; future analysis may reveal the presence of other species.

The fauna may be grouped into three categories: (1) Taxa reasonably expected in the area at present or in the historic past; (2) Extant animals unknown and unexpected in the immediate area; (3) Extinct forms. (See tables 1, 2, 3).

Material from category 1 varies from complete mummies of relatively fresh aspect to bones appearing as old as any in categories 2 or 3. Undoubtedly,

TABLE 1

Forms identified from the Isleta Caves and now occurring in the vicinity of the caves

Reptilia	
<i>Crotaphytus collaris</i>	<i>Pituophis catenifer</i>
<i>Cnemidophorus perplexus</i>	<i>Lampropeltis getulus</i>
<i>Salvadora grahamiae</i>	<i>Crotalus?</i>
Mammalia	
Hominidae	Vespertilionidae
<i>Homo sapiens</i>	<i>Myotis thysanodes</i>
	<i>Antrozous pallidus</i>
Leporidae	Sciuridae
<i>Sylvilagus auduboni</i>	<i>Citellus spilosoma</i>
<i>Lepus</i> sp.	<i>Cynomys gunnisoni</i>
Geomysidae	Heteromyidae
<i>Thomomys bottae</i>	<i>Perognathus flavus</i>
Cricetidae	<i>P. intermedius</i>
<i>Reithrodontomys</i> sp.	<i>Dipodomys ordi</i>
<i>Peromyscus</i> sp.	<i>D. spectabilis</i>
<i>Onychomys leucogaster</i>	<i>D. merriami</i>
<i>O. torridus</i>	Erethizontidae
<i>Neotoma albigula</i>	<i>Erethizon dorsatum</i>
Canidae	Ursidae
<i>Canis latrans</i>	<i>Ursus americanus</i>
<i>C. cf. lupus</i>	
<i>Urocyon</i> sp.	
Mustelidae	Felidae
<i>Mustela nigripes</i>	<i>Felis concolor</i>
<i>Taxidea taxus</i>	<i>Lynx rufus</i>
<i>Mephitis mephitis</i>	Equidae
Antilocapridae	<i>Equus</i>
<i>Antilocapra americana</i>	
Bovidae	
<i>Bison</i> or <i>Bos</i>	
<i>Bison</i> (Hibben, 1941)	
<i>Ovis</i> sp.	

TABLE 2

Extralimital forms identified from the Isleta Caves

Mammalia	
Leporidae	Sciuridae
<i>Sylvilagus floridanus</i>	<i>Marmota flaviventris</i>
Cricetidae	Canidae
<i>Neotoma cinerea</i>	<i>Vulpes fulva</i>
<i>Microtus</i> sp.	<i>Vulpes velox</i>
<i>Lagurus</i> cf. <i>curtatus</i>	

TABLE 3

Extinct forms identified from the Isleta Caves

Mammalia	
Ursidae	Elephantidae
<i>Tremarctotherium</i> sp.	<i>Elephas</i> sp.
Camelidae	(Hibben, 1941)
<i>Camelops</i> sp.	Equidae
<i>Tanupolama</i> sp.	<i>Equus</i> sp.

some date from the late Pleistocene. *Equus* appears both in category 1 and category 3; it may belong in both or only in one category. Several features of the category 1 material are worthy of note. For example, the Gray Fox (*Urocyon cinereoargenteus*) is very common today in New Mexico in pinyon-juniper habitat, but the genus is represented in the cave material only by one identified bone fragment. The Porcupine (*Erethizon dorsatum*) is represented by one item also despite its common occurrence in woodland and forest and its occasional appearance in grassland and desert.

Six members of category 1 are primarily southern in distribution (*Cnemidophorus perplexus*, *Salvadora grahamiae*, *Lampropeltis getulus*, *Onychomys torridus*, *Dipodomys merriami*, and *Perognathus intermedius*). However, with the exception of *Onychomys torridus*, all are known from north of the caves within the Rio Grande drainage. *Onychomys torridus* occurs at least as far north in the Rio Grande Valley as the latitude of Belen, some 15 miles south of the caves (personal communication from A. L. Gennaro).

Members of category 3 are chiefly of interest in showing that the deposits date back to the Pleistocene. At least four individuals of *Camelops* and one individual of *Tanupolama* are represented. A portion of a skull of *Tremarctotherium* came from Isleta 1 and the genus is almost certainly represented in Isleta 2 by the distal end of a humerus. Hester (1960) cites the latest radiocarbon dates that have not been seriously questioned for *Arctodus* (= *Tremarctotherium*), *Camelops*, and *Tanupolama* as $13,890 \pm 280$ B.P. (years before present), 7756 ± 370 B.P., and 8527 ± 250 B.P., respectively. A questioned date for *Arctodus* and *Camelops* from Burnet Cave, New Mexico, is 7432 ± 300 B.P.

Members of category 2 are of most interest since their modern ecology and distribution are known to some degree, supplying data for a hypothetical reconstruction of climate and vegetation.

The Eastern Cottontail, *Sylvilagus floridanus*, occurs in the Manzano Mountains, some 30 miles east of the caves, and in mountain forests in other

ranges of central New Mexico. Similar habitat in the mountains of northern New Mexico is inhabited by a different species, *S. nuttalli*. A second subspecies of the Eastern Cottontail occurs in southern New Mexico, in woodland and forest areas. The single recognizable skull of *S. floridanus*, from Isleta 1, differs from those New Mexican specimens that we have seen, resembling specimens from the Great Plains, northeast of New Mexico.

The Yellow-bellied Marmot, *Marmota flaviventris*, makes its nearest approach some 80 airline miles northeast of the caves in the high mountains of north-central New Mexico. It is represented in our material by at least five individuals. Stearns (1942) and Antevs (1954) have used the past distribution of the marmot as evidence for past lowering of life-zones in New Mexico by as much as 4000 feet. Unfortunately, more recent data on distribution negates this evidence. Lange (1956) records Recent remains of this animal from arid northern Arizona, and Harris (in press, Navajo Project Studies, Museum of New Mexico) has recorded its presence in northwestern New Mexico at an altitude of about 5980 feet. It is likely that the marmot is limited in range at present primarily by lack of green fodder during parts of the warm season.

Two subspecies of the Bushy-tailed Wood Rat, *Neotoma cinerea*, presently occur in New Mexico. In the northwestern portion of the state, *N. c. arizonae* occupies cliff areas in pinyon-juniper habitats; in northern mountain areas, *N. c. orolestes* lives in and above the Transition life-zone. In size, our specimens, representing at least two individuals, resemble *N. c. orolestes*.

A single dentary, containing the last lower molar, is referable to the genus *Microtus*. Of the four species presently occurring in the state, it least resembles the two species (*M. longicaudus* and *M. mexicanus*) found in the nearby Manzano Mountains. The dentary more closely resembles those of the Meadow Vole, *M. pennsylvanicus*, and the Montane Vole, *M. montanus*. The Meadow Vole occurs in relict populations in a relatively few mesic areas in the western portion of the state (San Juan, Valencia, and Catron Counties) and inhabits hydrosere communities in north-central and northeastern New Mexico. The Montane Vole occurs mainly above woodland habitat in the northern portion of the state, west of the Rio Grande.

Five dentaries of the Sagebrush Vole, *Lagurus*, are available. One dentary lacks teeth: the others contain varying numbers up to the full complement. At least three individuals are represented. This animal is unknown in New Mexico in Recent times, the nearest record station being in south-central Utah, some 300+ miles northwest of the caves. As its name implies, this vole commonly lives among sagebrush plants (*Artemisia tridentata*).

The present geographic range of the Red Fox, *Vulpes fulva*, is poorly known in New Mexico. The nearest substantiated records are from the mountains of north-central New Mexico. The animals also occur in the lower mountain areas in south-central New Mexico and in the grasslands of the eastern part of the state.

The common small *Vulpes* of all but extreme eastern New Mexico is *V. macrotis*, the Kit Fox. Identified remains from the Isleta Caves are of the plains species, *V. velox*, chiefly distinguished by relatively smaller audital bullae.

DISCUSSION

It is clear from the presence of extinct forms that deposition in both caves began in the Pleistocene. Absence of forms other than relatively late survivors and the presence of only a small number of extinct forms suggests that deposition started only a short time before general extinction of Pleistocene mammals. There appears to be no way in which the entrances to the caves, once opened, could have become closed and, due to the pitfall nature of the caves, animal entrapment should have occurred continuously from time of formation of the openings. Amounts of other sediments, plant detritus, and colian materials, would likely vary with climatic changes. Despite minor differences in species composition, faunas of the two caves appear to represent approximately the same time span.

Various theoretical models of climatic and biotic changes may be constructed to account for the presence of the different members of category 2. One of the simplest, and the most satisfying from the point of agreement with the data, is obtained by inspection of the present geographic ranges of the members of category 2. All these forms presently occur in the vicinity of southeastern Wyoming and north-central Colorado and are not found together elsewhere. We consider it likely that conditions similar to those found in that area today obtained in the Isleta area during the late Pleistocene. Climatic data from southeastern Wyoming (Cheyenne) and from near Los Lunas, New Mexico, are compared in figure 1. We consider, then, that the climate during deposition of members of categories 2 and 3 probably was somewhat cooler,

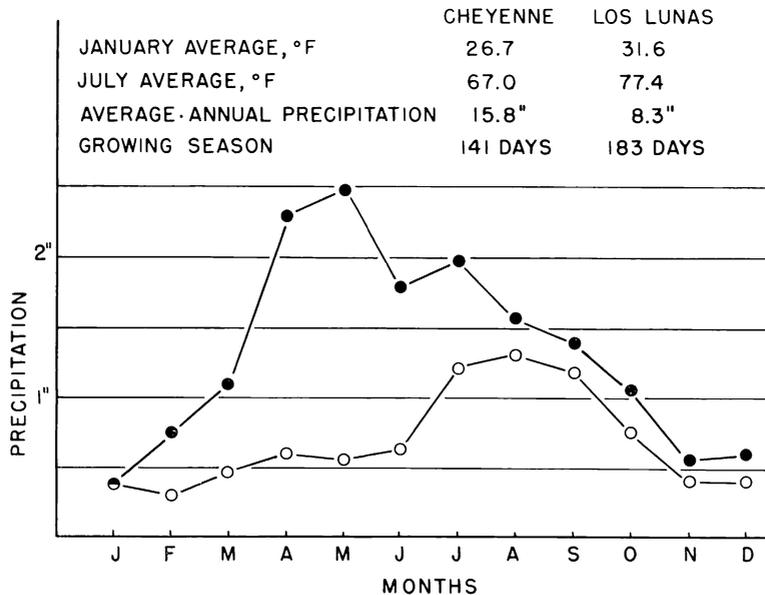


Fig. 1. Comparison of climatic data from Cheyenne, Wyoming, and near Los Lunas, New Mexico. Solid symbols denote mean monthly precipitation for Cheyenne; open symbols, for near Los Lunas.

particularly during the summer months; wetter, with almost double the present precipitation: and with the period of greatest precipitation occurring in the spring months rather than in mid and late summer. Floristically, the area was dominated by sagebrush grassland, with few or no trees. Following this time, climatic conditions similar to those of today appeared with the vegetational types going directly to something very similar to historic conditions. Relatively minor climatic fluctuations are not ruled out.

Other data from the cave deposits add support to this model. Late Pleistocene camelids probably were animals of relatively open country, not inhabitants of forests or woodlands. Also, there is a dearth of mammals now typical of New Mexican forest lands, including tree squirrels (*Sciurus* and *Tamiasciurus*), chipmunks (*Eutamias*), and porcupines. Deer (*Odocoileus*) appear to be absent. Eastern Cottontails of forms now adapted to New Mexican highland floras and climates have not been found but, rather, a form to be expected in an open habitat. It may also be noted that the almost complete absence of *Urocyon* decreases the likelihood that the area supported good pinyon-juniper woodland at any time since deposition began.

Thus the history of the area emerges as follows. Deposition began during a time of cooler and damper climatic conditions. The vegetation of the divide between the Rio Grande and the Rio Puerco, west of Isleta Pueblo, consisted primarily of sagebrush grassland: trees were mostly or entirely absent. Camelids and, probably, horse ranged the area: cave bear appeared on occasion. Marmots and Bushy-tailed Wood Rats dwelt among the lava rocks and microtines made runways through the grass and among the sagebrush. Two species of *Vulpes* preyed on the Eastern Cottontail and the other small mammals. Additional species undoubtedly were present but, without stratigraphic control of the cave deposits, cannot be separated surely from Recent members of the same species. Eventually, as climatic conditions tended toward those of today, such species as the marmot and Bushy-tailed Wood Rat were forced into the more mesic habitats remaining in highland areas: others, their requirements not met in the highlands, moved east or north. These animals were replaced by forms similar to those inhabiting the area today.

Evidence of a post-Pleistocene time warmer and drier than today, the Altithermal of Antevs, is absent. There is no identified animal present in the deposits that is surely representative of such climatic conditions, and it is quite likely that all members of category I have been in the area during historic times. Such evidence is essentially negative and, of course, far from conclusive.

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