Plio-Pleistocene Vertebrate Fossils of the El Paso Area

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**An Informal, Non-refereed Electronic Publication
of the Centennial Museum**

Number 6, 3 April 2000

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From fossilized teeth of three-toed horses and armor plates of giant armadillo-like beasts of the Blancan Land-Mammal Age of 2 million years ago to the sand-blasted chicken bones of last year's riverside picnic, the El Paso region holds a wealth of remains of animals with backbones--the vertebrates. These are the fish, amphibians, reptiles, birds, and mammals that most of us have in mind when we think "animals."

In geologic time, 2 million years is almost nothing, but to the biologist, this span of time is significant, allowing time for new species to evolve, others to become extinct, and all sorts of movements into and out of the region. In the past, as in the present, the El Paso region was in the tension zone between northern faunas coming south in the highlands and the southern faunas of Mexico and the lowlands of the Southwest; and between the grasslands to the east and those lowlands to the west that today support deserts. Add to this the presence of the watered bolsons and streams of the ancestral and modern Rio Grande and the topographic relief supplied by the local mountain ranges. With one final ingredient, the dramatic climatic changes of the Pleistocene Ice Ages and the subsequent Holocene in which we now live, the sediments of the region preserve a virtual Noah's ark of vertebrate diversity.

Using a broad definition of "fossil" as any recognizable remains more than a few thousand years old, there are nearly 200 kinds of vertebrates known from the region. Some of these are from the ancient lake, playa, and river sediments flanking the Rio Grande. Most of these range from about 2 million years in age (Blancan North American Land Mammal Age) down to some time in the succeeding Irvingtonian Land Mammal Age, perhaps in the neighborhood of a million years old. Many others are from sediments deposited in caves during the next land-mammal age, the Rancholabrean. Most of these recovered so far were deposited within the last 60,000 or so years.

There are roughly 550 species of vertebrates historically occurring in the greater El Paso region (most are birds and many of these are present only seasonally, during migration, or as waifs not normally occurring in the area). The collections of the Laboratory for Environmental Biology (Centennial Museum) contain many of these fossils, while fossils from sites in nearby New Mexico were summarized by Harris (1993), and Vanderhill (1986) studied the vertebrate fossils from the local river-basin sediments. Considering how seldom back-boned animals are preserved as fossils and how seldom those that are preserved fossils end up with paleontologists, almost 200 species is a high number indeed, even for a 2-million-year span.

The sediments revealed by entrenchment of the Rio Grande range in age from Blancan (a relatively small area of exposure uncovered only near the base of the deposits) into the Irvingtonian (the bulk of the sediments seen in the high valley edge west of the Rio Grande, for example). These are mostly lake and river sediments, preserving remains of animals inhabiting aquatic situations or flood plains, or animals watering in those areas. Most finds are associated with the sands and gravels laid down in old river channels. Unfortunately, few small vertebrates have been preserved (or, perhaps more likely, found), and most of the remains are of animals the size of horses or larger.

Figure 1. Molar of *Stegomastodon*.

Best known, and certainly most spectacular, are the proboscideans (elephant-like creatures), camels, and horses--all extinct now in North America. Other spectacular, but rarer, forms included glyptodonts, tapirs, pronghorns, and giant ground sloths.

Three families of proboscideans occurred here during the Irvingtonian: the Gomphotheriidae, Mammutidae, and Elephantidae. Of these, the most common were the gomphotheres. These locally are called mastodons, but differ from the true mastodons (Mammutidae) in a number of ways, including the teeth. The teeth (including tusks, which are specialized incisor teeth) of proboscideans are the most common elements found. Gomphothere teeth have complex folding of the ridges (lophs) that span the teeth from side to side (Fig. 1). The figure shows four such lophs, but there may be as many as seven in the last molars to come in. The

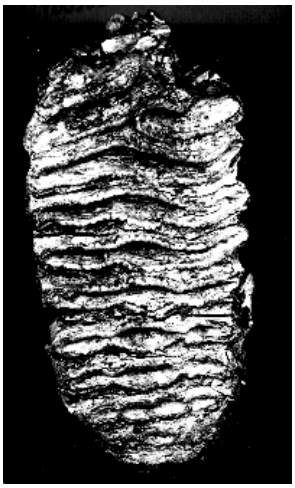

Figure 2. Molar of mammoth

mastodons (*Mammut*) have similar teeth but with very little in the way of complex folding. Both of these families were mainly browsers, feeding on relatively soft plant foods. The grazing mammoths (*Mammuthus*, several species through time), on the other hand, had much more complex teeth able to withstand the abrasive nature of grasses (and the accompanying grit). Their teeth have many more lophs, with the front and back of each having the enamel bands parallel and close together, and the teeth also are much deeper between the grinding surface and the roots than in the other proboscideans.

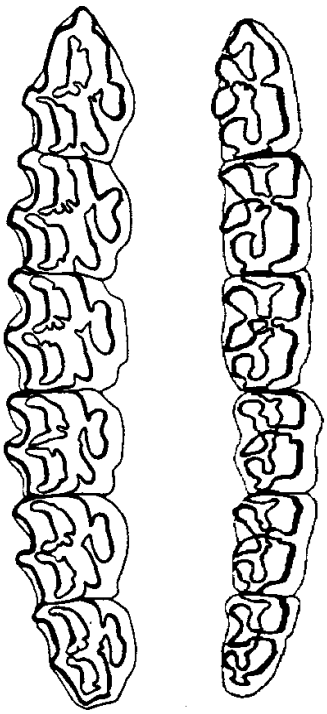

Figure 3. Upper (left) and lower cheek teeth of *Equus.*

Few people realize that camels and horses are native North Americans, but both of these families underwent most of their evolutionary history here and were common locally up to near the end of the Pleistocene, some 11,000 years ago. Local camels included the gigantic *Blanocamelus* and *Gigantocamelus* in the earlier deposits. Surviving in our area to the end of the Pleistocene were Yesterday's Camel (*Camelops hesternus*), larger than the modern Dromedary Camel of Africa, and the Big-headed Llama (*Hemiauchenia macrocephala*), a large, stilt-legged form.

Horses (*Equus* spp.) were a prominent feature throughout the local Pleistocene scene. A slenderly built three-toed horse (*Nannippus peninsulatus*) closed out the Blancan in our area, becoming extinct at the end of that age. At least four species of *Equus* (the genus of modern horses, zebras, burros, and relatives) occurred in the region during the Pleistocene--a large, a medium, a small, and a stilt-legged form. Horse teeth and lower-leg bones (which are compact and fossilize well) probably are the commonest fossils brought into the university and schools of the area for identification. Luckily, the teeth are easily identified as horse (Fig. 3).

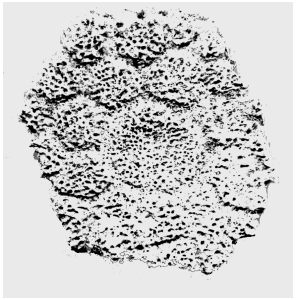

Figure 4. Bony scute of Glyptodont armor.

Glyptodonts (*Glyptotherium*) were distantly related to armadillos and, like armadillos, had a carapace ("shell") made up of bony plates. The resemblances pretty much stop at that point, however, since these

were large animals (one author compares them in size to a small hippopotamus), and the body armor was extremely heavy and joined so as to form a single element. The distinctive pieces making up the armor (Fig. 4) are the most often found fossils. Extinction apparently occurred locally early in the Pleistocene.

Aside from the large mammals thus far mentioned, our early Pleistocene included a sabertooth cat (*Smilodon gracilis*), smaller and possibly ancestral to the late Pleistocene sabertooth so prominent in places such as Rancho La Brea. Likewise, an extinct wolf (*Canis armbrusteri*) roamed the area. In the later Pleistocene, a representative of the Old World lion (*Panthera leo atrox*); Gray Wolves (*Canis lupus*); the large, bone-cracking Dire Wolf (*Canis dirus*); extinct condors (*Breagyps clarki*); and a variety of pronghorn "antelope" traversed the area. Also present was the Giant Short-faced Bear (*Arctodus simus*), which was larger than the Grizzly (*Ursus arctos*) that replaced it near the end of the Pleistocene; the latter is not known as a fossil from our region.

Perhaps the most famous of the local fossilized individuals is the Shasta Ground Sloth (*Nothrotheriops shastensis*) from the Aden Crater fumerole (Lull 1929). The 100-foot-deep pit produced a complete sloth, about the size of a black bear, with some skin and other tissues still present; a coprolite (fossil fecal material) gave one of the earliest clues as to the diet of this extinct creature. Because of the survival of soft tissues, there was speculation that the sloth became extinct only a few hundred years ago, but radiocarbon dates place its death at more than 11,000 years ago.

Many of the large mammals of the Pleistocene survived until nearly the end of the epoch, with wholesale extinction of large mammals and birds most likely centered around 11,000 radiocarbon years BP (Before Present), though this is difficult to prove for some of the rarer forms. An indication of the massiveness of the extinction in North America can be seen in figures given by Martin (1984): in the over 3 million years just previous to the large major glacial episode (the Wisconsinan glaciation), 20 genera of large mammals are known to have become extinct; at the end of the Wisconsinan glaciation, 33 genera disappeared from North America. End-Pleistocene climatic and resultant vegetational changes are invoked by some workers to explain this major megafaunal extinction event, while others believe the timing of the extinction, coinciding with the arrival of hunters into the region stretching from southern Canada to the southern tip of South America, is too much of a coincident to not be involved. Other researchers believe a

combination of climatic change and hunting overkill was the cause. Regardless of cause, the Pleistocene plains of the El Paso region were more reminiscent of the savannas of Africa than of the present-day depauperate fauna of our area.

What of the smaller vertebrates? With few exceptions, there was an absence of extinction, but there was widespread geographic displacement during latter part of the Pleistocene, the time span for which we have the most data. These smaller vertebrates are useful to the biologist and climatologist because they are much more sensitive than are large animals to changes in vegetation and climate.

A number of lines of evidence, geologic and biologic, show that the Pleistocene was a time of relatively long ice ages alternating with relatively short interglacial ages (of which the current age, the Holocene, is the latest). The last interglacial centered around 120,000 years ago and was followed by an early Wisconsinan advance of continental ice which was separated from another, more powerful advance by a middle Wisconsinan interval of more moderate conditions. The late Wisconsinan Full Glacial had its apex around 20,000 years BP. There were lesser fluctuations of climate within each portion of the Wisconsinan.

Although ice covered most of northern North America, the nearest glacier to El Paso was a small mountain glacier on Sierra Blanca, New Mexico. Nonetheless, the climatic changes had major repercussions for the regional fauna through changes in temperature and in amount, distribution, and effectiveness of precipitation.

Most of our evidence concerning the smaller vertebrates comes from cave deposits. Aside from animals that live in caves and their immediate surroundings, there is another powerful force at work to augment the fossil treasure trove--owl power. Owls swallow their prey in relatively large hunks (whole, for small items); the soft tissues are digested away and bones, teeth, and fur eventually regurgitated in the form of "owl pellets." This vomiting of the indigestible portions of animals usually takes place at a roost, and caves are favorite roosts. Thousands of bones may accumulate annually, so that even sporadic usage of a cave for roosting may provide a huge sample garnered from within a few miles of the cave. (Other carnivorous animals also may bring prey into caves from elsewhere.) Although not without various biases, such samples go far in allowing reconstruction of past environments. Aiding in this reconstruction is the fact

that most kinds of small vertebrates are not extinct, and knowledge of their present ecology can be applied (with caution) to the environments of the past.

There are a number of major fossil cave sites within our region. Two caves excavated early in the century were Shelter Cave and Conkling's Cavern, located on opposite sides of Bishop's Cap peak, at the southern end of the Organ Mountains. The Khulo Site, near Aden Fumerole, is a lava bubble excavated by the Smartt brothers in the early 1970s; they also made collections from Anthony Cave near the northern end of the Franklin Mountains (Smartt 1977). A site with a disreputable name, Pendejo Cave, lies in the breaks of Otero Mesa east of Orogrande. This site has produced a major faunal record from earlier than 55,000 radiocarbon years to the present and also is interpreted (Chrisman et al. 1996) as showing presence of man in excess of 35,000 radiocarbon years ago

The Aztlán Rabbit (*Aztlanolagus agilis*), known from two of the regional sites (Anthony Cave and Pendejo Cave), is of interest as one of the very few small vertebrates that became extinct late in the Pleistocene. This pygmy rabbit is smaller than a cottontail rabbit but with limb proportions more like those of a jack rabbit. Technical details indicate that it is not closely related to any living rabbit. Another small, extinct vertebrate is the Thick-billed Cowbird (*Pyelorhamphus molothroides*) from Shelter Cave.

Of more interest to the modern biologist are kinds of animals not now found in the immediate area. These animals give information on past climates and vegetations and, as they wax and wane through time, guide us to an understanding of how the biology of the region evolved to its present form. Particularly interesting are such animals as the Sagebrush Vole (*Lemmiscus curtatus*). Now approaching our area no closer than south-central Utah, this mouse is known to have extended southeast to the Carlsbad area and south to Pendejo Cave and to the bootheel of New Mexico, a few miles from the Mexican border. Closely associated with Big Sagebrush (*Artemisia tridentata*), the strong assumption is of a climate having similarities with that of the Great Basin, the stronghold of that plant (however, sagebrush does extend into the San Juan Basin and into northern New Mexico today). This assumption is bolstered by presence of another vertebrate closely associated with sagebrush, the Sage Grouse (*Centrocercus urophasianus*), at Shelter Cave and Conkling Cavern.

Cooler ice-age temperatures (at least during the summer) and increased effective moisture (particularly during the winter) are indicated by a number of vertebrates. Animals and birds that reach their modern usual southern limits in northern New Mexico, but extended south in low elevations into our region during the late Wisconsinan, include the Boreal Owl (*Aegolius funereus*), Magpie (*Pica pica*), Yellow-bellied Marmot (*Marmota flaviventris*), Gunnison's Prairie Dog (*Cynomys gunnisoni*), Nuttall's Cottontail (*Sylvilagus nuttallii*), White-tailed Jack Rabbit (*Lepus townsendii*), Northern Pocket Gopher (*Thomomys talpoides*), Bushy-tailed Packrat (*Neotoma cinerea*), and possibly Ermine (*Mustela erminea*). Also present locally in the late Wisconsinan were species that occur now in southern New Mexico, but only in montane situations high enough to support woodland or forest. Some of these kinds are the Mexican Vole (*Microtus mexicanus*), Merriam's Shrew (*Sorex merriami*), and at least two kinds of chipmunks (*Tamias minimus* and a larger species of *Tamias*).

Although many members of our current fauna mingled with these northern and highland forms, some became locally extinct during portions of the ice ages. The large Banner-tailed Kangaroo Rat (*Dipodomys spectabilis*) is present in most faunas most of the time, but its two relatives that are more common in the region today, Merriam's Kangaroo Rat (*Dipodomys merriami*) and Ord's Kangaroo Rat (*Dipodomys ordii*), are rare or absent. Likewise, pocket mice (*Perognathus, Chaetodipus*) remains are scanty. Cotton rats (*Sigmodon*), currently common, are rare and some remains may represent a species now characteristic of higher montane habitats rather than the common, lowland kind.

At least one inhabitant of marshy, sedge-bed habitats hung on into the early Holocene, presumably along the Rio Grande, before becoming locally extinct. It has been recovered from the Khulo Site. This mouse is the Meadow Vole (*Microtus pennsylvanicus*), currently limited to relictual habitats in western and northern New Mexico or to the high northern mountains of the state.

In contrast to the many northern or highland animals characteristic of the area during the late Pleistocene, only a few kinds with southern affinities have been recovered (sites in southwestern New Mexico record more, suggesting that our region may eventually pick up others). Most notable is the Desert Tortoise (*Gopherus agassizii*) from several sites. This is a terrestrial turtle generally considered to be confined to the Sonoran and Mojave deserts by cold winter temperatures outside of those regions. It

occurs in one stratum of the middle Wisconsinan of Pendejo Cave and in what is interpreted as the near-terminal Pleistocene of Pendejo, Shelter, and Robledo caves. If limiting factors are as we believe, then their presence records intervals, probably brief, during which hard, prolonged winter freezes were absent.

The literature concerning El Paso regional vertebrate paleontology is scattered and often difficult to obtain. There are a number of web sites, however, that supply information pertinent to the region. Several of these can be accessed through the Laboratory for Environmental Biology (LEB) pages at <http://www.utep.edu/leb/>, including a list of Pleistocene fossils held by the LEB from the El Paso region. There also are in-progress listings of a number of Pleistocene and Holocene sites that are available through the LEB home page. The "Bibliography of Fossil Vertebrates" has a searchable website at <http://eteweb.lscf.ucsb.edu/bfv/bfv_form.html> that is useful for locating references. Examples of some of the larger Pleistocene fossils are on display in the Strain Gallery at the Centennial Museum on the campus of the University of Texas at El Paso.

Literature Cited

Chrisman, D., R. S. MacNeish, J. Mavalwala, and H. Savage. 1996. Late Pleistocene human friction skin prints from Pendejo Cave, New Mexico. American Antiquity 61 (2):357-376.

Harris, A. H. 1993. Quaternary vertebrates of New Mexico. Pp. 179-197, *in* Vertebrate Paleontology in New Mexico, New Mexico Museum of Natural History, Bulletin 2:i-vii, 1-338.

Lull, R. S. 1929. A remarkable ground sloth. Memoir of the Peabody Museum, Yale University 3, pt. 2:i-x + 1-39.

Martin, P. S. 1984. Prehistoric overkill: The global model. Pp. 354-403 *in* Quaternary extinctions: A prehistoric revolution (P. S. Martin and R. G. Klein, eds.), University of Arizona Press, Tucson, 892 pp.

Smartt, R. A. 1977. The ecology of Late Pleistocene and Recent *Microtus* from south-central and southwestern New Mexico. Southwestern Naturalist 22:1-19.

Vanderhill, J. B. 1986. Lithostratigraphy, vertebrate paleontology, and magnetostratigraphy of Plio-Pleistocene sediments in the Mesilla Basin, New Mexico. Ph.D. Dissertation, University of Texas at Austin, Austin, 305 pp.