A LATE PLEISTOCENE MAMMALIAN FAUNA FROM CUEVA QUEBRADA, VAL VERDE COUNTY, TEXAS

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ABSTRACT

Deposits from Cueva Quebrada, Val Verde County, Texas, contain a mammalian fauna consisting of chiropterans, *Spilogale* sp., *Mephitis mephitis, Canis* sp., *Urocyon cinereoargenteus, Bassariscus* cf. *astutus, Arctodus simus, Ammospermophilus interpres, Thomomys bottae, Pappageomys castanops, Perognathus* sp., *Baiomys taylori, Onychomys leucogaster, Peromyscus* sp., *Neotoma* sp., *Sylvilagus* sp., *Lepus* cf. *californicus, Equus* cf. *scotti, Equus francisci,* cf. *Camelops, Navajoceros fricki, Stockoceros* sp., and *Bison* sp.

Much of the bone is charred and extensively broken. Only five specimens show damage that can be readily attributed to carnivore activity. Both spiral and rectilinear fractures are present. Although few cut marks were seen on the bones, the general breakage pattern is consistent with human activity.

The fauna has only one extant species, *Baiomys taylori,* that is not found in the Amistad area today. It suggests a more humid climate at the time of accumulation of the deposits.

The composition of the fauna indicates a late Pleistocene age which is confirmed by three radiocarbon dates of 12,280 ± 170 B.P., 13,920 ± 210 B.P., and 14,300 ± 220 B.P.

INTRODUCTION

Cueva Quebrada is located on the north side of a small tributary canyon to the Rio Grande River about 2 mi north of the mouth of the Pecos River, 18 mi (28 km) west of Comstock, Val Verde County, Texas, at 29°44′N by 101°24′W (Figs. 1, 2). It is located immediately east of a large shelter known as Conejo Shelter, the archaeology of which was studied by Alexander (1974). The excavations in Cueva Quebrada were done under the supervision of Alexander in connection with the Texas Archaeological Salvage Project's (TASP) contract with the National Park Service in the Amistad Reservoir. It is recorded in the TASP files as 41 VV 162A.

The archaeological material found at this site was negligible, but a considerable amount of faunal material of Pleistocene age was recovered from the lower units. This material provides new information on the Pleistocene fauna of southwest Texas. The condition of the bones and their distribution in the cave raises questions as to what were the agent(s) responsible for bringing the bones into the cave and what caused the burning.

ACKNOWLEDGMENTS

I thank the following people for assistance in this study: Ms. Melissa Winans prepared the computer generated maps and scatter diagrams (Figs. 8–11), and made available her measurements on the metapodials of *Equus* samples from San Josecito Cave, Channing, Texas, and Rock Creek, Texas; Dr. Dee Ann Story and Dr. Solveig Turpin helped with finding and interpreting the available records of the excavation; Dr. Arthur Harris made available his original measurements of *Equus* metapodials from Dry Cave, New Mexico; Mr. Elton Prewitt provided information on the stratigraphy of the deposits. The figures of the teeth and bones were drawn by Mrs. Pam Westerby. My wife Judith Lundelius edited the manuscript. Financial assistance was provided by the Geology Foundation of the University of Texas at Austin.

MATERIALS AND METHODS

The cave was excavated as an archaeological site according to standard archaeological methods. Provenience data on some of the bones was kept in terms of precise horizontal grid coordinates and depth below a datum. Other bone material was recorded only from a given square and stratigraphic unit. All specimens were scored for degree of burning—burned was defined as having all the organic material burned which left the bone light blue-gray or white in color and often deformed; charred was defined as blackened but with organic material still present; unburned bones showed no evidence of scorching. All specimens with horizontal grid and vertical control were used to construct maps with the aid of a computer mapping routine to determine any patterns of occurrence of burning and/or taxonomic units.

The materials listed for each taxon are not necessarily all specimens of that taxon, but are those that are most useful for identification. The detailed provenience of each specimen is also omitted. A complete list with provenience is available from the Vertebrate Paleontology Laboratory, Texas Memorial Museum, University of Texas, Austin.

Measurements were taken with dial calipers and a microscope reticle. Abbreviations are: TMM—Texas Memorial Museum, M Recent Skeletal collection of Vertebrate Paleontology Laboratory, TNHC—Texas Natural History Collection of Texas Memorial Museum, TAMU—Texas A&M University. The material from Cueva Quebrada is catalogued under TMM 41238.

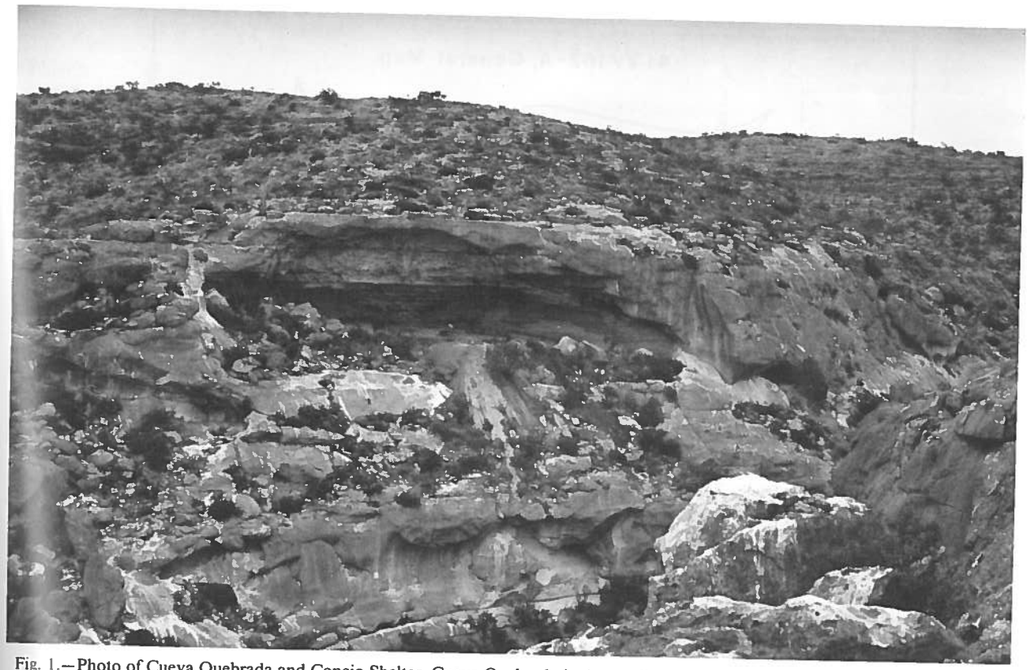

Fig. 1.—Photo of Cueva Quebrada and Conejo Shelter. Cueva Quebrada is the small opening to the right and slightly below the larger Conejo Shelter.

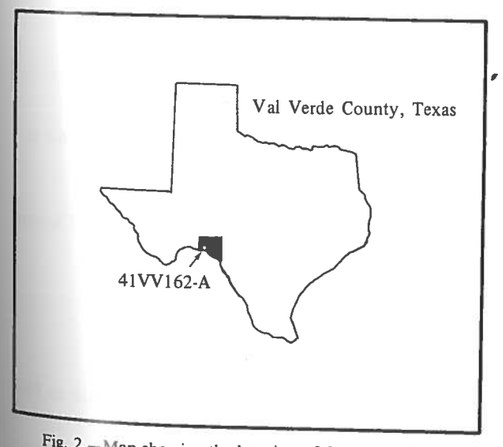

Fig. 2.—Map showing the location of Cueva Quebrada.

STRATIGRAPHY

The cave is small, measuring 30 ft by 15 ft with the long axis oriented north-south (Fig. 3). A number of stratigraphic units were recognized (Fig. 4) but notes with descriptions of these units are not available. Layer I at the top was composed of white limestone dust. It was completely devoid of artefacts and bone. Layers II through IV were also composed of limestone dust but were various shades of gray and brown presumably related to the amount of finely divided charcoal mixed with the limestone dust. Layer V was a light yellow color. The stratigraphic layers were approximately horizontal but

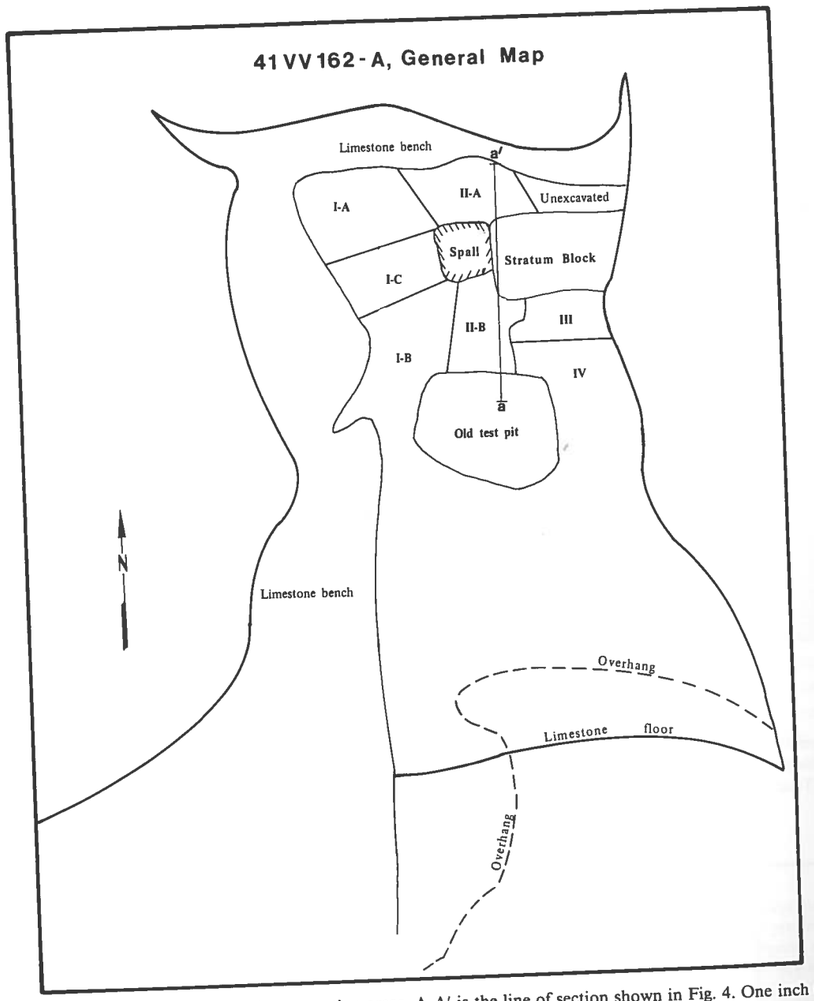

Fig. 3.—Map of Cueva Quebrada showing the excavation areas. A-A′ is the line of section shown in Fig. 4. One inch equals 6.3 ft.

the surfaces dividing them were frequently uneven. The cross section (Fig. 4) shows that the surface of Layers III and IV were eroded in places. All layers have limestone spalls of various sizes.

AGE

The presence of several extinct taxa in the deposits of Cueva Quebrada indicates a late Pleistocene age. In addition there are three radiocarbon dates (Valastro et al., 1977, 1979). They are as follows:

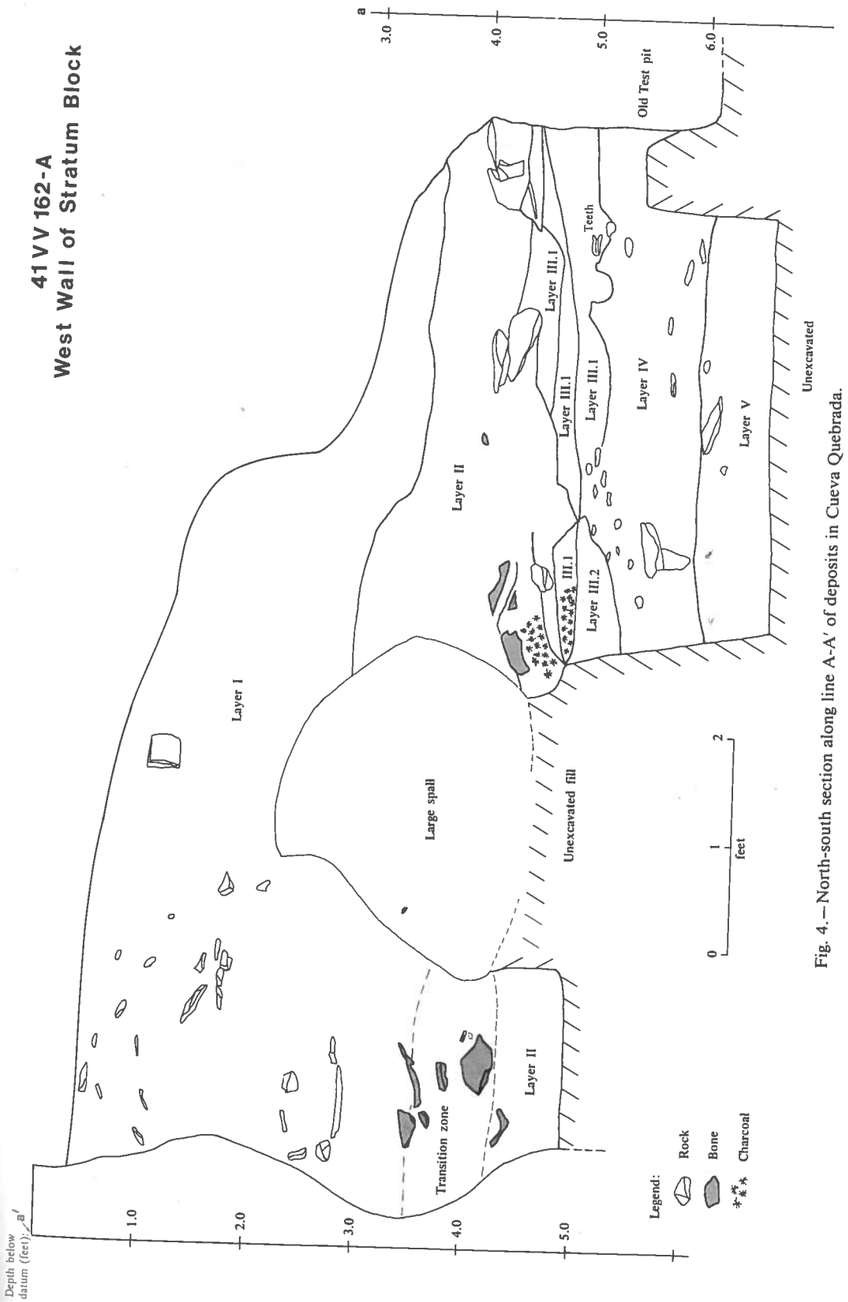

Fig. 4.—North-south section along line A-A′ of deposits in Cueva Quebrada.

TX-879 12,280 ± 170 on charcoal from units I and II, 1.04–1.19 m below datum.

TX-880 13,920 ± 210 on one piece of wood from Unit IC, top of dark layer, 1.37 m below datum, immediately above a broken femur of *Equus scotti* (TMM 41238-317).

TX-881 14,300 ± 220 on one piece of wood .18 m north of TMM 41238-317, 1.37 m below datum.

These dates are consistent with the late Pleistocene age indicated by the fauna. Two of the dates, TX-880 and TX-881, overlap at ±1.96 standard deviations and are not significantly different. The third, TX-879, does not overlap the other two at 1.96 standard deviations and is slightly younger. All the dated samples are from levels that contain abundant bone and would seem to be good indicators of the age of the bone.

TAPHONOMY

The fauna of Cueva Quebrada is not extensive, but the condition of the bones and the sparse evidence of human involvement raise questions as to the agent or agents responsible for bringing the bones into the cave. Much of the bone is burned, some so thoroughly as to have lost all organic material and to have been plastically distorted as is seen in much of the *Bison* bone from Bonfire Shelter in the same region (Dibble and Lorrain, 1968). Burning, especially in caves, is usually thought of as indicating human activity. As pointed out by Dibble and Lorraine (1968) large accumulations of organic material undergoing decomposition may generate enough heat to start combustion. In contrast to the situation at Bonfire Shelter, where there is evidence that large numbers of *Bison* were driven over the cliff and fell into the cave, the maximum number of large animals represented by the bones from Cueva Quebrada is approximately nine, which would not seem to provide enough organic material to initiate spontaneous combustion. There is also no evidence that all these animals were introduced into the cave at the same time. On the contrary, the general lack of articulation and the distribution of burned and charred bone in the deposits suggests a number of separate episodes of burning.

An examination of the maps showing the horizontal distribution of burned, charred and unburned bone for which there was precise data shows little concentration of burned or charred bones. There is a slight indication of increased burning and charring of bones of *Equus* in the central part of the cave. This is consistent with the observation of E. Prewitt (personal communication) that there were no hearths or fire pits.

The possibility that a packrat nest was ignited either by natural or human agency should not be overlooked. These nests are sometimes very large (up to 2 m in height and diameter) and represent a considerable amount of fuel (Van Devender, personal communication).

The agent or agents responsible for bringing the bones into the cave cannot be identified certainly. The bones of the small animals, such as rodents, probably were brought in by owls. They are generally unbroken, which is characteristic of bones derived from owl pellets. A number of the bones of the larger animals such as horse are not broken or the fragments were not widely dispersed and it is possible to reassemble them. The skull of *Arctodus* was burned and then fractured but was found intact. The thoracic and lumbar vertebrae of *Arctodus* were articulated, a foot of *Equus scotti* was articulated, and the phalanges of a foot of *Stockoceros* were articulated.

Many of the breaks in the long bones show a spiral fracture pattern indicating breakage as fresh bones. Some of the horse metapodials show rectilinear fractures. All of the skull material of horse, bison, and antelope is extensively broken.

The postmortem alteration of bones by humans and animals has recently been considered by a number of people (Bonnichsen, 1973, 1979; Brain, 1981; Haynes, 1980, 1983). Both experimental and field studies have identified criteria that indicate carnivore damage to bones. When these criteria are applied to the bones from Cueva Quebrada, a few seem to show features indicating carnivore damage. Three bones show what appear to be tooth marks. A horse first phalanx (TMM 41238-322) has conical depressions on both the anterior and posterior faces that have the shape and size of the canine of a wolf (Fig. 5A). Fragments of the surface bone that were driven into the depression are still present. The proximal end of a femur of *E. scotti* (TMM 41238-290) shows a similar depression on the posterior surface just below the head (Fig. 5B). These depressions are similar to puncture marks made by a wolf on the femur of a bison figured by Haynes (1983: fig. 1). There are also grooves that are U shaped in cross section on the ball of the femur that resemble those produced by carnivore teeth. If *Arctodus* was a carnivore as Kurtén (1967) suggests, it is possible that the depressions on the horse phalanx and femur were made by the carnassials of that animal. The protoconid of the M_1 is approximately the right size and shape.

Two horse tibias (TMM 41238-152, 412) show damage resembling that reported by Haynes (1980, 1983) to the tibias of moose by wolves (Fig. 5). In one (TMM 41238-152), the cnemial crest and the anterior part of the proximal articular surfaces are removed. The other (TMM 41238-412) lacks the proximal end, and the posterior part of the distal end is removed. No grooves that might have been made by carnivore teeth are visible on these two bones.

The distal end of a humerus of *Stockoceros* has a large hole in the epicondylar area and a deep conical depression on the inside of the medial wall of the epicondylar fossa. This latter depression seems to have been made by a more slender tooth than the one that made the depressions in the other two bones. This suggests that more than one carnivore was involved in chewing the bones. Although *Arctodus* is the only carnivore represented by skeletal material in the cave deposits that is large enough to have made the large depressions, the late Pleistocene fauna included large canids (*Canis lupus* and *Canis dirus*) which were widespread in North America and were almost certainly members of the fauna of the Amistad region. There is no guarantee that any of these predators were responsible for bringing the animals into the cave, but they could have scavenged the carcasses found there.

All the bones were examined for cut marks, particularly near the ends, that might indicate human butchering activity. Only one was found. The proximal end of the horse femur (TMM 41238-290) has three linear V shaped grooves that resemble grooves on bones known to have been made by tools (Fig. 5C). Thus the breakage pattern, the surface alterations and the burning, suggest that both man and animals were responsible for the presence and condition of the bones in the cave.

ENVIRONMENTAL INTERPRETATION

The Pleistocene fauna from Cueva Quebrada has only a few extant taxa that are useful in a paleoecological analysis. The relatively poor representation of the smaller animals of the fauna has made species identification difficult for many taxa. Most of the extant taxa have a wide distribution in the southwest today and are still living in Val Verde County. One exception is *Baiomys taylori* which is now found in more mesic areas to the east in Texas and at higher elevations to the south in Mexico.

The extinct fauna, with two species of horse, an antilocaprid, and *Bison*, suggests prevalence of open country, grasslands or savannah, on the uplands. The canyons, as now, probably supported brushy vegetation and provided habitats for many non-grassland and savannah species.

SPECIES ACCOUNTS

Class Mammalia
Order Chiroptera

Material.—An incomplete rostrum (TMM 41238-476); a number of isolated teeth.

Discussion.—The bat material is inadequate for reliable identification.

Order Carnivora
Family Mustelidae

Spilogale sp.

Material.—Right edentulous juvenile mandibular ramus (TMM 41238-571).

Description.—The alveoli for all the post incisor teeth are present. The alveoli for the M_1 show clearly that this tooth had two small lateral roots under the midpoint of the tooth. This distinguishes it from comparable sized species of *Mustela* in which the M_1 has only one very small median root on the labial side. The horizontal ramus is very shallow and the surface of the bone is spongy indicating that it is from a young animal. The distinction between *S. gracilis* and *S. putorius* cannot be made on the basis of the material reported here.

Discussion.—The spotted skunk *Spilogale gracilis* is widely distributed in Trans-Pecos Texas where it is usually found in rocky and brushy conditions (Schmidly, 1977).

Mephitis mephitis (Schreber)

Material.—Left mandibular ramus with M_1, roots of P_4 alveolus for M_2 (TMM 41238-178); left mandibular ramus with roots of P_4, M_1 (TMM 41238-406).

Table 1.—*Dental and mandibular measurements of fossil and Recent specimens of* Urocyon cinereoargenteus *and* Vulpes macrotis.

Specimen	Length P_4	Length M_1	Anterior width M_1	Posterior width M_1	Length talonid M_1	Length M_2	Depth mandible at midlength M_1
			Urocyon cinereoargenteus				
Cueva Quebrada							
TMM 41238-252	7.2	—	—	—	—	—	12.7
TMM 41238-366	—	11.5	5.5	5.3	4.5	6.1	12.4
Recent							
M-1662	7.5	11.6	4.7	4.8	4.7	6.2	11.3
M-998	7.1	13.1	4.9	5.0	4.7	6.3	10.9
M-2063	7.7	11.4	4.9	4.4	4.2	6.6	11.6
M-3453	6.9	12.6	4.8	5.1	5.0	6.7	10.7
M-4822	7.3	12.3	5.3	5.3	4.8	7.4	12.1
			Vulpes macrotis				
M-1200	7.7	12.2	4.5	4.2	3.8	—	11.3
M-1412	7.7	11.8	4.7	4.1	3.6	5.1	10.5
M-1269	7.7	11.7	4.5	4.1	3.3	5.6	10.6
M-1910	8.4	12.6	4.8	4.5	3.4	5.6	11.8

Description.—The M_1 of TMM 41238-178 is deeply worn especially on the lingual side where the wear extends below the enamel. The trigonid is longer than the talonid and the talonid is relatively narrow as in *Mephitis* and in contrast to *Conepatus* in which the talonid is longer than the trigonid and is very much wider than the trigonid. Specimen TMM 41238-406 has the crown of M_1 and P_4 broken away. It is assigned to *M. mephitis* on the basis of size and the presence of well developed lateral roots under the center of M_1. *Mustela vison,* which has an M_1 slightly smaller than that of *M. mephitis,* has a very small central root only on the labial side.

Discussion.—*Mephitis mephitis* is present today in the vicinity of Cueva Quebrada. It occupies a wide variety of habitats in Trans-Pecos Texas but is least common in rough rocky terrain (Schmidly, 1977).

Family Canidae

Canis sp.

Material.—One first phalanx (TMM 41238-201).

Description.—The phalanx is similar in size and proportions to those of living specimens of *Canis latrans* which is common in Val Verde County today.

Urocyon cinereoargenteus (Schreber)

Material.—Part of a left horizontal ramus with part of P_2, P_4, alveoli for P_1, P_3 and M_1 (TMM 41238-252); part of a right horizontal ramus with M_1, M_2 alveoli for P_4 and M_3 (TMM 41238-366).

Description.—The specimens from Cueva Quebrada are similar to *U. cinereoargenteus* in both size and morphology. The cuspule directly posterior to the main cusp of the P_4 is relatively larger than that of *Vulpes macrotis.* The talonid of the M_1 is broad and has equidimensional entoconid and hypoconid, whereas in *V. macrotis* the hypoconid is larger than the entoconid and the talonid is relatively narrower and shorter (Table 1). The size of the P_4 and the depth of the mandible are closer to the corresponding dimensions of *U. cinereoargenteus* than to *Vulpes vulpes,* which is larger, or to *V. macrotis* which is smaller.

Discussion.—*Urocyon cinereoargenteus* is widespread in Texas today including the Trans-Pecos region where it is usually found in rocky areas in association with pinyon-juniper forests (Schmidly, 1977).

Family Procyonidae

Bassariscus cf. ***astutus*** (Lichtenstein)

Material.—Left calcaneum (TMM 41238-560).

Description.—The calcaneum of *Bassariscus* is distinguishable from those of similar sized animals such as *Mephitis, Conepatus, Spilogale,* and *Mustela vison* on the basis of both size and morphology. It is smaller than the corresponding bone in *Mephitis* and *Conepatus* and is larger than that of *Spilogale.* The proximal articular facet extends posteriorly over the dorsal surface of the calcaneal tuber, which is not the case in any of the skunks. The calcaneum of *Mustela vison* is the same size as that of *Bassariscus* and also has a proximal articular facet that extends posteriorly onto the dorsal surface of the calcaneal tuber but the form of the dorsal articular facet differs. The part of the dorsal articular facet that lies on the dorsal surface of the calcaneal tuber is concave in *Bassariscus* and convex in *Mustela vison* and the anterior portion of the facet is not abruptly turned ventrally as in *Bassariscus astutus.* The calcanei of these two animals can be further distinguished by the relatively longer pre-proximal articular facet length in *B. astutus.* This is approximately one of the half total length of the calcaneum in *B. astutus* and one third the total calcaneum length in *M. vison.* In all these characters the specimen from Cueva Quebrada resembles *B. astutus.*

Discussion.—*Bassariscus astutus* is widely distributed in Texas today and is present in the vicinity of Cueva Quebrada. Dalquest et al. (1969) have noted the general absence of *B. astutus* from Pleistocene faunas of central Texas. The one exception is a record from the Pleistocene Red Fill unit of Longhorn Cavern, Burnet County, Texas (Semken, 1961). These authors have suggested that *B. astutus* has moved eastward into central Texas in post-Pleistocene time. It is known from a number of Pleistocene faunas in the southwest such as Rancho La Brea, California (Akersten et al., 1979), Smith Creek Cave, Nevada (Miller, 1979), Rampart Cave, Arizona (Meade, 1981), Upper Sloth Cave in the Guadelupe Mountains of West Texas (Logan and Black, 1979); Burnet Cave and Dry Cave in eastern New Mexico (Harris, 1977). Except for the Longhorn Cavern record, the Cueva Quebrada occurrence is the easternmost Pleistocene record for this species.

According to Schmidly (1977) the most important factor influencing the distribution of *B. astutus* is the presence of rocky areas such as cliffs and canyons. These situations were surely present on the Edwards Plateau during the Pleistocene as they are today and yet *Bassariscus* was apparently absent.

Family Ursidae

Arctodus simus (Cope)

Material.—Skull (TMM 41238-72); ten thoracic and lumbar vertebrae (TMM 41238-249); right femur (TMM 41238-347).

Description.—The *Arctodus* material from Cueva Quebrada is being described and compared with other *Arctodus* material by Kurtén, Lundelius, and Johnson and the reader is referred to that paper for more detailed information. The skull is fairly complete but has been burned and is distorted (Fig. 6). The teeth have been essentially destroyed by the burning and no characters can be discerned on them. Some idea of tooth size can be obtained from the alveoli in the skull. The skull is proportionately broader across the canines and orbits than in *Ursus* as noted by Kurtén (1967). This skull is morphologically similar to other known skulls but is somewhat small. In most dimensions it is within the range reported by Kurtén (1967) but others are below the observed range (Table 2). Some of the dimensions probably have been affected by the distortion caused by the burning but there seems to be no doubt that the skull is at the small end of the size range of this species. Kurtén (1967) presents evidence for considerable sexual dimorphism in *Arctodus simus* with the females being noticeably smaller than the males. On this basis the small size of the Cueva Quebrada specimen probably indicates that it is a female.

The femur is long and slender with a wide distal end. Although it is longer than the femur of *Ursus americanus* it is not relatively more massive as might be expected. Kurtén (1967) has noted this characteristic of the femur of *Arctodus.* The femur is slightly small in comparison to other North American *Arctodus simus* material. An examination of Table 3 shows that the Cueva Quebrada femur is slightly shorter than other femora reported by Kurtén (1967).

Discussion.—Remains of this large extinct bear have been found over a large part of North America (Kurtén and Anderson, 1980) but are not common. Kurtén (1967) has suggested that this large bear was predominantly carnivorous on the basis of its skull shape, primarily its short, broad rostrum which is similar to that of the large cats. If this interpretation of the mode of life is correct, *Arctodus* could have been an important agent in bringing other animals into the cave (see the section on taphonomy).

Order Rodentia
Family Sciuridae

Ammospermophilus interpres (Merriam)

Material.—Left upper molar (M^1 or M^2) (TMM 41238-730); right M^3 (TMM 41238-731).

Description.—The upper molar is broadly triangular. The anteroloph does not join the protocone by turning abruptly posteriorly as in *Spermophilus spilosoma, S. tridecemlineatus,* and *S. mexicanus.* The metaconule shows no tendency to fuse with the metacone and the metaloph does not join the pro-

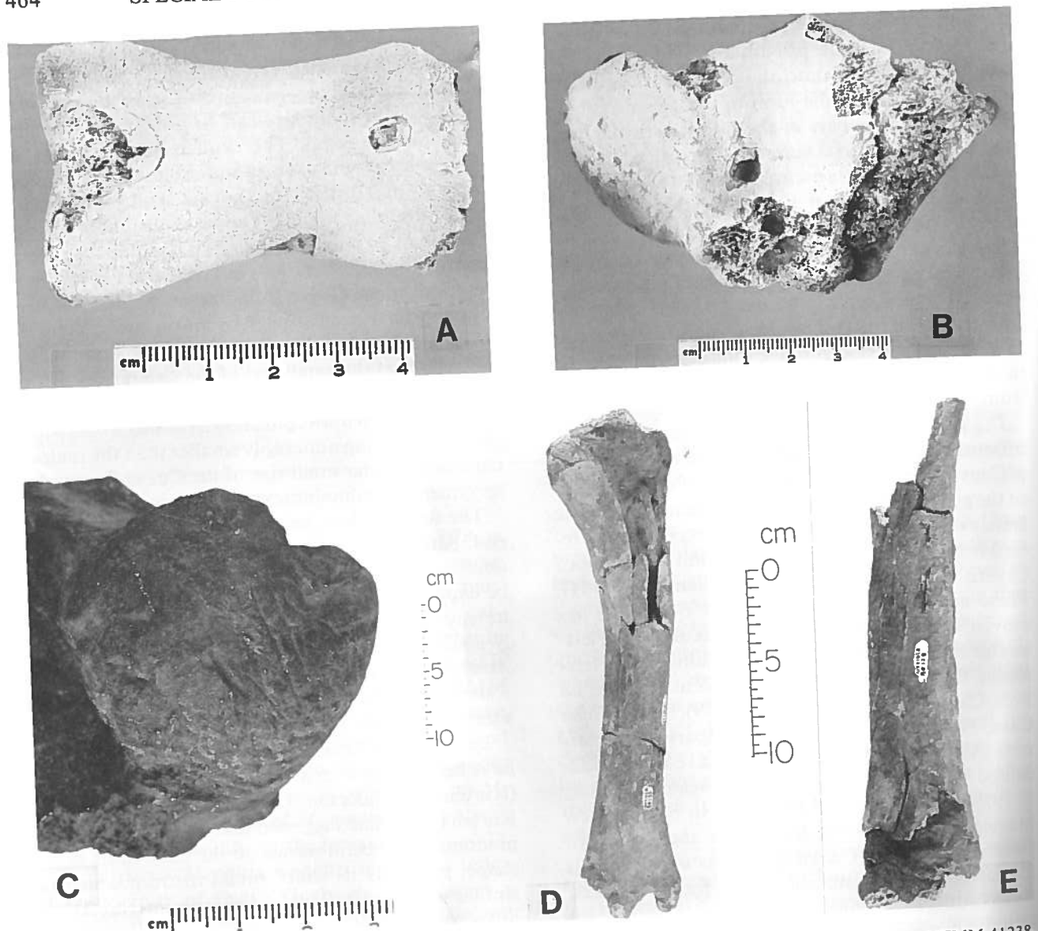

Fig. 5.—Bones showing carnivore and possible human damage. A) Anterior surface of first phalanx of *Equus francisci* (TMM 41238-322) showing perforations caused by carnivores; B) proximal end of left femur of *E. scotti* (TMM 41238-290) showing a perforation caused by a carnivore tooth; C) ball of left femur of *E. scotti* (TMM 41238-290) showing possible cut marks from a tool and grooves from carnivore gnawing; D) right tibia of *Equus scotti* (TMM 41238-152) with cnemial crest missing; E) right tibia of *Equus scotti* (TMM 41238-412) showing damage to distal end.

tocone. The mesostyle was apparently small and has been largely removed by wear.

The tooth is larger than the molars of *Eutamias cinereicollis, E. quadrivittatus,* and *Tamias striatus,* and smaller than the molars of the three species of *Spermophilus* mentioned above. It is the same size as the M^1 and M^2 of three specimens of *Ammospermophilus interpres* from Brewster County, Texas (Table 4). The M^3 is rounded in occlusal view, wear has removed many of the features of the crown. The anteroloph is close to the metaloph. The upper M^1 or M^2 is more similar to the upper molars of this species than to any other sciurid and is tentatively assigned to it. The M^3 is the same size as those of

Table 2.—*Skull measurements of* Arctodus simus *from Cueva Quebrada and other North American specimens*

Measurements	TMM 41238-72	Observed range of North American *Arctodus simus*[1]
Basal length	343	330–440
Condylobasal	366	352–463
Extreme length	371	373–521
Palatal length	207	185–260
Zygomatic width	246	222–364
Rostral width at canines	101 est.	100–136
Width over M^2	118	110–150
Interorbital width	112	117–153
Width over postorbital processes	161	147–205
Width over postorbital constriction	107 est.	98–107
Postorbital height	113	128–187
Width of nasal opening	69	76–107

[1] From Kurtén, 1967, Table 5.

Table 4.—*Measurements of upper molars of fossil and Recent specimens of* Ammospermophilus interpres.

Specimens	Tooth	Length (mm)	Width (mm)
Cueva Quebrada			
TMM 41238-730	M^1 or M^2	1.74	2.03
TMM 41238-731	M^3	1.85	1.87
Recent			
TNHC 4002	M^1	1.63	1.74
	M^2	1.63	2.03
	M^3	1.72	1.90
TNHC 4005	M^1	1.74	2.00
	M^2	1.79	2.05
	M^3	1.87	1.96
TNHC 4003	M^1	1.70	2.03
	M^2	1.74	2.07
	M^3	1.85	1.98

A. interpres, but the extensive wear makes a detailed comparison impossible. Its assignment to *A. interpres* is uncertain.

Discussion.—*Ammospermophilus interpres* is currently found in the area of Cueva Quebrada in Val Verde County, where it is an inhabitant of canyons with bare rocks and cliffs (Schmidly, 1977).

Family Geomyidae

Thomomys bottae (Eydoux and Gervais)

Material.—Right mandibular ramus with incisor, M_2 and alveoli for P_4, M_1, and M_3 (TMM 41238-439); left P_4 (TMM 41238-722); left P^4 (TMM 41238-732).

Description.—The anterior lobe of the P_4 is longer than wide and has dentine tracts on both sides. The posterior lobe of the P_4 is oval with dentine tracts on both sides. The M_2 is strongly narrowed lingually to produce a tear drop shape. The dentine tract on the labial side is much wider than the one on the lingual side and is the site of a shallow groove on this side of the tooth. The P^4 is bilobed with the anterior lobe more flattened than in a specimen of *T. bottae* from Dona Ana County, New Mexico, and the posterior lobe is less constricted labially.

Discussion.—This species occurs today in Val Verde County where it lives under a wide variety of environmental conditions (Davis, 1960; Schmidly, 1977).

Table 3.—*Measurements of femora of* Arctodus simus *from Cueva Quebrada and other North American specimens.*

Measurements	TMM 41238-248	Observed range of North American *Arctodus simus*[1]
Greatest length	508	513–678
Greatest proximal width	123	122–165
Caput diameter	63	61–77
Least transverse width of shaft	42	41–62
Greatest distal width over epicondyles	104	108–137

[1] From Kurtén, 1967, Table 18.

Pappageomys castanops (Baird)

Material.—Right mandibular ramus with incisor and P_4 (TMM 41238-353); right mandibular ramus with incisor (TMM 41238-405); left mandibular ramus with alveoli for incisor, P_4, M_{1-3}, probably a juvenile (TMM 41238-566); upper incisor (TMM 41238-616); right edentulous mandibular ramus with alveoli for incisor and P_4, M_{1-3} (TMM 41238-553); right mandibular ramus with incisor, alveoli for P_4, M_1 (TMM 41238-552); four upper incisors (TMM 41238-407).

Description.—The P_4 has dentine tracts on the antero-external and the antero-internal faces of the anterior lobe and on both the internal and external edges of the posterior lobe. The upper incisors are unisulcate.

Discussion.—*Pappageomys castanops* occurs throughout Trans-Pecos Texas (Schmidly, 1977) and is recorded in the vicinity of Langtry (Hall and Kelson, 1959). This species is reported by Schmidly (1977) to occupy areas of sandy loam with a minimum depth of 6 to 8 inches.

Table 5.—*Measurements of premolars of fossil and Recent specimens of* Perognathus.

Specimens	P^4 Length (mm)	P^4 Posterior width (mm)	P_4 Length (mm)	P_4 Anterior width (mm)	P_4 Posterior width (mm)
Cueva Quebrada					
TMM 41238-675	.73	.85	.91	.73	.88
TMM 41238-738	—	—	.60	.54	.65
Perognathus flavus					
TMM M-2666	.685	.93	—	—	—
TMM M-887	.65	.91	—	—	—
TMM M-6059	.65	.85	—	—	—
TMM M-6060	.57	.85	—	—	—
TMM M-6061	.65	.86	—	—	—
TMM M-6062	.685	1.02	—	—	—
TMM M-6063	.73	.89	—	—	—
TMM M-2666	.72	.91	—	—	—
TMM M-6064	—	—	.52	.51	.57
TMM M-6065	—	—	.51	.49	.60
TMM M-6066	—	—	.54	.47	.59
TNHC 6114	.55	.85	.59	.54	.64
TNHC 6115 worn	.73	.86	.55	.46	.60
TNHC 407	.72	.96	.60	.52	.60
Perognathus penicillatus					
TNHC 4039	.85	1.02	.76	.55	.73
TNHC 4040	.75	1.09	.73	.57	.75
TMM M-1994	.98	1.06	.76	.62	.86
TMM M-1993	.91	1.14	.73	.65	.81
Perognathus intermedius					
TNHC 2558	.83	1.14	.67	.65	.80
TMM M-3730	.82	1.06	.80	.57	.78
Perognathus nelsoni					
TNHC 3256 worn	1.02	1.06	.76	.62	.73
TNHC 3257	.89	1.03	.68	.60	.73
TNHC 3261	.89	1.14	.70	.68	.78

Family Heteromyidae

Perognathus sp.

Material.—Left maxilla with P^4 (TMM 41238-675); right mandible fragment with P_4 (TMM 41238-738); left mandible fragment with P_4 (TMM 41238-737); two molars (TMM 41238-711, 728).

Description.—The P^4 consists of three major cusps, one anterior and two posterior that form a transverse loph with wear. In size and morphology the P^4 is similar to that tooth in *P. flavus* (Table 5). It differs from the P^4 of *P. penicillata, P. intermedius* and *P. nelsoni* in being smaller (Table 5).

The two P_4's are somewhat different in size but both have four cusps. One, TMM 41238-737, is comparable in size to the P_4 of *P. penicillatus, P. nelsoni* and *P. intermedius.* One other, TMM 41238-738, is comparable in size to the P_4 of *P. flavus* (Table 5). The material is inadequate to allow a positive specific assignment. The different size of the P_4's suggests that two species might be represented.

Discussion.—Six species of *Perognathus* are found today in Trans-Pecos Texas. Two of them, *P. flavus* and *P. nelsoni,* are known to occur in Val Verde County and two more, *P. hispidus* and *P. penicillatus* might have occurred there in the past in view of their present distributions. The three that fall into the size category of the Cueva Quebrada specimens, *P. flavus, P. nelsoni,* and *P. penicillatus* occupy a variety of environments in this region (Schmidly, 1977).

Table 6.—*Measurements of teeth of* Onychomys leucogaster *from Cueva Quebrada.*

Specimens	Tooth	Length	Anterior width	Posterior width
TMM 41238-741	M_1	1.81	.95	1.18
TMM 41238-744	M_2	1.55	1.16	1.18
TMM 41238-783	M_2	1.65	1.32	1.17
TMM 41238-757	M^1	2.04	1.25	1.29
TMM 41238-758	M^1	1.85	1.05	1.25

Family Cricetidae

Baiomys taylori (Thomas)

Material.—Right M_1 (TMM 41238-776).

Description.—The M_1 is similar to a series of M_1's of recent *B. taylori* from San Patricio County, Texas, in size and morphology. This is one of the smallest of the North American cricetid rodents. The size (length 1.36 mm, maximum width .82 mm) is slightly larger than 4 specimens from San Patricio County, Texas (length 1.19 to 1.24 mm, maximum width .76 to .81 mm). The tooth is simple with no accessory cuspules and the major cusps are relatively high and inclined forward.

Discussion.—This species is not found in the Val Verde County area today. Its primary distribution in Texas is the Gulf Coastal Plain and south Texas. The two records closest to Val Verde County are Boerne, Kendall County, Texas, and six miles southwest of Geronimo, Coahuila, Mexico (Hall and Kelson, 1959:660). The area of Texas where it occurs today has a more humid climate than does Val Verde County. Its presence in the Pleistocene deposits of Cueva Quebrada implies more effective moisture for that area in the past.

Onychomys cf. ***leucogaster***

Material.—Left M^1 (TMM 41238-757); right M^1 (TMM 41238-758); right M_2 (TMM 41238-744); left M_1 (TMM 41238-771).

Description.—The teeth all have the simple pattern with high cusps and open valleys that are characteristic of this genus. The assignment of the *Onychomys* material from Cueva Quebrada to *O.* cf. *leucogaster* is based on size. The dimensions of the teeth from Cueva Quebrada are closer in value to those given by Carleton and Eshelman (1979) for *O. leucogaster* than for *O. torridus* (Table 6).

Discussion.—*O. leucogaster* is recorded from northeastern Terrell County and from the Edwards Plateau to the east (Hall and Kelson, 1959; Schmidly, 1977).

Peromyscus sp.

Material.—Nine left M^1's (TMM 41238-718, 740, 742, 743, 759, 772 through 775); one right M^1 (TMM 41238-777); one right M_1 (TMM 41238-760); two right M_2's (TMM 41238-778, 779).

Discussion.—The specific identification of individual *Peromyscus* teeth is difficult and unreliable. The Cueva Quebrada sample shows some variation in the size and complexity of the M^1's which may indicate the presence of more than one species.

Neotoma sp.

Material.—Left mandible fragment with incisor (TMM 41238-554); right edentulous mandible (TMM 41238-533); two left M^1's (TMM 41238-724, 746); right M^1 (TMM 41238-750); two left M^2's (TMM 41238-725, 745); left M^3 (TMM41238-739); right M^3 (TMM 41238-751); five left M_1's (TMM 41238-726, 747, 753, 727, 748); left M_2 (TMM 41238-723).

Description.—Three species of *Neotoma* occur today in Trans-Pecos Texas, *N. albigula, N. micropus,* and *N. mexicanus* (Schmidly, 1977). In addition *N. floridana* occurs in eastern Texas up to the edge of the Edwards Plateau with an isolated record near Rock Springs in Edwards County (Goldman, 1910) and *N. cinerea* occurs in the mountains of northern New Mexico (Hall and Kelson, 1959). *N. cinerea* has been reported in a mid-Holocene fauna from the southern Guadelupe Mountains of Hudspeth County, Texas (Lundelius, 1979). Both of these latter species might be expected to have occurred farther south during the Pleistocene when the climate was cooler and/or wetter than present.

Neotoma cinerea and *N. mexicana* can be readily distinguished from the other three species on the basis of the presence of a dentine tract on the antero-external side of the M_1. The differentiation of the other three species on the basis of individual teeth and mandibles is difficult. Dalquest et al. (1969) found no qualitative dental characters that separate *N. floridana* from *N. micropus* and the teeth do not differ in size. Dalquest et al. (1969) reported that *N. albigula* and *N. micropus* can be separated on the basis of the width of the second loph of the M_1. They report that in all Texas specimens of *N. albigula* they measured, the width of the second loph of the M_1 was less than 1.94 mm and in *N. micropus* this measure was greater than 1.94 mm. The samples they studied showed no overlap. M. Winans (pers. comm.) has found that in samples of 72 *N. micropus* and 68 *N. albigula* from Texas this measurement showed extensive overlap and indicates that this character is not reliable when large samples from varied geographic areas are compared. This is also true when specimens of both species from Trans-Pecos Texas are compared.

Table 7.—*Measurements of teeth of* Neotoma *sp. from Cueva Quebrada.*

Teeth and specimens	Length at base	Width at base	Width of second loph
M^1			
TMM 41238-724	3.28	2.33	—
TMM 41238-746	3.42	2.38	—
M^2			
TMM 41238-745	2.64	2.05	—
TMM 41238-725	2.68	2.23	—
TMM 41238-735	2.54	2.34	—
M^3			
TMM 41238-739	1.84	1.83	—
TMM 41238-751	1.95	1.70	—
M_1			
TMM 41238-748	3.06	1.78	1.78
TMM 41238-753	3.01	1.92	1.92
TMM 41238-747	3.50	1.91	1.91
TMM 41238-726	3.28	1.89	1.89
M_2			
TMM 41238-723	2.70	1.97	—

Four M_1's are available from Cueva Quebrada. None have the dentine tract on the antero-labial side which rules out their assignment to either *N. cinerea* or *N. mexicana.* The dimensions and qualitative characters of the *Neotoma* teeth from Cueva Quebrada do not allow a specific identification (Table 7).

Discussion.—*N. micropus* is known today as a living animal in western Val Verde County; *N. albigula* is recorded 7.5 mi (11.5 km) to the west of Val Verde County (Schmidly, 1977) and the nearest known

occurrence of *N. floridana* is 80 mi (123 km) to the east. *N. floridana* might be expected to have extended its range farther west during the Pleistocene but more material will be needed to demonstrate its presence.

Order Lagomorpha

Sylvilagus sp.

Material.—Two upper molars (TMM 41238-754, 755); two right P_3's (TMM 41238-756, 789); left P^2 (TMM 41238-790); fragment of left maxillary (TMM 41238-618); fragment of left mandible (TMM 41238-572); proximal ends of two left humeri (TMM 41238-559, 398); ventral ends of two right scapulae (TMM 41238-585, 562); two partial pelves (TMM 41238-473, 403); distal ends of two right femora (TMM 41238-622, 648); proximal ends of two right tibias (TMM 41238-455, 623); distal end of one right tibia (TMM 41238-626); three right calcanei (TMM 41238-240, 480, 627).

Description.—The material assigned to *Sylvilagus* is unmistakable in both size and morphology as to its generic assignment but is totally inadequate to permit specific identification.

Discussion.—Two species of *Sylvilagus, S. floridanus* and *S. audubonii* occur today in Val Verde County.

Lepus cf. ***californicus*** (Gray)

Material.—Left mandibular ramus with P_2, P_3 alveolus for M_1 (TMM 41238-499); partial right edentulous right maxilla (TMM 41238-590); partial right ilium (TMM 41238-386).

Description.—The material assigned to *Lepus californicus* is within the size range of modern specimens of that species. The measurements of the dentition are P_3 L. 3.76 mm, W. 3.30 mm; P_4 L. 3.00 mm, W. 3.49 mm. The morphology of the P_3 is also like that of living specimens of *L. californicus. Lepus townsendi* has been reported from Pleistocene faunas from Schultze Cave in Edwards County, Texas, 80 km (50 mi) to the east of Cueva Quebrada (Dalquest et al., 1969), Dry Cave Eddy County, New Mexico, 419 km (262 mi) to the north of Cueva Quebrada (Harris, 1970) and Burnet Cave in the Guadelupe Mountains, 395 km (247 mi) north of Cueva Quebrada. A comparison of the Cueva Quebrada specimen with two specimens of *L. townsendi* from Minnesota (TMM M-3347) shows that the latter species has fewer crenulations of the enamel in the re-entrant angles of the P_3. Recent specimens of *L. californicus* from Texas have more crenulated enamel in the re-entrants of the P_3. The Cueva Quebrada material is assigned to *L. californicus* on this basis.

Discussion.—*L. californicus* is found in the area of Cueva Quebrada today. Pleistocene records of *L. townsendi* mentioned above are well to the south of its southernmost occurrence today and raise the question as to the extent of its southward extension at that time. Dry Cave is located at an altitude of 1,300 m (4,200 ft) which is 900 m higher than Cueva Quebrada as well as being farther north. However Schultze Cave is only 300 m higher than Cueva Quebrada and is no farther north. If the specimen from Schultz Cave is *L. townsendi* there is a real possibility that it also reached Val Verde County during late Pleistocene time. Additional material from more localities will be necessary to settle this question.

Order Perissodactyla

Family Equidae

The taxonomy of the Pleistocene horses is currently confused. Although it is usually possible to assign horse material from one locality to one or more groups it is difficult to decide on the name or names that should be applied. This is the case with the horses from Cueva Quebrada. There are clearly two horses represented, a large form and a small one, and most of the material can be assigned to one or the other on the basis of size.

Equus cf. ***scotti*** Gidley

Material.—Three right M^2's (TMM 41238-64, 68, 103); fragments of upper molars (TMM 41238-433); left upper premolar (TMM 41238-99); right upper premolar (TMM 41238-105); two right upper molars (TMM 41238-62, 60); two upper molars (TMM 41238-61, 191); right horizontal ramus with P_3–M_3 (TMM 41238-2); right P_2 (TMM 41238-74); left M_3 (TMM 41238-102); three left lower premolars (TMM 41238-65, 83, 66); two right lower premolars (TMM 41238-104, 278); four right lower molars (TMM 41238-70, 67, 255, 253); two left lower molars (TMM 41238-197, 258); one unworn lower cheek tooth (TMM 41238-196); distal ends of two right humeri (TMM 41238-225, 194); right radius (TMM 41238-195); distal end of right femur (TMM 41238-37); proximal end of left femur (TMM 41238-290); right tibia (TMM 41238-152); left tibia (TMM 41238-159); distal ends of two left tibias (TMM 41238-47, 23); distal end of one right tibia (TMM 41238-153); right metacarpal (TMM 41238-48); left metacarpal (TMM 41238-41); two right metatarsals (TMM 41238-88, 42); three right calcanei (TMM 41238-139, 96, 138); two right astragali (TMM 41238-79, 158); one left astragalus (TMM 41238-205); left articulated pes with all tarsals and proximal end of metatarsal (TMM 41238-142 through 151); fifteen first phalanges (TMM 41238-322, 90, 303, 305, 109, 14, 160, 304, 202, 301, 45, 193, 17, 302, 169); six second phalanges (TMM 41238-15, 174, 44, 166, 175, 192); three third phalanges (TMM 41238-316, 461, 256).

Description.—The material assigned to this taxon is from a heavily built horse about the size of a riding horse. The upper premolars and molars are large, very close to the dimensions given by Dalquest (1964) for specimens assigned by him to *E. scotti* from three localities in north Texas including the type locality in Briscoe County, Texas. The enamel pattern is comparable in complexity (Fig. 7). The three specimens figured by Dalquest show some variation in the fossettes and the development of the pli caballin. The latter tends to be better developed on the premolars in the three specimens illustrated by Dalquest (1964) and the same is true of the Cueva Quebrada material.

The lower premolars and molars are also large and high crowned when unworn (Table 8). All the P_3–M_3's have open U-shaped linguaflexids with flattened metastylids (Fig. 7). In the one specimen in which the position of each tooth can be established (TMM 41238-2), the ectoflexids of P_3 and P_4 are blunt and do not enter the metaconid-metastylid isthmus. The ectoflexids of M_1 and M_2 are narrower than those of P_3 and P_4 and extend into the metaconid-metastylid isthmus. The ectoflexid of M_3 extends to the level of, but not into, the isthmus.

Table 8.—*Measurements of teeth of* Equus scotti *from Cueva Quebrada.*

Specimens and teeth	Measurements		
	Upper teeth		
	Length along ectoloph	Width normal to para-mesostyle	Width normal to meso-metastyle
TMM 41238-62 Pm	32.0	28.2 est.	30.6
TMM 41238-105 Pm	30.7	29.9	29.0
TMM 41238-99 Pm	32.1	28.3	31.1
TMM 41238-60 M	27.1	28.3	27.2
TMM 41238-61 M	30.9	25.3	26.2 est.
TMM 41238-191 M	31.4	27.6	28.8
	Lower teeth		
	Length	Anterior width	Posterior width
TMM 41238-64 P_2	44.4	—	—
TMM 41238-68 P_2	37.9	14.3	16.4
TMM 41238-74 P_2	34.1	13.3	15.8
TMM 41238-102 M_3	31.8	13.7	13.2
TMM 41238-65 Pm or M	31.0	17.2	18.5
TMM 41238-66 Pm or M	31.4	19.0	—
TMM 41238-253 Pm or M	33.7	15.4	14.0 est.
TMM 41238-197 Pm or M	27.7	15.5	14.9
TMM 41238-70 Pm or M	31.5	17.1	15.2
TMM 41238-83 Pm or M	28.2	—	18.6
TMM 41238-255 Pm or M	28.9	14.7	15.0
TMM 41238-104 Pm or M	31.7	17.6	18.0
TMM 41238-278 Pm or M	—	16.5	—
TMM 41238-67 Pm or M	33.7	15.1	14.0
TMM 41238-2 P_3	30.3	15.5	17.7
TMM 41238-2 P_4	27.0	18.3 est.	18.0
TMM 41238-2 M_1	27.1	16.7	—
TMM 41238-2 M_2	26.8	15.6 est.	15.0
TMM 41238-2 M_3	—	—	14.0

The postcranial material that can be assigned to this taxon with some confidence consists of limb and foot bones. Scatter diagrams show the metapodials match those from the type locality of *E. scotti* in Briscoe County, Texas, in both length and width (Figs. 8, 9). The horse phalanges from Cueva Quebrada fall into two size groups. The larger size group agrees with phalanges of *E. scotti* and are assigned to that taxon (Tables 9–12).

Discussion.—There is little agreement on the taxonomy of the large late Pleistocene horses. In the southern Great Plains region these horses have been assigned to a number of species. Stock and Bode (1937) assigned large horse teeth from Blackwater Draw, New Mexico, to *E. excelsus.* Quinn (1957) recognized *E. caballus caballus* from two localities (Blackwater Draw, New Mexico and Lubbock, Texas), *E. caballus* from Blackwater Draw and *E. midlandensis* from three localities (Blackwater Draw, J. O. Baggett Ranch in Ector County, Texas, and Scharbaur Ranch in Midland County, Texas). Lundelius (1972) assigned the large horse material from the gray sand unit at Blackwater Draw to *E. scotti* on the basis of morphological similarity. Harris and Porter (1980) assigned much of the larger horse material from the Dry Cave, New Mexico fauna and the Blackwater Draw material to *E. niobrarensis* and differentiated it from *E. scotti* on the basis of its smaller size.

However, a scatter diagram of length versus transverse width of the distal articular surface of metatarsals of large horses from various late Pleistocene localities shows a clustering of specimens from Blackwater Draw, Knox County, Texas, and Cueva Quebrada (Fig. 9). This cluster includes the type of *E. scotti* and other specimens from the type locality in Briscoe County, Texas. Part of the Dry Cave sample of metatarsals assigned to *E. niobrarensis* by Harris and Porter (1980) plot with the specimens from Rock Creek, Blackwater Draw, Scharbaur Ranch, and Cueva Quebrada and are considered to be the same taxon. One Dry Cave specimen (UTEP 31-64) assigned to *E. scotti* by Harris and Porter (1980) on the basis of its size, is somewhat longer (304 mm). Although it plots outside the cluster of the other large horses, it would not extend the range beyond expectation if the total ranges of the other

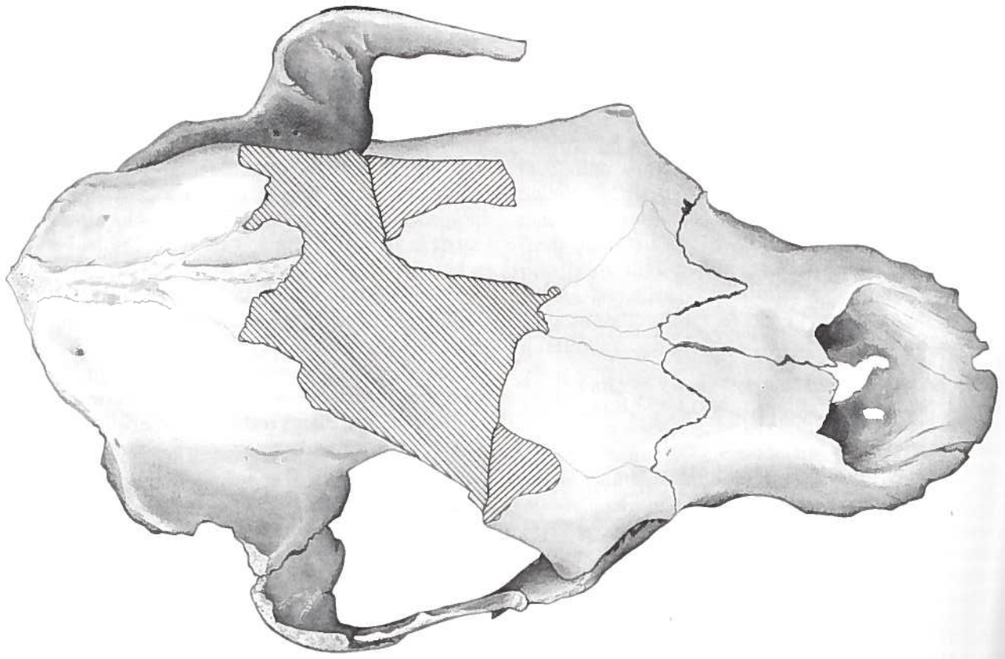

Fig. 6.—Dorsal view of skull of *Arctodus simus* (TMM 41238-72) from Cueva Quebrada. ×.5.

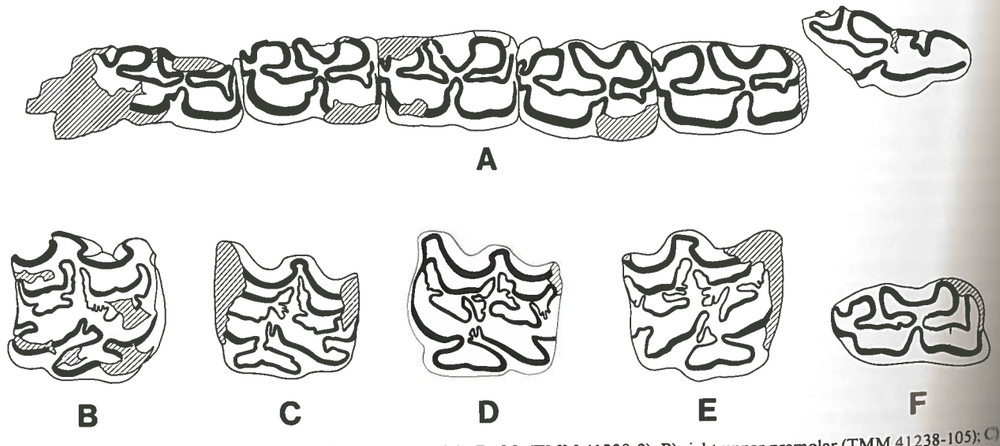

Fig. 7.—Teeth of *Equus scotti* from Cueva Quebrada. A) Right P_2–M_3 (TMM 41238-2); B) right upper premolar (TMM 41238-105); C) left upper molar (TMM 41238-61); D) left upper molar (TMM 41238-191); E) right upper molar (TMM 41238-62); F) right lower molar (TMM 41238-67). ×.75.

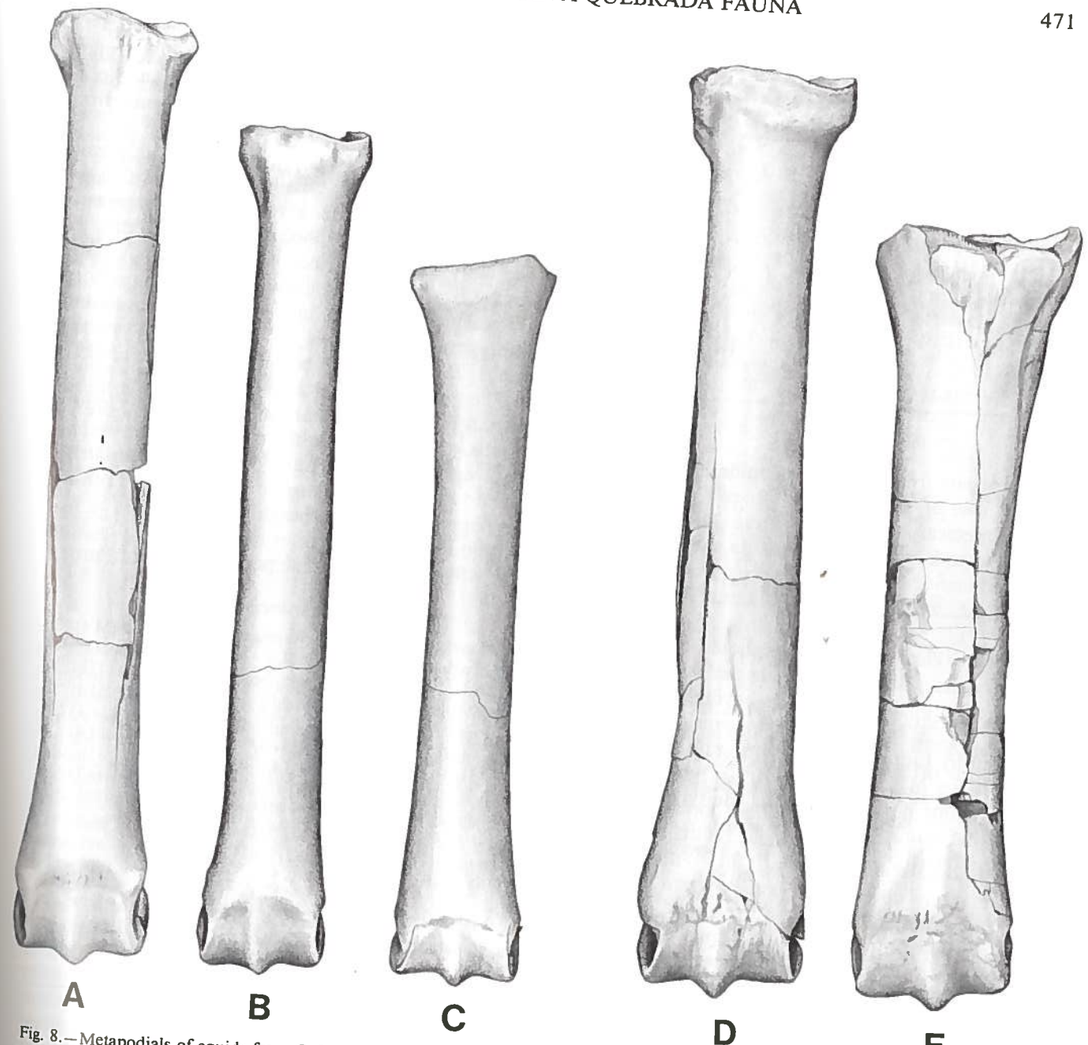

Fig. 8.—Metapodials of equids from Cueva Quebrada. A) Right third metatarsal of *Equus francisci* (TMM 41238-46); B) right third metatarsal of *Equus francisci* (TMM 41238-227); C) left third metacarpal of *Equus francisci* (TMM 41238-629); D) right third metatarsal of *Equus scotti* (TMM 41238-42); E) right third metacarpal of *Equus scotti* (TMM 41238-48). ×.55.

samples shown in Fig. 8 are considered. The plot of the distal width versus trochlear diameter shows more heterogeneity (Fig. 10). The Cueva Quebrada specimens are closely associated with *E. scotti*.

An examination of the scatter diagram of the length versus distal width and distal width versus trochlear diameter of the metacarpals leads to the same conclusion, although there seems to be more variation in the distal width (Figs. 11, 12) and less clear cut differentiation of the Dry Cave sample. The large

Table 9.—*Measurements of major limb bones of* Equus scotti *from Cueva Quebrada.*

Bones and specimens	Length	Proximal width	Distal width
Femur			
TMM 41238-37	—	—	102
Tibia			
TMM 41238-47	—	—	80
TMM 41238-23	—	—	83 (min.)
Humerus			
TMM 41238-255	—	—	86
TMM 41238-194	—	—	85
Radius			
TMM 41238-195	353	88	84

metacarpals from Cueva Quebrada are associated with those of *E. scotti* from Rock Creek and the larger metacarpals from Dry Cave. The teeth of the large horse from Cueva Quebrada show no significant differences in either enamel pattern or size from those of *E. scotti* from Briscoe County, Texas (Table 8, Fig. 7).

It is not clear which names should be applied to the large late Pleistocene horses and a thorough investigation of this problem is beyond the scope of this study. *E. caballus* is inappropriate as it was applied by Linnaeus (1758) to the domestic horse. The status of the other species is uncertain. The oldest name is *E. excelsus* but the type consists of a maxilla with P^4–M^3. The type of *E. scotti* is a skull, jaws, and part of a skeleton. Topotype material consisting of several individuals is available. The type of *E. midlandensis* consists of left and right mandibular rami, P^1, P^3–M^1, a metatarsal III, and phalanges of fore and hind foot believed to come from one individual.

All the material assigned to the various species listed above, with the possible exception of *E. excelsus,* appear to form a relatively homogeneous group in size and morphology in so far as they are presently known. The best known type material is that of *E. scotti* and the Cueva Quebrada large horse is assigned to that taxon. If future work demonstrates that *E. excelsus* and *E. scotti* are synonymous, *E. excelsus* will become the proper name.

The type material of *E. scotti* is from the Irvingtonian Rock Creek local fauna in Briscoe County, Texas, which is about .75 million years old. It is realized that the application of this name to material of late Rancholabrean age implies the continuity of one species over this period of time. This is well within the range of species longevity given by Kurtén (1968) for Pleistocene perissodactyls of Europe.

Equus francisci Hay

Material.—Left maxillary fragment with P^4–M^3 (TMM 41238-157); right upper premolar (TMM 41238-639); right upper molar (TMM 41238-100); left upper cheek tooth (TMM 41238-220); right M^3 (TMM 41238-485); right lower cheek tooth (TMM 41238-75); right ilium (TMM 41238-232); right humerus (TMM 41238-234); right pelvis (TMM 41238-231); two left radii (TMM 41238-226, 131); distal part of right radius (TMM 41238-285); distal end of left radius (TMM 41238-313); two right femora (TMM 41238-39, 229); distal half of left femur (TMM 41238-38); distal ends of two right tibias (TMM 41238-19, 342); distal ends of two left tibias (TMM 41238-207, 208); two right metatarsals (TMM 41238-46, 227); one left metatarsal (TMM 41238-1); two left metacarpals (TMM 41238-154, 629); distal ends of two metatarsals (TMM 41238-228, 660); proximal end of right metatarsal (TMM 41238-87); distal ends of two metacarpals (TMM 41238-40, 49); one left and two right calcanei (TMM 41238-118, 457, 165); two right astragali (TMM 41238-52, 312); seven first phalanges (TMM 41238-16, 4, 6, 161, 630, 692, 3); distal end of first phalanx (TMM 41238-425); six second phalanges (TMM 41238-299, 176, 424, 168, 438, 213); one third phalanx (TMM 41238–315).

Table 10.—*Measurements of metacarpals of* Equus scotti *from Cueva Quebrada.*

Measurements	TMM 41238-48	TMM 41238-41	TMM 41238-13	TMM 41238-78
Length	237	237	231	—
Transverse width of proximal end	58.9	56.2	47.7	—
Antero-posterior width of proximal end	—	36.8	35.6 (min.)	33.6 (min.)
Transverse diameter of posterior articular facet for the magnum	32.5	33.6	37.0	31.1
Transverse width of facet for magnum	43.9	41.9	46.2	40.7
Transverse width of shaft at midpoint	38.6	38.5	36.7	36.1
Antero-posterior diameter of shaft at midpoint	28.8	29.0	27.4	27.7
Transverse width of distal end above the articular facet	48.8	51.2	49.2	—
Transverse width of distal articular surface	48.5	51.8	52.4 est.	—
Antero-posterior diameter of inner distal articular facet	31.8	35.7	33.1	—
Antero-posterior diameter of central ridge of distal articular surface	39.9	41.5	38.3	—

Table 11.—*Measurements of metatarsals of* Equus scotti *from Cueva Quebrada.*

Measurements	TMM 41238-88	TMM 41238-42
Length	291	289
Transverse width of proximal end	59.5	53.0
Antero-posterior width of proximal end	52.7	51.2
Transverse diameter of posterior articular facet	29.3	28.3
Transverse width of facet for ectocuneiform	51.5	48.9
Transverse width of shaft at midpoint	40.2	37.1
Antero-posterior diameter of shaft at midpoint	35.5	33.4
Transverse width of distal end above the articular surface	—	51.0
Transverse width of distal articular surface	—	50.7
Antero-posterior diameter of inner distal articular facet	39.4 est.	32.0
Antero-posterior diameter of central ridge of distal articular surface	—	38.0

Table 12.—*Measurements of phalanges of* Equus scotti *from Cueva Quebrada.*

Phalanges and specimens	Length	Proximal width	Distal width	Mid width
First phalanx				
TMM 41238-90	—	—	46.4	30.5
TMM 41238-301	—	—	43.0	35.7
TMM 41238-322	—	—	44.7	30.1
TMM 41238-45	80.4	58.4	47.9	36.8
TMM 42138-14	81.7	54.3	47.8	35.8
TMM 42138-17	83.0	—	—	35.5
TMM 42138-160	81.1	51.5	45.8	35.6
TMM 42138-202	—	—	—	34.7
TMM 42138-193	74.9	58.5	45.3	33.3
TMM 41238-305	78.2	59.1	45.1	36.6
TMM 41238-302	78.8	58.4	—	36.9
TMM 41238-304	79.5	58.5	46.2	36.2
TMM 41238-169	—	56.9	—	—
Second phalanx				
TMM 41238-175	36.7	54.6	—	—
TMM 41238-44	38.7	55.3	51.1	49.0
TMM 41238-166	38.3	47.2	—	41.0
TMM 41238-15	38.6	55.1	50.6	47.6
TMM 41238-192	39.3	54.6	48.7	44.6
TMM 41238-174	40.3	57.5	51.0	47.3

Description.—The upper dentition is much less complex than that of *E. scotti* (Fig. 13). The fossettes of the available teeth have virtually no secondary plications. The pli caballin is small on both premolars and molars. The protocones of the upper teeth are short (except for TMM 41238-220) and most have grooves on their lingual faces. In size and qualitative characters the upper teeth from Cueva Quebrada are similar to the dentition of the type of *E. francisci* (TAMU 2518) reported by Lundelius and Stevens (1970).

Only one lower cheek tooth can be confidently assigned to this taxon (TMM 41238-75). It is smaller than most of the lower teeth assigned to *E. scotti.* Several teeth of the latter species are very close to the same length (TMM 41238-2, M_1 and M_2, TMM 41238-83, 255, 258) but are noticeably wider (Tables 8, 13). The Cueva Quebrada specimen is somewhat longer than any of the lower teeth of the type specimen of *E. francisci* but is close to the same width of that specimen (Lundelius and Stevens, 1970: table 1). Some of the length difference may be the result of the difference in the stage of wear of the two specimens. The Cueva Quebrada specimen is less deeply worn. Its antero-posterior length at the midpoint of its crown height is 23.7 mm which is close to the widths of the lowers of the type of *E. francisci.* The ectoflexid just reaches the metaconid-metastylid isthmus and a small pli caballinid is present. Both these characters differ from the type of *E. francisci* in which the ectoflexid does not reach the metaconid-metastylid isthmus and no pli caballinid is present. The metaconid-metastylid groove is open but is V-shaped as in the type of *E. francisci.*

The limb bones are smaller and more gracile than those of *E. scotti* and the metapodials are long and slender (Tables 14–16). A scatter diagram of the length versus distal width of the metatarsals shows that two of the three specimens from Cueva Quebrada are grouped with the type of *E. francisci* and specimens of *E. quinni* (Slaughter et al., 1962) and a large sample of *Equus* sp. from Channing, Texas (Fig. 9). One metatarsal (TMM 41238-227) is closer

Table 13.—*Measurements of teeth of* Equus francisci *from Cueva Quebrada.*

Specimens and teeth	Measurements		
	Upper teeth		
	Length along ectoloph	Width normal to para-mesostyle	Width normal to meso-metastyle
TMM 41238-157 P^4	23.1	24.9	25.2
TMM 41238-157 M^1	22.1	24.4	23.5
TMM 41238-157 M^2	22.5	23.3	24.9
TMM 41238-157 M^3	23.7	20.1	21.8
TMM 41238-639 Pm	24.3 (min.)	24.8	—
TMM 41238-100 M	21.7	23.2	24.3
TMM 41238-220 M	—	21.1	—
	Lower teeth		
	Length	Anterior width	Posterior width
TMM 41238-75 Pm or M	27.8	11.6	12.0

in length to metatarsals from the Slaton fauna assigned to *E. conversidens* by Dalquest (1967), the Cedazo fauna from Aguascalientes, Mexico assigned to *E. conversidens* by Mooser and Dalquest (1975), the more slender metatarsals from the Dry Cave fauna assigned to *E. conversidens* by Harris and Porter (1980) and a large sample from San Josecito Cave, Nuevo Leon, assigned to *E. conversidens* by Stock (1950, 1953). The Cueva Quebrada metatarsal is narrower distally than all of the others with

Table 14.—*Measurements of major limb bones of* Equus francisci *from Cueva Quebrada.*

Bones and specimens	Length	Proximal width	Distal width
Femur			
TMM 41238-39	310	—	80
TMM 41238-229	315	108	82
TMM 41238-38	—	—	83
Tibia			
TMM 41238-159	345	81 (min.)	62
TMM 41238-152	357	91 (min.)	—
TMM 41238-208	—	—	65
TMM 41238-207	—	—	59
TMM 41238-342	—	—	52
Humerus			
TMM 41238-234	232	80	66
Radius			
TMM 41238-226	315	—	65
TMM 41238-130	—	—	69
TMM 41238-180	—	—	67

Table 15.—*Measurements of metacarpals of* Equus francisci *from Cueva Quebrada.*

Measurements	TMM 41238-628	TMM 41238-154
Length	223	237
Transverse width of proximal end	44.4	—
Antero-posterior width of proximal end	29.3	—
Transverse diameter of posterior articular facet for the magnum	28.7	—
Transverse width of facet for magnum	33.3	—
Transverse width of shaft at midpoint	27.2	29.4
Antero-posterior diameter of shaft at midpoint	24.1	23.7
Transverse width of distal end above the articular facet	39.1	39.1
Transverse width of distal articular surface	39.7	—
Antero-posterior diameter of inner distal articular facet	27.7	27.2
Antero-posterior diameter of central ridge of distal articular surface	30.4	30.4

the exception of the Cedazo material which is shorter. The proportions of the distal end (trochlear diameter versus distal width) show much more homogeneity in the Cueva Quebrada metatarsals (Fig. 10) and plots with the San Josecito sample.

The two small metacarpals do not show the same amount of variation as the metatarsals. They are shorter than those from Channing, Texas, and more slender than those from San Josecito but they are similar to two from Dry Cave (Figs. 11, 12).

The phalanges assigned to this taxon are slender and show no evidence of heterogeneity (Table 17).

Discussion.—The taxonomy of the small Pleistocene horses is still uncertain. There is no agreement on the number of species or on the characters or the limits of variation that might characterize the different species. All of the small horse material from Cueva Quebrada indicates the presence of only one species with the possible exception of the somewhat short metatarsal (TMM 41238-227). If only one species is represented the three metatarsals represent the range of length for this species. This is not appreciably greater than the ranges shown by two other much larger samples of metatarsals of comparable sized horses, one from Channing, Texas, and one from San Josecito Cave, Nuevo Leon, Mexico (Fig. 9). The Cueva Quebrada sample would be inter-

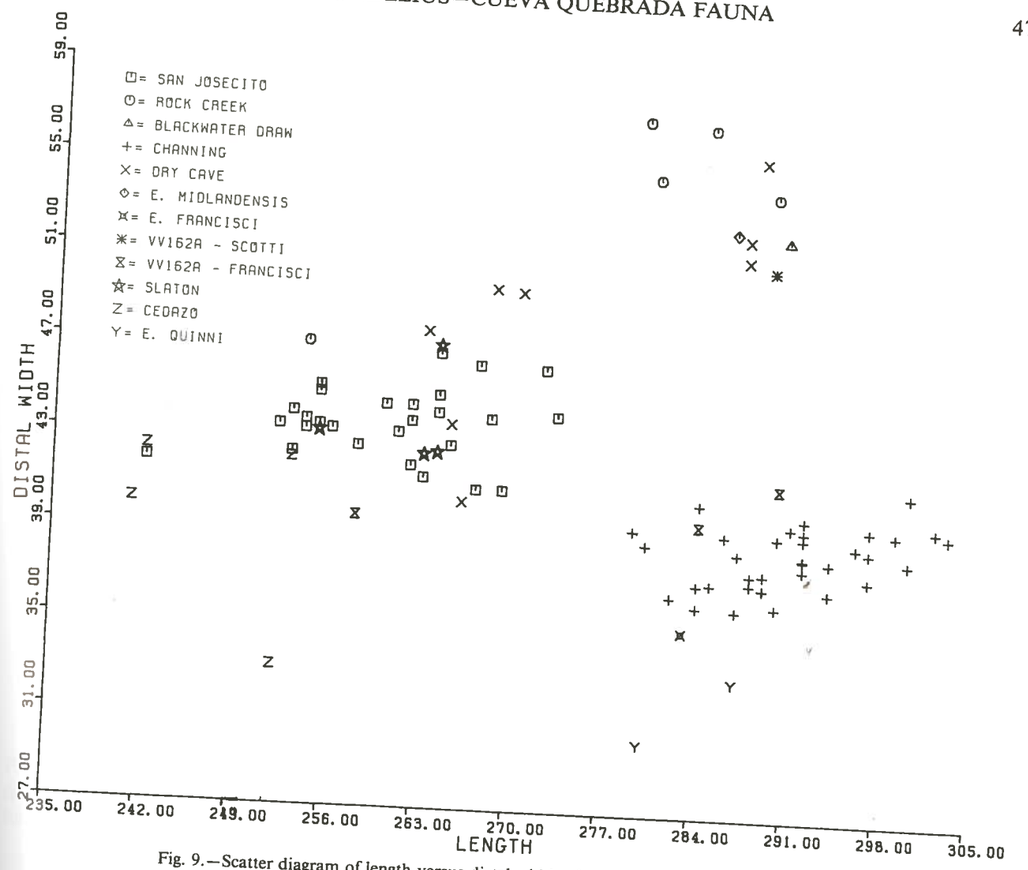

Fig. 9.—Scatter diagram of length versus distal width of metatarsals of Pleistocene *Equus*.

Table 16.—*Measurements of metatarsals of* Equus francisci *from Cueva Quebrada.*

Measurements	TMM 41238-227	TMM 41238-1	TMM 41238-46	TMM 41238-228	TMM 41238-87
Length	258	284	290	—	—
Transverse width of proximal end	41.8	—	45.8	—	44.6
Antero-posterior width of proximal end	39.8	—	—	—	—
Transverse diameter of posterior articular facet	19.2	—	—	—	—
Transverse width of facet for ectocuneiform	39.8	—	40.0	—	40.6
Transverse width of shaft at midpoint	28.6	27.8	31.3	29.2	—
Antero-posterior diameter of shaft at midpoint	28.4	27.7	28.7	30.4	—
Transverse width of distal end above the articular surface	38.9	38.5	40.9	41.7	—
Transverse width of distal articular surface	39.6	39.6	41.3	40.5	—
Antero-posterior diameter of inner distal articular facet	27.8	29.2	29.4	29.0	—
Antero-posterior diameter of central ridge of distal articular surface	30.0	31.3 est.	33.6 est.	31.4	—

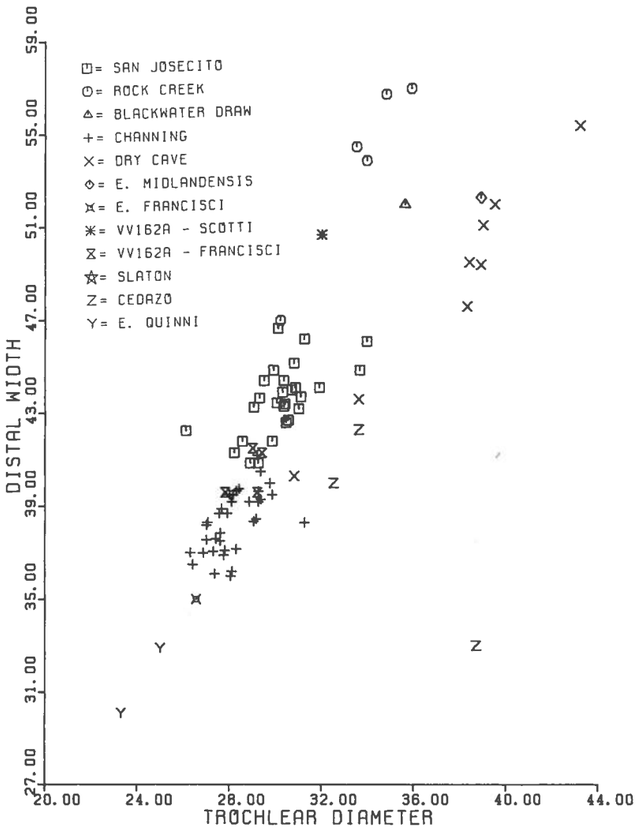

Fig. 10.—Scatter diagram of distal width versus trochlear diameter of metatarsals of Pleistocene *Equus*.

mediate in size. If two species are represented the other small horse material shows no clear evidence of this. A single species appears more probable and is adopted here.

Which name should be applied to the Cueva Quebrada material, is not clear. Lundelius and Stevens (1970) demonstrated that the type of *E. francisci* had long, slender metapodials. In their study of the Cedazo fauna from Aguascalientes, Mooser and Dalquest (1975) associated somewhat stockier metapodials with dentitions they believed were referable to *E. conversidens* and metapodials similar in proportions to those of *E. francisci* and Cueva Quebrada specimens were associated with dentitions they believed could be assigned to *E. tau*. If these associations are correct, *E. francisci* would be a junior synonym of *E. tau*.

Order Artiodactyla
Family Camelidae

cf. ***Camelops***

Material.—Distal end of a third or fourth metapodial (TMM 41238-326).

Description.—The form and size of the articular surface match those of *Camelops* from other late Pleistocene localities. The crest on the articular surface is confined to the ventral part. The width of the articular surface is 40.0 mm, the antero-posterior diameter is 42.3 mm. This is slightly below or at the lower end of the size range of *Camelops* given by Webb (1965). The differences are slight and are probably not significant in view of the small size of the sample available to Webb.

Discussion.—*Camelops* sp. is a widespread large camel in late Pleistocene faunas in the western part of North America (Kurtén and Anderson, 1980). Remains of a large camel, probably *Camelops*, are known from Bonfire Shelter in Val Verde County, Texas (Frank, 1968).

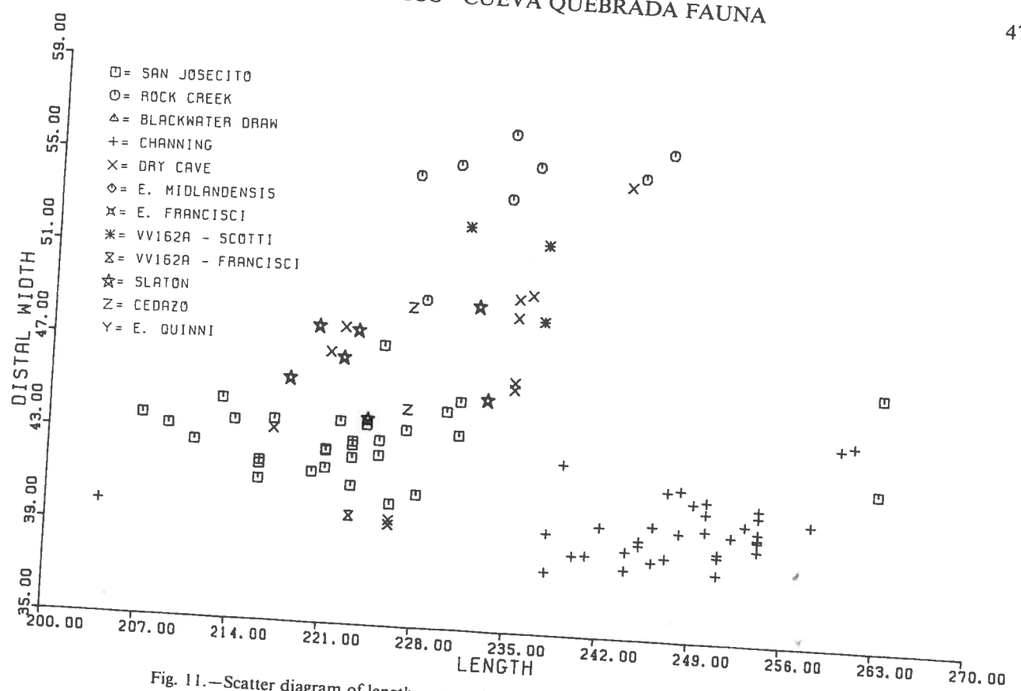

Fig. 11.—Scatter diagram of length versus distal width of metacarpals of Pleistocene *Equus*.

Table 17.—*Measurements of phalanges of* Equus francisci *from Cueva Quebrada.*

Phalanges and specimens	Length	Proximal width	Distal width	Mid width
First phalanx				
TMM 41238-3	72.4	41.7	33.8	25.2
TMM 41238-16	76.3	40.5	35.1	26.3
TMM 41238-6	87.6	45.3	36.6	26.7
TMM 41238-4	81.7	48.2 est.	35.2	27.6
TMM 41238-161	78.1	41.4 est.	34.4	26.2
TMM 41238-630	73.1	43.6	33.7	26.5
TMM 41238-692	86.2	—	—	28.3
Second phalanx				
TMM 41238-438	34.6	42.2	39.4	35.2
TMM 41238-299	33.4	37.9	33.7	31.1
TMM 41238-213	34.8	41.0	37.0	32.5
TMM 41238-168	33.8	38.5	37.6	33.5
TMM 41238-176	26.8	36.1	34.1	30.6
TMM 41238-424	—	41.4	—	—

Family Cervidae

Navajoceros fricki Kurtén

Material.—Proximal part of a left femur (TMM 41238-362).

Description.—The femur is intermediate in size between those of *Odocoileus hemionus* and *Cervus canadensis*. The length of the Cueva Quebrada specimen cannot be determined but the length of the femur given by Kurtén (1975), of 328 mm would not be an impossible estimate. The proximal width is 89 mm.

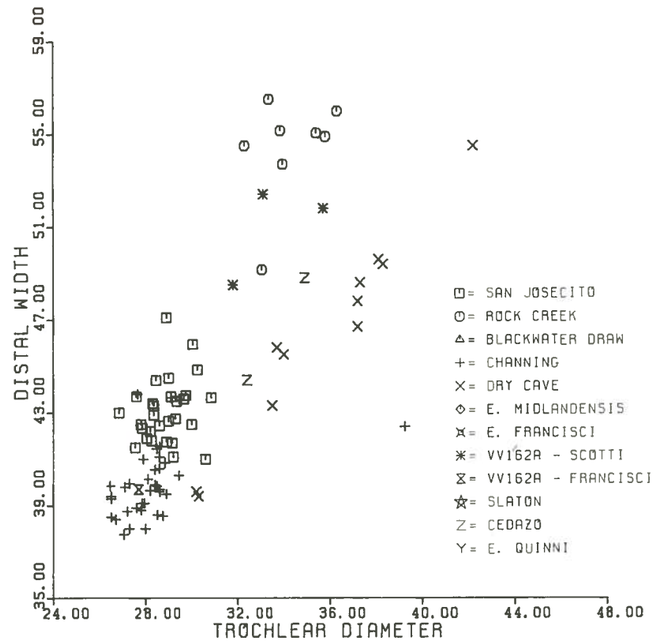

Fig. 12.—Scatter diagram of distal width versus trochlear diameter of metacarpals of Pleistocene *Equus*.

Discussion.—This large deer has been reported from a number of localities in the Rocky Mountains from Wyoming to Mexico (Kurtén and Anderson, 1980). The Cueva Quebrada record is the easternmost occurrence known in the United States. Although Val Verde County is located well east of the Rocky Mountains as such, the rocky, steep terrain associated with the canyons in the region of Cueva Quebrada apparently provided the proper environment.

Family Antilocapridae

Stockoceros sp.

Material.—Fragment of a right frontal with basal part of anterior horn core and base of posterior horn core (TMM 41238-462); right M^3 (TMM 41238-11); right mandibular fragments with P_4–M_3 (TMM 41238-9); right P_4 (TMM 41238-466); two left M_3's (TMM 41238-12, 10); lower incisor (TMM 41238-410); distal ends of one right and two left humeri (TMM 41238-216, 215, 513); one juvenile left radius with distal epiphysis gone (TMM 41238-172); distal part of juvenile right radius with epiphysis gone (TMM 41238-112); proximal part of right radius (TMM 41238-658); proximal end of left ulna (TMM 41238-173); part of shaft of a left femur (TMM 41238-171); shaft and distal epiphyses of right femur (TMM 41238-5); shaft and distal end of juvenile right tibia (TMM 41238-107); proximal part of one right and one left tibia (TMM 41238-286, 642); distal parts of right and left tibia (TMM 41238-257, 21); distal epiphysis of a left tibia (TMM 41238-368); two right and one left astragali (TMM 41238-369, 370, 611); proximal end of right metacarpal (TMM 41238-101); distal epiphysis of a metapodial (TMM 41238-217); distal end of a metapodial (TMM 41238-641); articulated pair of first, second and third, phalanges (TMM 41238-7); eight first phalanges (TMM 41238-222, 54, 111, 356, 245, 58, 110, 602); distal end of a first phalanx (TMM 41238-395); proximal end of first phalanx (TMM 41238-123); eleven second phalanges (TMM 41238-291, 508, 56, 55, 57, 113, 394, 472, 292, 294, 279).

Fig. 13.—Teeth of *Equus francisci* from Cueva Quebrada. A) Left P^4–M^3 (TMM 41238-157); B) right upper premolar (TMM 41238-639); C) right lower molar or premolar (TMM 41238-75). ×.75.

Table 18.—*Measurements of teeth of* Stockoceros *sp. from Cueva Quebrada.*

Specimens	Teeth	Length	Anterior width	Posterior width	Width of fourth lobe
TMM 41238-11	M^3	17.3	9.0	7.8	—
TMM 41238-466	P_3	9.7	5.1	4.9	—
TMM 41238-9	P_4	9.5	5.0	5.0	—
TMM 41238-9	M_1	10.1	4.7	5.4	—
TMM 41238-9	M_2	11.5	6.2	6.3	—
TMM 41238-10	M_3	—	6.9	6.3	4.8
TMM 41238-12	M_3	19.4	6.9	6.8	4.7

Table 19.—*Measurements of major limb bones of* Stockoceros *sp. from Cueva Quebrada.*

Bones and specimens	Proximal width	Distal width
Humerus		
TMM 41238-215	—	30.6
TMM 41238-513	—	30.7
Radius		
TMM 41238-172	30.4	—
TMM 41238-658	29.3	—
Tibia		
TMM 41238-107	—	29.5
TMM 41238-21	—	29.5
TMM 41238-368	—	31.2
TMM 41238-642	48.5	—
TMM 41238-257	—	27.2
Metacarpal		
TMM 41238-101	22.6	—

Description.—The fragment of the frontal bone has the lower part of the anterior horn core and the base of the posterior horn core. The anterior edge of the anterior horn core is broken away so the entire cross section of the horn core cannot be determined, but it appears to have been oval as in *Stockoceros onusrosagris* (Skinner, 1942). The breakage of the base of the posterior horn core makes it impossible to determine the angle between the two horn cores but it appears to have been approximately that shown for *Stockoceros onusrosagris* by Skinner (1942:fig. 10). The prominent pit at the base of the horn cores at the junction with the supraorbital process stated by Skinner (1942) to be characteristic of *Stockoceros* is discernable on the Cueva Quebrada specimen but is not obvious because of the breakage of the supraorbital process. The supraorbital foramen is located immediately anterior to the core base.

The dentition of the Cueva Quebrada antilocaprid is similar to that of *Stockoceros onusrosagris* in both size and morphology (Table 18). The M^3 has a smaller metacone that is seen on the M^3 of *Antilocapra americana*, a point of similarity with *S. onusrosagris*, and a prominent heel is present on the external side of the posterior end. This character is variable in both *A. americana* and *S. onusrosagris* (Skinner, 1942). The lower dentition is similar to that of *Stockoceros onusrosagris* from Papago Springs Cave. The P_4 consists of two lobes, a large anterior one and a much smaller posterior one. The posterior fold is closed by the union of the hypoconid and entoconid to form a posterior median fossette. The anterior median fold is closed by the junction of the paraconid and metaconid to form a median fossette in the anterior lobe. The form of the two P_4's from Cueva Quebrada is not as molariform as those figured by Skinner (1942:fig. 16). They are more like those figured by Colbert and Chaffee (1939:fig. 7). The M_3's are three lobed teeth with weakly developed posterior ridges. In neither of these specimens does the posterior ridge approach the stage of a fourth lobe shown in some specimens from Papago Springs Cave (Skinner, 1942). The size of the dentition is close to that of the Papago Springs Cave sample and is smaller than that of *A. americana* (Table 18). The postcranial material is too incomplete to provide measurements that would allow comparison with those of *S. onusrosagris* from Papago Springs Cave given by Roosevelt and Burden (1934), Colbert and Chaffee (1939), and Skinner (1942). Comparison with a skeleton of *A. americana* shows the Cueva Quebrada specimens to be somewhat smaller. Measurements of some postcranial elements are given in Table 19, 20.

Discussion.—Antilocaprids of the genus *Stocko-*

Table 20.—*Measurements of phalanges of* Stockoceros *sp. from Cueva Quebrada.*

Phalanges and specimens	Length	Depth large dist. art. surface	Proximal width	Proximal depth
First phalanges				
TMM 41238-58	—	12.5	—	—
TMM 41238-54	40.4	10.1	11.2	15.1 (min.)
TMM 41238-356	40.1	12.6	12.0 (min.)	15.9
TMM 41238-111	39.9 (min.)	12.3	—	—
TMM 41238-245	39.1	11.5	11.5	14.9
TMM 41238-222	39.9	12.2	11.9	15.7
TMM 41238-7	44.1	11.3	11.7 (min.)	16.8
TMM 41238-7	44.4	12.2	12.3	16.9
TMM 41238-110	—	12.7	13.1	16.0
TMM 41238-123	—	—	13.2	16.8
TMM 41238-602	—	10.7	—	—
Second phalanges				
TMM 41238-291	25.1	12.4	—	—
TMM 41238-508	26.9	12.3	11.6	14.9
TMM 41238-279	26.2	11.6	10.8	14.0
TMM 41238-56	27.1	10.1	10.5	—
TMM 41238-55	25.4	11.8	10.9	14.2
TMM 41238-57	24.3	11.0	10.3	13.4 (min.)
TMM 41238-394	24.2	12.4	10.7	14.2
TMM 41238-472	27.0	11.6	11.4	14.7
TMM 41238-292	26.4	12.8	11.1	14.1
TMM 41238-294	25.0	11.1	10.1	13.4

ceros are known from a number of late Pleistocene localities in the southwestern United States and Mexico. Two species *S. conklingi* and *S. onusrosagris* have been named but the differences between them are slight and Kurtén and Anderson (1980) have suggested that detailed quantitative studies on all samples may clarify their relationship.

Family Bovidae

Bison sp.

Material.—Two partial horn cores (TMM 41238-22); distal end of a metapodial (TMM 41238-447); first phalanx (TMM 41238-432).

Description.—The two horn cores, probably from the same individual are too large to be from a modern bison. They are the right size for either *B. antiquus* or *B. occidentalis,* but the material is too incomplete to allow a specific identification.

Discussion.—Bison remains are not common in Pleistocene deposits in Trans-Pecos Texas, but are common farther north on the Great Plains. Bison remains are abundant in deposits in Bonfire Shelter in the same area (Dibble and Lorrain, 1968). It can be shown there that on at least three occasions Paleo Indians drove a herd of bison over the cliff and into the shelter.

LITERATURE CITED

AKERSTEN, W. A., R. L. REYNOLDS, and A. E. TEJADA-FLORES. 1979. New mammalian records from the late Pleistocene of Rancho La Brea. Bull. Southern California Acad. Sci., 78: 141–143.

ALEXANDER, R. K. 1974. The archaeology of Conejo Shelter: A study of cultural stability at an archaic rockshelter site in southwestern Texas. Unpublished dissert., Univ. Texas, Austin, 340 pp.

BONNICHSEN, R. 1973. Some operational aspects of human and animal bone alteration. Pp. 9–24, *in* Mammalian osteology: North America (B. M. Gilbert, ed.), Missouri Archaeol. Soc., Spec. Publ., Columbia, 337 pp.

———. 1979. Pleistocene bone technology in the Beringian refugium. Nat. Mus. Man Merc. Ser., Archaeol. Surv. Canada Paper, 89:1–297.

BRAIN, C. K. 1981. The hunters or the hunted? An introduction to African cave taphonomy. Univ. Chicago Press, Chicago, 365 pp.

CARLETON, M. D., and R. E. ESHELMAN. 1979. A synopsis of fossil grasshopper mice, genus *Onychomys,* and their relationships to Recent species. Univ. Michigan, Papers Paleont., 21:1–63.

COLBERT, E. H., and R. G. CHAFFEE. 1939. A study of *Tetrameryx* and associated fossils from Papago Springs Cave, Sonoita County, Arizona. Amer. Mus. Novit. 1034:1–21.

DALQUEST, W. W. 1964. *Equus scotti* from a high terrace near Childress, Texas. Texas J. Sci., 16:350–358.

———. 1967. Mammals of the Pleistocene Slaton local fauna of Texas. Southwestern Nat., 12:1–30.

DALQUEST, W. W., E. ROTH, and F. JUDD. 1969. The mammal fauna of Schulze Cave, Edwards County, Texas. Bull. Florida State Mus., Biol. Sci., 13:205–276.

DAVIS, W. B. 1960. The mammals of Texas. Bull. Tex. Game and Fish Comm., 27:1–252.

DIBBLE, D. S., and D. LORRAIN. 1968. Bonfire shelter: a stratified bison kill site, Val Verde County, Texas. Misc. Papers, Texas Memorial Mus., 1:9–138.

FRANK, R. M. 1968. Identification of miscellaneous faunal remains from Bonfire Shelter. Pp. 133–134 Appendix, *in* Bonfire Shelter: a stratified bison kill site, Val Verde County, Texas (D. S. Dibble and D. Lorrain), Misc. Papers, Texas Memorial Mus., 1:9–138.

GOLDMAN, E. A. 1910. Revision of the wood rats of the genus *Neotoma.* N. Amer. Fauna, 34:1–124.

HALL, E. R., and K. R. KELSON. 1959. Mammals of North America. The Ronald Press Co., New York, 1:xxx + 1–546 + *79*; 2:viii + 547–1083 + *79*.

HARRIS, A. H. 1970. The Dry Cave mammalian fauna and late pluvial conditions in southeastern New Mexico. Texas J. Sci., 22:3–27.

———. 1977. Wisconsin age environments in the northern Chihuahuan Desert: Evidence from the higher vertebrates. Pp. 23–52, *in* Transactions of the Symposium on the Biological Resources of the Chihuahuan Desert Region, United States and Mexico (R. H. Wauer and D. H. Riskind, eds.), National Park Service. Proc. Trans. Ser., 3:ixxii + 1–658.

HARRIS, A. H., and L. S. W. PORTER. 1980. Late Pleistocene horses of Dry Cave, Eddy County, New Mexico. J. Mamm., 61:46–65.

HAYNES, G. 1980. Evidence of carnivore gnawing on Pleistocene and Recent mammalian bones. Paleobiology, 6:341–351.

———. 1983. A guide for differentiating mammalian carnivore taxa responsible for gnaw damage to herbivore limb bones. Paleobiology, 9:164–172.

KURTÉN, B. 1967. Pleistocene bears of North America. 2. Genus *Arctodus,* short-faced bears. Acta. Zool. Fennica, 117:1–60.

———. 1968. Pleistocene mammals of Europe. Aldine Publ. Co., Chicago, 317 pp.

———. 1975. A new Pleistocene genus of American mountain deer. J. Mamm., 56:507–508.

KURTÉN, B., and E. ANDERSON. 1980. Pleistocene mammals of North America. Columbia Univ. Press, New York, 442 pp.

LINNAEUS, C. 1758. Systema Naturae. 10th ed. Stockholm, v. 1, 824 pp.

LOGAN, L. E., and C. C. BLACK. 1979. The Quaternary vertebrate fauna of Upper Sloth Cave, Guadelupe Mountains National Park, Texas. Pp. 141–158, *in* Biological investigations in the Guadelupe Mountains National Park, Texas (H. H. Genoways and R. J. Baker, eds.), National Park Service Proc. Trans. Ser., 4:xvii + 1–442.

LUNDELIUS, E. L., JR. 1972. Vertebrate remains from the Gray Sand. Pp. 148–163, *in* Blackwater Locality No. 1, A stratified early man site in eastern New Mexico (J. J. Hester, ed.), Publ. Fort Burgwin Research Center, 8:1–239.

———. 1979. Post-Pleistocene mammals from Pratt Cave and their environmental significance. Pp. 239–257, *in* Biological Investigations in the Guadelupe Mountains National Park, Texas (H. H. Genoways and R. J. Baker, eds.), National Park Service Proc. Trans. Ser., 4:xvi + 1–442.

LUNDELIUS, E. L., JR., and M. S. STEVENS. 1970. *Equus francisci* Hay, a small stilt legged horse, Middle Pleistocene of Texas. J. Paleo., 44:148–153.

MEADE, J. J. 1981. The last 30,000 years of faunal history within the Grand Canyon, Arizona. Quat. Res., 15:311–326.

MILLER, S. J. 1979. The archaeological fauna of Smith Creek Canyon. Pp. 273–329, *in* The Archaeology of Smith Creek Canyon, eastern Nevada (D. R. Tuohy and D. L. Randall, eds.), Nevada State Mus. Anthro. Papers, 17:273–329.

MOOSER, O., and W. W. DALQUEST. 1975. Pleistocene mammals from Aguascalientes, central Mexico. J. Mamm., 56: 781–820.

QUINN, J. H. 1957. Pleistocene Equidae of Texas. Bur. Eco. Geol., Univ. Texas, Rept. Invest., 33:5–51.

ROOSEVELT, Q., and J. W. BURDEN. 1934. A new species of antilocaprine, *Tetrameryx onusrosagris,* from a Pleistocene cave deposit in southern Arizona. Amer. Mus. Novit., 754: 1–4.

SCHMIDLY, D. J. 1977. The mammals of Trans-Pecos Texas. Texas A&M University Press, College Station, 225 pp.

SEMKEN, H. A. 1961. Fossil vertebrates from Longhorn Cavern, Burnet County, Texas. Texas J. Sci., 13:290–310.

SKINNER, M. F., 1942. The fauna of Papago Springs Cave, Arizona and a study of *Stockoceros* with three new antilocaprines from Nebraska and Arizona. Bull. Amer. Mus. Nat. Hist., 80:143–220.

SLAUGHTER, B., W. W. CROOK, JR., R. K. HARRIS, D. C. ALLEN, and M. SEIFERT. 1962. The Hill-Shuler local faunas of the Upper Trinity River, Dallas and Denton Counties, Texas. Univ. Texas Bur. Econ. Geol., Rept. Invest., 48:1–75.

STOCK, C. 1950. 25,000-year-old horse; the skeleton of an ice age horse makes a return trip to Mexico. Eng. Sci. Monthly, 14:16–17.

———. 1953. El caballo pleistoceno (*Equus conversidens leoni*) de la cueva de San Josecito, Aramberri, Nuevo Leon. Mem. Congr. Cient. Mexico, 3:170–171.

STOCK, C., and F. D. BODE. 1937. The occurrence of flints and extinct animals in pluvial deposits near Clovis, New Mexico, Part III—Geology and vertebrate paleontology of the late Quaternary near Clovis, New Mexico. Proc. Acad. Nat. Sci. Philadelphia, 88:219–241.

VALASTRO, S., E. M. DAVIS, JR., and A. VARELA. 1977. University of Texas at Austin, Radiocarbon Dates XI. Radiocarbon, 19:280–325.

———. 1979. University of Texas at Austin, Radiocarbon Dates XIII. Radiocarbon, 21:257–273.

WEBB, S. D. 1965. The osteology of *Camelops.* Bull. Los Angeles County Mus., Sci., 1:1–54.

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