

OCCASIONAL PAPERS

THE MUSEUM

TEXAS TECH UNIVERSITY

NUMBER 30

23 MAY 1975

VERTEBRATE FOSSILS FROM THE BLANCO LOCAL FAUNA OF TEXAS

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Vertebrate fossils were discovered near Mount Blanco, in Crosby County, Texas, in 1889, and reported the following year (Cummins, 1890). In the next few decades, a number of institutions made collections at Mount Blanco, and several publications describing the sediments and fauna resulted (for example, Cope, 1893; Gidley, 1903 *a, b*). Later, Evans and Meade (1945) discussed the geology of the Blanco Formation, and Meade (1945) added materially to the knowledge of the fauna. The Blanco local fauna has become the type local fauna for the Blancan Stage, Blancan Mammalian Age and Blancan fauna. Blancan local faunas have been described from numerous sites in North America, and many authors have correlated other Blancan local faunas with the type Blanco local fauna.

Current knowledge of the Blanco local fauna rests largely on the studies made prior to 1910, as modified by the work of Meade (*loc. cit.*) in the 1940's. The known mammals are virtually all large species, with long time ranges, and even these are incompletely known. Microvertebrates, so important in detailed correlations, have been unknown. Errors in identification of taxa and much controversy and speculation have occurred. As a result, the Blanco local fauna is perhaps the least understood of the classical local faunas that are the types of Mammalian Ages of North America.

In 1964, the late J. S. Bridwell granted permission to the Biology Department of Midwestern University to carry on excavations in the Blanco Formation, the bulk of which occurs on one of the Bridwell ranches. During the next four years, and intermittently since then, field parties collected in the Blanco sediments. A fairly good understanding of the geology was obtained, the known vertebrate fauna of

the Blanco was more than doubled, and a much better knowledge of the age of the Blanco local fauna, and its place in the Blancan chronology, is available.

HISTORICAL BACKGROUND

The Blanco site and its vertebrate fossils were discovered by W. F. Cummins in 1889 (Cummins, 1890, 1891, 1892). In 1892, E. D. Cope visited the Blanco beds with Cummins and wrote several short papers (Cope, 1892*a-g*) about the formation and fauna and a report (Cope, 1893) of major importance. H. F. Osborn, of the American Museum of Natural History, sent expeditions under the charge of J. W. Gidley to the Blanco in 1900 and 1901 (Gidley, 1903*b*). The latter paper included the first detailed list of the vertebrate fauna, and this list is still a major source of knowledge of the Blanco local fauna. W. D. Matthew collected fossils in the Blanco Formation in 1924 and, according to Meade (1945), the results of his work are included in an unpublished manuscript. Only brief notes concerning the Blanco were ever published (Matthew, 1924*a, b*, 1925). No original contributions to the knowledge of the Blanco fauna appeared during the next two decades, although Blancan faunas from elsewhere in the United States were described, and Gazin (1936) updated Gidley's (1903) faunal list.

In 1940 and 1941, G. L. Evans and G. E. Meade made extensive collections in the Blanco Formation and reported briefly on the geology (Evans and Meade, 1945) and in detail on the vertebrates collected (Meade, 1945). Thereafter, no additional work seems to have been done, although Hibbard (1950) reported the giant ground squirrel from the Blanco and a specimen of bone-eating dog from a site that is doubtless in the Blanco Formation. Numerous mentions of the Blanco and its fauna were made during following decades, and Johnston and Savage (1955) published an updated faunal list, basically the same as that of Gidley (1903*b*) but with additions from Meade (1945).

TERMINOLOGY

I have noted (Dalquest, 1972*b*:570) that, although it is certainly undesirable to use the same noun (Blanco) as part of the name of a rock unit (formation), time unit (stage, land-mammal age), and faunal unit (fauna, local fauna), an exception should be made for "Blanco." The name Blanco has been employed in all of these senses, often for many decades, and no alternatives have ever been proposed.

To substitute another term at this late date would only lead to confusion, not clarity, and defeat the purpose of technical terminology.

The following usages are probably acceptable. Each is followed by the original forms employed, author, and date.

Blanco Formation:

Blanco Canyon Beds, Cummins, 1890.

Blanco Beds, Cummins, 1891.

Blanco Formation, Matthew, 1925; Gidley, 1926.

Blanco local fauna:

Blanco local fauna, Johnston and Savage, 1955.

Blancan stage:

Blanco stage, Gazin, 1936.

Blancan fauna:

Blanco fauna, Meade, 1945.

Blancan North American Land-Mammal Age:

Blancan North American Land-Mammal Age, Evernden, *et al.*, 1964.

The Blanco Formation was proposed by Cummins (1890), "I have given them the name of Blanco Canyon beds." At this time "bed" was used in the sense of a formation. In 1892, Cummins actually stated (p. 201) "this formation," but never used the combination Blanco Formation. Matthew, more than 20 years later, seems to have been the first to do so. The type locality is Mount Blanco, where Cummins (1892) measured a section, refigured by Gidley (1903*b*). Evans and Meade (1945) presented another measured section, refigured by Johnston and Savage (1955).

There may be objection to the use of "Blanco Formation" for sediments occupying such a restricted area. The white beds of the Blanco Formation are set into the brown sediments of the Bridwell Formation (Johnston and Savage, 1955:36), and separated from them by a sharp contact that represents an erosional unconformity between the two differently colored and lithologically distinct kinds of sediments. The fossils of the Bridwell Formation are of middle Pliocene age (Meade, 1945:516), and the disconformity represents several million years, at least. Whether the Bridwell Formation deserves recognition as a distinct formation is not at issue. In the absence of another category for lithologically (and chronologically) distinct and mapable units of rock that are of limited geographic extent but of paleontological importance, it seems best to retain them as formations. The distinctness of the Blanco as a rock unit has been recognized and accepted for nearly a century.

The term "Blanco" has been used so long and it is so familiar that it has often been used in the singular, "the Blanco," usually in reference to the sediments themselves but sometimes in other senses. It is suggested that this usage be restricted to the formation itself.

SEDIMENTS

The Blanco Formation is exposed in a section approximately a mile long and not more than 70 feet maximum thickness, on the north side of Crawfish Draw, 11 miles north of Crosbyton, Crosby County, Texas. Since measured sections have been presented elsewhere (see Terminology), one is not given here. The deposit, as seen from the south side of Crawfish Draw, a mile away, has a shallow lenticular shape and appears white. At closer range, the white color is emphasized, but study of the individual layers shows that a pale gray or greenish color predominates.

Bedding is strong, with the contacts of layers of different materials sharply marked. Massive clay deposits, gray to grayish white in color, and greenish sand are most common but layers of indurated sandstone, caliche gravel and freshwater limestone also are present. Volcanic ash is apparently mixed through the sediments; most clays are bentonitic. The few diatomite beds are restricted in area.

The genesis of the Blanco strata has been controversial since Cummins (1892) thought that the beds originated in a great inland sea. Gidley (1903*b*) denied a lacustrine origin, and considered the sediments to be a narrow valley or basin fill. Baker (1915) and others agreed with this, and the valley fill origin of the Blanco was not questioned until Evans and Meade (1945) and Meade (1945) rejected this theory and postulated the existence of a large, mostly permanent lake, the fillings of which formed the Blanco deposit.

It should be noted that the concept of the extent of the Blanco has decreased steadily. Cummins used the term for sediments covering much of West Texas and the Panhandle. Gidley (1903*b*) and Baker (1915) greatly restricted the extent of deposits attributed to the Blanco Formation but included some disjunct sediments. When Gidley (*op. cit.*, 625) wrote about stream or river deposition of the Blanco, he visualized the deposits as extending "eastward fifteen or twenty miles to the edge of the plains." Evans and Meade (1945) included in the Blanco Formation only the main Crawfish Draw site and a small area 6 miles northeast of Crosbyton. Apparently the Blanco Formation includes only the single limited deposit at the junction of Crawfish Draw and Blanco Canyon and the site near Crosbyton.

There are some puzzling features about the Blanco sediments, and some contradict the concept of a permanent or partly permanent lake occupying a closed depression of considerable extent. For one thing, I found no remains of fishes or aquatic turtles anywhere in the deposits, although a single alligator tooth was taken in one quarry. No aquatic snail fossils were found anywhere except in the obviously lacustrine deposits under the diatomite.

Evans and Meade (1945:492) listed four main reasons for thinking the Blanco sediments lacustrine: 1) the gravels are derived from the local caliche caprock and are found exclusively on the marginal slopes of the basin; 2) main strata of the exposed beds are traceable over the exposed areas; 3) some sediments, such as the bentonitic clays, freshwater limestones and diatomite, indicate quiet water deposition; 4) there is no evidence of connection between the two Blanco deposits and other sediments of proven similar age that might indicate that the Blanco was a valley filling.

With regard to 1 above, I found two places, one quite extensive, where gravels are present in a thick layer near the base and center of the apparent basin. As for point 2, it is often difficult to be sure sand or limestone layers on the opposite sides of a hill are actually exposures of a continuous layer, for the different strata of sand, limestone or sandstone are often very similar lithologically and in color. However, in general it is true that the major strata do seem to have considerable geographic extent.

More striking, however, is the abrupt discontinuity of many elements of the minor stratigraphy. A clay bed or sand stratum may end abruptly, usually sand replacing clay or the reverse. Sandstones and caliche often pinch out in short distances. This condition might occur in sediments formed in a lake with numerous embayments, but is in strong contrast to the even, uniform sediments typical of the deflation basins of West Texas, as described by Evans and Meade (1945).

The bentonitic clays and freshwater limestones (point 3) indicate still waters, but these might have occupied low areas or small, temporary depressions after floods or heavy rains. This type of deposition occurs today in arid areas. The diatomite, however, definitely is a lacustrine deposit. The sandy mud deposit beneath the diatomite beds can often be traced laterally for 100 yards or more away from the diatomite itself. The deposits are clearly recognizable as pond deposits by their evenness and uniformity of sediments, and by their contained fossils. Remains of aquatic plants are abundant, and some few fossil aquatic snails also occur. The ponds, however, were shal-

low and apparently limited to areas of a few acres. No fish or aquatic turtle remains have been found, and fossil wood and hackberry seeds are usually as abundant as fossils of emergent vegetation. It should be emphasized that these deposits within the Blanco sediments are readily recognized as laucustrine.

As to Evans and Meade's point 4, it may be argued that a connecting valley did exist, but has been removed by erosion in the present miles-wide valley of White River.

The absence of fossils of aquatic vertebrates and the varied nature of the sediments in the Blanco Formation argue against a closed depression occupied by a lake. It seems more likely that the deposits accumulated in a shallow drained rather than closed basin, formed by stream erosion or deflation. Coarser materials were deposited on the valley slopes but floods or mudflows carried some gravels far out into the valley. Slope wash and wind-blown materials filled the basin, the materials being sorted and reworked by wandering shallow streams during wet intervals. Heavy rains, perhaps seasonal, carried clay materials that accumulated in low areas. Dry intervals permitted accumulation and leaching of carbonates into sands and clay deposits to form the calcareous limestones and caliche.

COLLECTING SITES

The microvertebrate fossils here reported were obtained from more than 100 tons of matrix collected from three quarries. In addition to the matrix processed by Midwestern personnel, a large but unknown quantity of matrix from one of these quarries was washed and sorted by John and Lillian Carter, and the Carter collection was purchased later by Midwestern University. The specimens obtained by the Carters are included in this report, as noted below.

Not included in the above totals are many tons of matrix collected at various sites in the Blanco Formation in an attempt to find a concentration of microvertebrate fossils. Samples of a few hundred pounds to a ton or more of matrix were taken from 20 or more potentially productive sites, but yielded only about two *Sigmodon* teeth to the ton. A few *Sigmodon* teeth apparently can be found in virtually any sandy clay matrix in the Blanco deposits. These sites and specimens are not dealt with further, except for a few important isolated finds. Preservation of Blanco fossils is such that few surface finds are complete enough to identify. It is probable that, in the course of this work, nearly 150 tons of matrix were processed.

The main fossiliferous portions of the Blanco Formation are peppered with quarries. The University of Texas quarries, operated by

Meade and Evans in the 1940's, were mapped incorrectly by Meade (1945:510) but were described (pp. 519-520) and are easily located. The many other old quarries must have been excavated in the early 1900's or earlier, and their pits, and even the hundreds of bone fragments surrounding them, attest to the ineffective erosion in the dry climate and sandy sediments of the Blanco.

The microvertebrate quarries operated by Midwestern University are located with reference to Meade's (*op. cit.*, 519-520) descriptions, as follows.

Low Quarry.—Approximately 50 yards north of, and up the small canyon from, Meade's Quarry 11 (his main *Gigantocamelus* quarry). Here an 18-inch thick layer of sandy clay is more resistant than the sands above and beneath and forms a ledge. Forty tons of matrix from this ledge were processed and yielded a kangaroo rat jaw, a cotton rat jaw, a few other jaw fragments, and numerous isolated teeth. Mastodon remains were numerous, and a few specimens of horse and peccary also were obtained. Notable is a single tooth of a large crocodylian. Preservation of both bones and teeth is excellent. This site is approximately 12 feet above the contact with the underlying middle Pliocene deposits and is the lowest productive microvertebrate site discovered.

Red Quarry.—Same as Meade's Quarry 6, 28 feet above the basal contact. Here, a thick bed of diatomite overlies a sandy clay. The clay originally formed the bottom of a shallow, vegetation-clogged pond and it contains countless rounded cavities from less than a millimeter to several millimeters in diameter, resulting from decomposition of organic debris. The upper portion of the clay layer and the lower part of the diatomite layer contain abundant white fossil plant remains. The bulk of the fossils are of rushes and other aquatic types, but seeds of the hackberry tree are common. Small mammals are represented by a mole, a shrew, rabbits and several kinds of rodents, recovered from approximately 50 tons of matrix. Large mammals include a three-toed horse, a sloth, and others, found both in the diatomite and in the clay. The bones and teeth from this site often are distinctly red in color. Most bone is very poorly preserved but teeth are usually in fair condition.

Carter Quarry.—Between Meade's Quarry 17 and the Red Quarry. The Carters worked in this quarry intermittently for more than a year, and both large mammals and microvertebrates were obtained. The site is a massive clay bed about 50 yards from, and at the same level as, the Red Quarry, above. After the Carter collection was obtained, further excavation was carried out, and much additional material was ob-

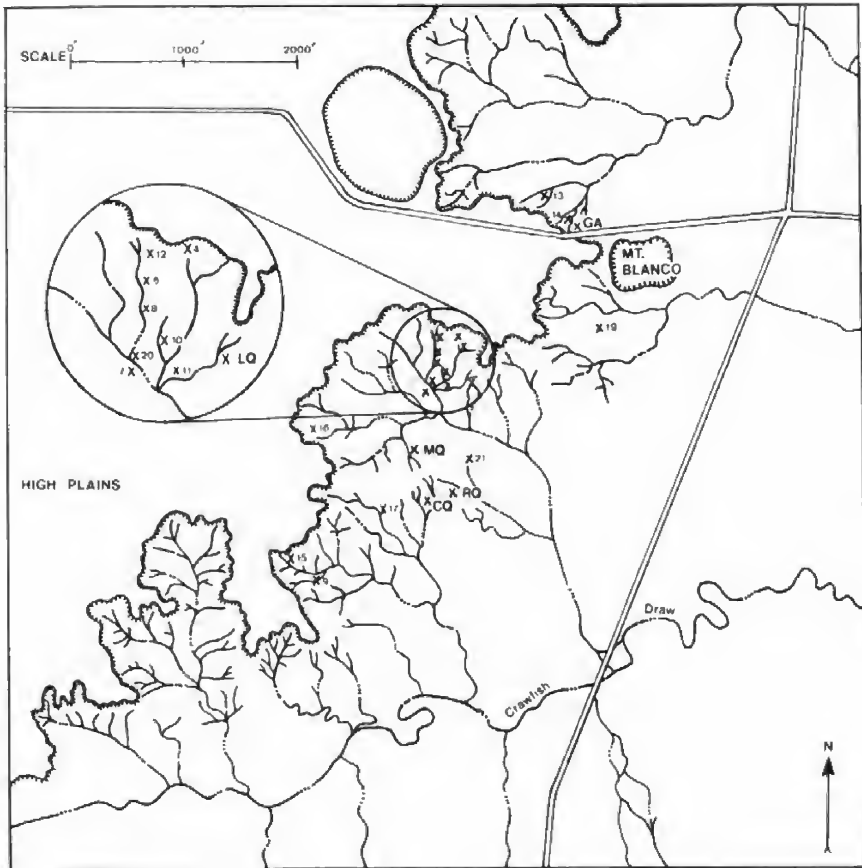


FIG. 1.—Map of the Blanco area. Numbered sites, marked with crosses, are corrected localities of University of Texas quarries, described by Meade (1945: 519-520). Letters indicate (north to south) sites of: GA, Guaje Ash; LQ, Low Quarry; MQ, Marmot Quarry; RQ, Red Quarry; CQ, Carter Quarry.

tained. The bulk of the microvertebrate fossils came from narrow, sandy and pebbly strata in the clay bed, and when these were worked out, no additional fossils of value were obtained. The quantity of matrix processed by the Carters is unknown, but Midwestern University collected approximately 10 tons. Large mammals from this quarry include the bone-eating dog and giant camel. Preservation of fossils is excellent, and the surface of bones is usually slick, hard, and white.

Marmot Quarry.—About 50 yards north of Meade's Quarry 3. No important microvertebrates were found, but the site was rich in remains of larger mammals. Part of the jaw of a giant ground squirrel, the skull of a camel, and other specimens were obtained here, about 15 feet above the contact with the Bridwell Formation.

ACKNOWLEDGMENTS

I am indebted to the late J. S. Bridwell for the original permission to collect and work in the Blanco. Following Mr. Bridwell's death, Mr. Clifford Tinsley, of Wichita Falls, continued this permission. Mr. Bobby Adams, Manager of the Bridwell Hereford Ranch at Crosbyton, extended numerous courtesies during the years of work on the ranch. Dr. Travis White, President of Midwestern University, encouraged this work, and financial support was granted from Midwestern University research funds. Over the years, many graduate and undergraduate students aided in field work, especially the hard labor involved in gathering, transporting and washing more than 100 tons of matrix from which the microfossils were obtained. I wish to thank all of these people, and especially the following, who spent weeks working with me in the field: Frank Judd, Richard Palmer, Edward Roth, Joseph Stone, Wayne Seifert and Robert Westmoreland. Mrs. Rose Carpenter aided in both the field work and preparation of materials.

Dr. Wann Langston, of the Texas Memorial Museum, permitted me free access to the material collected at the Blanco by Meade and Evans, and allowed me to use comparative materials in the University of Texas collections. Dr. Ernest Lundelius, University of Texas, and Dr. S. David Webb, University of Florida, made helpful suggestions in the course of this work, and Dr. Gerald Schultz, West Texas State University, gave especially valuable help in detailed criticisms of the manuscript, based partly on his own knowledge of the Blanco. Dr. Craig C. Black, Texas Tech University, made available to me the Blanco materials in his charge and aided greatly in the preparation of this report.

Above all, I am indebted to the late Dr. Claude W. Hibbard, University of Michigan. Dr. Hibbard allowed me free use of the Blancan age materials he had assembled at the Museum of Paleontology and aided in the identification of many of the specimens. His insistence that the Blanco would eventually furnish a vertebrate microfauna, and of the importance of fitting the Blanco local fauna into the Blancan sequences, as well as his aid and encouragement in the long and often discouraging work, is largely responsible for the completion of this project.

METHODS

Synonomies in the following species accounts deal primarily with the Blanco, or involve major name changes. All catalogue numbers are

those of The Museum, Texas Tech Univ. (TTU-P) except those of the University of Texas (TMM), and Midwestern University (MU). Abbreviations for Midwestern University quarries are: RQ (Red Quarry), LQ (Low Quarry), MQ (Marmot Quarry), and CQ (Carter Quarry). Measurements of specimens are in millimeters, and, when diameters of bones or teeth are involved, the first measurement is anteroposterior diameter; the second, transverse diameter (as 13.5×8.4).

ORDER INSECTIVORA

Family SORICIDAE

***Sorex taylori* Hibbard**

1938. *Sorex taylori* Hibbard, Trans. Kansas Acad. Sci., 40:242. Holotype from the Rexroad local fauna of Kansas.

Referred specimens.—Anterior end of lower jaw with I-M₁ (TTU-P 6129, LQ); edentulous lower jaw (TTU-P 6130, RQ).

The articular condyles, processes, foramina and fossae of the mandible are like those of *Sorex taylori*, and the size and characters of the teeth, as far as they can be compared, resemble those of *S. taylori*. Unfortunately the teeth of TTU-P 6130 are missing, but the size of the alveolus of M₃ suggests a small tooth, like the M₃ of *S. taylori*.

S. taylori is known from the Rexroad local fauna, of Kansas, and the Beck Ranch local fauna of Scurry County, Texas (Dalquest, 1972*b*). It seems to be a widespread species of the early Blancan. It is the only kind of shrew so far found in the Blanco.

Family TALPIDAE

***Hesperoscalops blancoensis* new species**

Holotype.—Fragment of right lower jaw, TTU-P 6131, with well-preserved M₁-M₃, broken off just anterior to M₁ and posterior to M₃.

Type locality.—Carter Quarry, the same as or very close to University of Texas Quarry 17 (Meade, 1945, fig. 1), Blanco Formation, Blanco local fauna, Crosby County, Texas.

Distribution.—Known only from the Blanco Formation of Crosby County, Texas.

Diagnosis.—A mole larger than *Scalopus aquaticus* Linnaeus, with M₃ distinctly reduced in size as compared with M₂ and with very strongly developed basal accessory cusps, especially on M₃.

Referred specimens.—Upper right jaw fragment with M³, from the Low Quarry (TTU-P 6132); jaw fragment, two humeri, isolated lower M₁, from the Carter Quarry (TTU-P 6619-6621, 6133); isolated lower M₃ from the Red Quarry (TTU-P 6134).

Description.—The holotype is beautifully preserved, and the teeth are only lightly worn. It represents a mole similar to *Hesperoscalops rexroadii* Hibbard, the type species for the genus, but differs in larger, broader teeth, M_3 markedly reduced as compared with M_2 , rather than almost the same size, and basal accessory cusps of molars better developed, especially on M_3 .

Hesperoscalops sewardensis Reed, the only other known species of the genus, is very similar to but much larger than either *H. rexroadii* or *H. blancoensis*. Reed (1962) emphasized the large size of the basal accessory cusps of *H. sewardensis*. Dr. Claude Hibbard has kindly loaned to me the holotype of *H. sewardensis* and much of his *H. rexroadii* material, including the lower jaw with M_1 - M_3 from Fox Canyon (Hibbard, 1953). The basal accessory cusps of the holotype of *H. sewardensis* are larger than those of *H. rexroadii*, but the entire dentition is larger. Relatively, the basal accessory cusps of *H. sewardensis* are but little larger than those of *H. rexroadii*. *Hesperoscalops blancoensis* is only slightly larger than *H. rexroadii* but has relatively much larger basal accessory cusps, especially on M_3 .

Discussion.—Moles of the genus *Hesperoscalops* are very poorly known. *H. sewardensis* is known only from the holotype, a fragmentary lower jaw. *H. rexroadii* is known from several lower jaw fragments, an upper jaw fragment, isolated teeth and some skeletal elements listed but not described (Hibbard, 1953). Available also is a quantity of material from the Beck Ranch of Scurry County, Texas, that includes lower jaw fragments, isolated teeth, and a number of postcranial elements, as yet all undescribed. Classification must necessarily be based on the lower jaw fragments and teeth.

Hesperoscalops has very high-crowned teeth that change markedly in occlusal aspect with wear, and this must be taken into account in making comparisons. Diagnostic characters include the relative and actual size of the teeth and jaw, relative size of M_3 as compared with M_2 , and development of the accessory basal cusps of the molars. These have been described by Hibbard (1941). There is no basal accessory cusp on the posterior face of the talonid of M_3 . The anterior edge of the trigonid of M_3 is strongly oblique to the transverse plane of the ramus, but the posterior face of the talonid of M_2 is less so, and there is a triangular gap between M_3 and M_2 . Further, the molars are well separated in the toothrow, as is true of moles generally. The basal accessory cusps rise from the cingula and flare outward to close the spaces between the molars at about half the height of the unworn teeth. The basal accessory cusp on the trigonid of M_2 must additionally close the triangular gap between the posterolingual edge of M_2

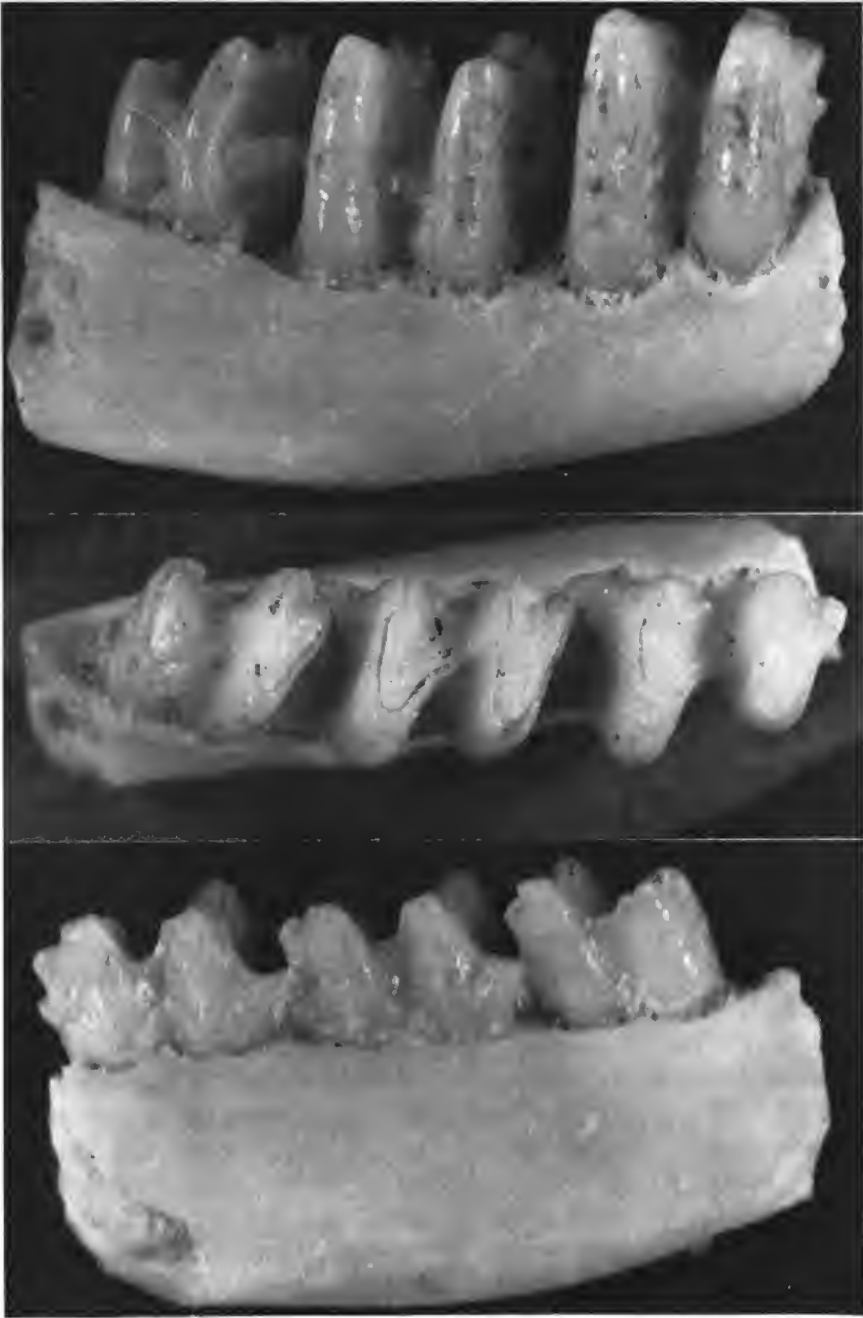


FIG. 2.—*Hesperoscalops blancoensis*: holotype, right lower jaw (TTU-P 6129) fragment in labial, occlusal, and lingual views. For measurements see text.

and the anterolingual edge of M_3 . It is a relatively huge, flared shelf, larger than the other basal accessory cusps. On all lower third molars of *Hesperoscalops rexroadi* seen, the cusp of M_3 is relatively small. All teeth were well worn to greatly worn, and it is not known how much wear reduces the size of the shelflike cusp. The basal accessory cusp of the M_3 of *H. blancoensis* is both relatively and actually huge as compared with that of *H. rexroadi*. It is probable that, when more complete specimens of the several kinds of *Hesperoscalops* are discovered, greater differences between the species will become obvious.

Hibbard (1953) considered *Hesperoscalops* ancestral to the modern eastern mole, *Scalopus*. *Scalopus* has no basal accessory cusps or, at best, only a faint trace of them (in 30 Recent specimens from north-central Texas). In *Scalopus*, the M_3 is reduced in size as compared with M_2 . If development of basal accessory cusps is primitive, *Hesperoscalops blancoensis* is more primitive than *H. rexroadi*. If reduction of M_3 is advanced, *H. blancoensis* is more advanced than *H. rexroadi*.

Etymology.—The species is named for the Blanco Formation.

ORDER CHIROPTERA

Bat, near *Tadarida*

In a sample of matrix taken in a pebbly band in the sand between Meade's Quarry 6 and Quarry 3, about 3 meters above the bottom of the Blanco sediments, a single M_2 of a bat (TTU-P 6135) was recovered, along with one cotton rat tooth. The site was judged unworthy of further collecting effort, but the bat tooth is the only evidence of Chiroptera in the Blanco local fauna. The tooth is well preserved and resembles the lower second molar of the modern *Tadarida brasiliensis*.

ORDER EDENTATA

Family GLYPTODONTIDAE

Glyptotherium texanum Osborn

1903. *Glyptotherium texanum* Osborn, Bull. Amer. Mus. Nat. Hist., 19:492. Holotype from the Blanco.

Referred specimens.—Two scutes (TTU-P 6136-6137, CQ), and material at the University of Texas (Meade, 1945).

The holotype consisted of "the nearly complete carapace, pelvis, sacrum, caudals, and complete tail armature of an individual in fine preservation." Curiously, Osborn did not give the source of the speci-

men, other than saying it came from "the lower Pleistocene of Texas," and was obtained by an expedition under the direction of J. W. Gidley. Gidley (1903*b*) included *Glyptotherium texanum* in his faunal list and later (Gidley, 1926) definitely stated that the type came from the Blanco Formation. Meade (1945) reported scutes of this glyptodon from several different quarries, but fossils are uncommon. The relationships of *G. texanum* and other glyptodonts known from the United States are presently under study by Dr. David Guillet.

Family MEGALONYCHIDAE

Megalonyx leptostomus Cope

1893. *Megalonyx leptostomus* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 49. Holotype from the Blanco.

Referred specimens.—Four isolated cheek teeth (TTU-P 6138-6140, 6668, all RQ); lower jaw fragment with three teeth and two isolated teeth (TMM 31171-19); eight isolated teeth (TMM 31196-5).

The holotype consists of both premaxillaries, skull fragments, and an upper tooth of a single individual. Meade (1945) has figured the edentulous lower jaw of a specimen (TTU-P 438) from the Blanco, with the characteristic symphysis of the genus.

There are numerous nominal species of *Megalonyx*, but it is probable that only a few are valid. *M. leptostomus*, as the earliest-named Blancan species, is probably valid. It is unfortunate that it is so poorly understood.

The lower jaw at the University of Texas has three teeth in place. The caniniform tooth is straight, laterally compressed, and, in cross section, the external face is smoothly curved, the internal face more straight but convex medially. The second (anterior molariform) tooth is quadrate and measures 16.4×20.3 . The second molariform tooth is also quadrate but markedly broader lingually than labially. It does not, however, have a triangular or "L" shape. It measures 14.8×22.4 .

Catalogued under the same number (TMM 31171-19) are two isolated molariform teeth of the same size, appearance, and nature of preservation as the teeth in the jaw. One tooth is quadrate, measuring 16.0×20.8 , and is probably the posterior tooth of the jaw. The other tooth is somewhat triangular in cross-section, but with the hypotenuse concave. It is probably an upper tooth.

Among the isolated teeth, some are of the lower jaw, including two caniniforms and an anterior molariform. One tooth at the University of Texas is a large, curved tusk, narrowly triangular in cross section;

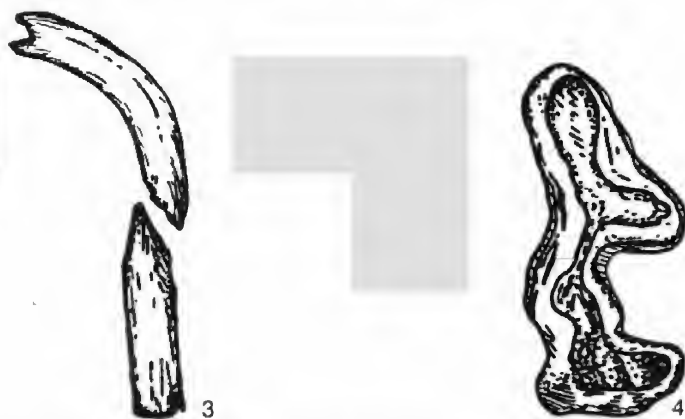


FIG. 3.—*Glossotherium* near *chapadmalense*, upper incisor (TTU-P 6142) and lower incisor (TTU-P 6144), in lateral views. These are isolated teeth, shown in occlusal aspect, and are not necessarily from one individual.

FIG. 4.—*Glossotherium* near *chapadmalense*, lower posterior molariform tooth (TTU-P 6147), occlusal view.

it is probably the upper caniniform. TTU-P 6139 is smoothly oval in cross-section and gently curved in lateral view. It may be the anterior upper molariform. The other teeth are quadrate but sometimes broader on one side than the other, not triangular.

Family MYLODONTIDAE

Glossotherium* near *chapadmalense

Referred specimens.—Nine isolated teeth (TTU-P 6141-6149, all RQ).

At the Red Quarry, in the lowermost part of the diatomite layer and the underlying sandy silt, crushed, powdered bone fragments indicated that a quantity of bone had disintegrated there. From this I was able to recover the listed teeth, representing two (possibly but not likely more) individual *Glossotherium*. TTU-P 6141-6143 are long, curved upper caniniform teeth and TTU-P 6144 is a straight, lower caniniform tooth. The upper caniniform teeth resemble the incisors of a giant rodent. The most characteristic teeth are the posterior lower molariforms, TTU-P 6145-6146. They are extremely complicated in cross-sectional shape, more so than any teeth figured by Stock (1925) from the Rancho La Brea of California. TTU-P 6147 may be an upper first molariform tooth, and TTU-P 6148 and TTU-P 6149 are lobate teeth of uncertain position.

The above teeth have been examined by Dr. David S. Webb, of the University of Florida, who remarked on their similarity to teeth of *Glossotherium chapadmalense* from a Blancan age site (Haile XVA) in Florida.

ORDER LAGOMORPHA

Family LEPORIDAE

Hypolagus sp.

Referred specimens.—Lower P₃ (TTU-P 6150), upper P² (TTU-P 6151, LQ).

The lower premolar is definitely of *Hypolagus*, and is from a small rabbit. It measures 2.5 × 2.3. The anteroexternal valley is deeper than in other specimens of *Hypolagus* of which I have found descriptions or seen specimens; it is nearly as deep as the posteroexternal valley. The tooth may represent a variant of *Hypolagus regalis* Hibbard or an unnamed species. The enamel of both valleys is wrinkled but not crenulated.

The upper premolar is small and simple, with a small labial and a large, open, anterior valley. The tooth could belong to *Pratilepus*, but there is no other evidence of this genus in the Blanco local fauna.

Meade (1945) listed the upper cheek tooth of a rabbit as *Hypolagus* but the tooth is not identifiable even to genus. The tooth is 4.8 wide and from a rabbit larger than the teeth listed above.

The Midwestern University collection contains numerous fragmentary and complete isolated rabbit teeth, including first and second upper incisors, and upper and lower cheek teeth. These are not identifiable, even to genus.

Nekrolagus cf. **progressus** Hibbard

1939. *Pediolagus progressus* Hibbard, Amer. Midland Nat., 21:512.

1939. *Nekrolagus progressus* Hibbard, Amer. Midland Nat., Table of Contents, May 1939. Substitute name for *Pediolagus*, preoccupied.

Referred specimens.—Three P²'s, one P₃ (TTU-P 6473-6476, LQ).

The lower premolar measures 3.2 × 2.7 and has a small anterior valley and an isolated lake. Two of the upper premolars are clearly of this genus, with three distinct, moderately large anterior valleys. Both teeth measure 1.6 × 3.2; in one tooth the enamel of the valleys is crenulated, whereas in the other it is not.

A third upper premolar is hesitantly referred to *Nekrolagus*. There is a small but distinct lingual valley, a very deep anterior (median) valley that turns strongly to the labial side of the tooth, and an indented, crenulated area in place of a labial valley.

ORDER RODENTIA

Family SCIURIDAE

Paenemarmota barbouri Hibbard and Schultz

1948. *Paenemarmota barbouri* Hibbard and Schultz, Univ. Nebraska Mus. Bull., 3:19. Holotype from the Rexroad Formation, Meade County, Kansas.

Referred specimens.—Anterior end of lower jaw with incisors and symphysis (TTU-P 6156, MQ); isolated incisor (TTU-P 6157, CQ), lower incisor (TMM 1176-65), and a fragmentary ramus with part of M_2 and M_3 (TMM 31179-52).

Meade (1945) reported an incisor of the giant ground squirrel (TMM 31176-65) as a beaver tooth (*Procastoroides* sp.). Three years later, the giant ground squirrel was named, and Meade sent the specimen to Hibbard (1950:136-137), who corrected the original identification and also described the jaw fragment. Subsequent authors have sometimes overlooked Hibbard's note and included both *Paenemarmota* and *Procastoroides* as members of the Blanco local fauna. No beaver has been found at the Blanco.

Spermophilus sp. large

Referred specimens.—Fragment of maxilla with alveolus of P^3 and well-preserved P^4 (TTU-P 6158), isolated upper P^4 (TTU-P 6159), 10 isolated teeth (TTU-P 6160-6165, 6612-6615), all LQ; five isolated teeth (TTU-P 6166-6169, 6265, CQ); four isolated teeth (TTU-P 6170-6173, RQ).

The teeth include worn, slightly worn, and unerupted teeth that are mere enamel caps. It is impossible to place some of these teeth in the toothrow. Two upper fourth premolars bear strong resemblance to teeth of *Spermophilus variegatus*, a species living in Texas today. All of the teeth differ from *S. variegatus* in being broader transversely and more slender anteroposteriorly.

Many species of ground squirrels have been described from Blanco faunas of the United States. The larger Blanco teeth may be in the size range of *S. bensoni* (Gidley) from Arizona, *S. rexroadensis* (Hibbard) from Kansas, and *S. finlayensis* (Strain) from far western Texas. Good lower jaws are required for identification.

Spermophilus sp. medium size

Referred specimens.—Five isolated teeth (TTU-P 6174-6178, LQ), five isolated teeth (TTU-P 6179-6183, CQ), seven isolated teeth (TTU-P 6185-6189, 6154-6155, RQ).

The teeth are from a species of ground squirrel about the size of *S. mexicanus* (Erxleben), which lives in the area today, and larger than

S. howelli (Hibbard), from the Rexroad local fauna of Kansas. The cusps and lophs are rather simple. Identification of this species must await the discovery of better material, preferably a good lower jaw.

***Spermophilus* cf. *howelli* (Hibbard)**

1941. *Citellus howelli* Hibbard, Amer. Midland Nat., 26:347. Holotype from the Rexroad Formation of Meade County, Kansas.

Referred specimens.—Four teeth (TTU-P 6190-6193, RQ).

The teeth are the size and have the appearance of teeth of *Spermophilus howelli*. This is the smallest species of ground squirrel in the Blanco collection, and was found only at the Red Quarry. The teeth are approximately the size of teeth of the living *Spermophilus pilosoma*.

Family GEOMYIDAE

***Geomys* sp.**

Referred specimens.—Numerous teeth (TTU-P 6194, 6596-6611, LQ, TTU-P 6195, 6152-6153, 6666-6667, 7492-7499, RQ, TTU-P 6196, 6529-6595, LQ); fragmentary skull (TTU-P 6197, CQ).

Teeth of pocket gophers are outnumbered only by teeth of cotton rats in the Blanco deposits. Upper and lower premolars and molars were found at all three quarries in about equal numbers. Among the specimens purchased from the Carters is the anterior end of a skull with the two incisors still in place in the matrix, but without cheek teeth. In the entire Blanco collection there are no lower jaws.

Incisors and cheek teeth are all from gophers of approximately the same size. The upper incisors have the typical *Geomys* bisulcate pattern. The teeth suggest animals smaller than the modern *Geomys bursarius* and about the size of some of the smaller races of the living *Thomomys*. Dentine tracts are developed on the cheek teeth as in *Geomys*. However, several lower third molars are from immature animals and these show that the unworn enamel cap is longer, and descends farther on the crown, than is the case in modern *Geomys bursarius* of comparable age.

Among the teeth, a lower molar and an upper third molar have the roots closed. Two other molars have the roots markedly constricted and are clearly in a process of closing. In one premolar and several other molars, the root canal is narrowed by a uniform constriction, and further normal growth of these teeth would be unlikely. In most of the teeth, the roots are open, in typical *Geomys* fashion. The teeth may represent two species of pocket gophers, but it is equally likely

that the teeth with constricted or closed roots are from senile individuals. The Blanco *Geomys* may have developed closed roots on the cheek teeth only late in life. Hibbard (1967) noted that the transition from pocket gophers with rooted cheek teeth to ever-growing cheek teeth occurred in pre-Blancan or earliest Blancan times. The tendency toward closure of the roots in the Blanco specimens may represent a persistently primitive character.

Hibbard (*loc. cit.*) gave a detailed account of the pocket gophers of the upper Pliocene and lowest Pleistocene of Kansas, and it is obvious that at least a complete jaw is required for specific identification of these rodents. The Blanco gopher is probably an undescribed species, but identification must await collection of better material.

Family HETEROMYIDAE

***Perognathus cf. rexroadensis* Hibbard**

1950. *Perognathus rexroadensis* Hibbard, Contrib. Univ. Michigan Mus. Paleontol., 8:140. Holotype from the Rexroad Formation of Meade County, Kansas.

Referred specimens.—End of rostrum with incisors (TTU-P6198, CQ), numerous isolated teeth and several fragmentary jaws (TTU-P 6199-6200, 6479, 6516-6527, CQ and TTU-P 6477-78, LQ, TTU-P 6528, RQ).

The material was compared directly with topotypes of *Perognathus rexroadensis*, and no significant differences were detected. It should be noted, however, that teeth and jaws of *Perognathus* offer few characters, other than actual and relative size of teeth, that are diagnostic at the specific level. Pocket mice are common mammals of the deserts and arid plains of southwestern United States and adjacent México today, and more than two species often occur together. The morphological differences between these sympatric species often do not extend to teeth and jaws, the only parts usually found as fossils. It is possible that the specimens from the Blanco actually represent a species different from *P. rexroadensis*.

***Perognathus cf. pearlettensis* Hibbard**

1950. *Perognathus pearlettensis* Hibbard, Contrib. Univ. Michigan Mus. Paleontol., 8:139. Holotype from the Rexroad Formation of Meade County, Kansas.

Referred specimens.—Lower jaw with P₄ (TTU-P 6201, CQ), maxillary fragment with P⁴-M² (TTU-P 6202, RQ); maxillary fragment with P⁴ (TTU-P 6203, CQ); numerous isolated teeth (TTU-P 6204, 6461-6472, LQ; TTU-P 6205, 6432-6448, CQ; TTU-P 7143, 6497-6498, 6487-6494, LQ).

The small pocket mouse is only slightly less common than the large *P. rexroadensis* but is represented by fewer jaws. The specimens have

been compared directly with topotypes of *P. pearlettensis* and are very similar but seem to average a trifle smaller.

***Prodipodomys centralis* (Hibbard)**

1941. *Liomys centralis* Hibbard, Amer. Midland Nat., 26:349. Holotype from the Rexroad Formation, Meade County, Kansas.
 1954. *Prodipodomys rexroadensis* Hibbard, Trans. Kansas Acad. Sci., 57:228. Holotype from the Rexroad Formation of Meade County, Kansas.
 1972. *Prodipodomys centralis* Hibbard, in Skinner *et al.*, Bull. Amer. Mus. Nat. Hist., 148:88.

Referred specimens.—Lower jaw with P₄ and M₂-M₃ (TTU-P 6207, LQ); and numerous isolated teeth (TTU-P 6208, 6235-6237, LQ; TTU-P 6495-6496, RQ).

Kangaroo rats were taken only at the Low and Red quarries. The roots of the premolars are strongly developed and there are no dentine tracts on the sides of the molars. The teeth are moderately hypsodont and resemble teeth of *Prodipodomys centralis* in detail. One isolated molar is from a very young animal and, like the holotype, closely resembles lower molars of young spiny pocket mice, *Liomys*.

Family CRICETIDAE

***Peromyscus* near *kansasensis* Hibbard**

1941. *Peromyscus kansasensis* Hibbard, Amer. Midland Nat., 26:352. Holotype from the Rexroad Formation of Meade County, Kansas.

Referred specimens.—Maxillary fragment with M¹-M² (TTU-P 6209, LQ); M¹ (TTU-P 6210, LQ); two M₃ (TTU-P 6211-6212, CQ).

The teeth are the size of those of *Peromyscus kansasensis*, but a lower jaw will be required for reliable identification. The few specimens do show the presence of a large deer mouse in the fauna.

TTU-P 6212 (CQ) is a lower third molar of a much smaller kind of *Peromyscus* or a *Bensonmys*.

***Reithrodontomys* sp.**

Referred specimen.—Isolated upper first molar (TTU-P 6213, LQ).

Hibbard (personal communication) examined this tooth and referred it to *Reithrodontomys*, stating "lingual root not as broad anteroposteriorly as in *Baiomys*. It has no labial root as in *R. megalotis* or *R. montanus*, or most fossil forms I have."

***Baiomys* sp.**

Referred specimen.—Upper first molar (TTU-P 6214, CQ).

Baiomys is known from several Blancan local faunas. The single tooth is not specifically identifiable.

Bensonomys sp.

Referred specimen.—Upper first molar (TTU-P 6215, CQ).

Bensonomys is a typical Blancan genus, known from numerous Blancan local faunas. The genus is extinct. The single tooth is not specifically identifiable.

Onychomys sp.

Referred specimen.—Upper first molar (TTU-P 6216, CQ).

The tooth is from a very small species of grasshopper mouse, smaller than the living *O. leucogaster* or *O. torridus*. Dr. Hibbard has examined the specimen and remarked that it is the size of the smallest *Onychomys gidleyi* Hibbard, from the Rexroad Formation of Kansas. Reference to a species on the basis of one tooth is impractical.

Neotoma cf. quadriplicatus (Hibbard)

1941. *Parahodomys quadriplicatus* Hibbard, Amer. Midland Nat., 26:356. Holotype from the Rexroad Formation of Meade County, Kansas.
1967. *Neotoma quadriplicatus*, Hibbard, Papers Michigan Acad. Sci., Arts and Letters, 52:125.

Referred specimen.—Lower second molar (TTU-P 6217, LQ).

The enamel is thick, and the pattern is typical of woodrats from the Rexroad Formation of Kansas and the Beck Ranch local fauna of Scurry County, Texas. Scarcity of woodrats in the Blanco may indicate scarcity of cliffs and talus in the vicinity when the deposits were forming.

Sigmodon medius Gidley

1922. *Sigmodon medius* Gidley, U.S. Geol. Surv. Prof. Papers, 131:126. Holotype from the Benson local fauna of Arizona.

Referred specimens.—Lower jaw fragment and 43 isolated teeth (TTU-P 6218-6234, 6238-6264, RQ); numerous isolated teeth from CQ (TTU-P 6266, 6480-6486) and LQ (TTU-P 6267, 6449-6460).

The little cotton rat is almost ubiquitous in the Blanco sediments. Nearly every prospect site, if it yielded microvertebrate fossils at all, had *Sigmodon*. Usually, the cotton rat was the only species present. Dr. Claude Hibbard and Dr. Robert A. Martin have examined teeth from the Blanco and agree that the species is *S. medius*.

ORDER CARNIVORA

Family CANIDAE

Canis lepophagus Johnston

1938. *Canis lepophagus* Johnston, Amer. J. Sci., 5th ser., 35:383. Holotype from the Cita Canyon local fauna of Texas.

Referred specimens.—Lower jaw fragment with P₃-P₄, held together largely by matrix (TTU-P 6268) and numerous isolated teeth (TTU-P 6209), all RQ; tibia lacking the proximal end (TTU-P 6270), pick-up on surface.

Canis lepophagus is the Blancan ancestor of the modern coyote. The differences between the known specimens and equivalent parts of the modern coyote are numerous but minor (Bjork, 1970), and isolated teeth are not identifiable.

Meade (1945) predicted the presence of *Canis* in the Blanco local fauna, but the only material thus far obtained includes the listed teeth, belonging to at least one puppy and one adult, recovered in the lower part of a thick layer of diatomite. Bone associated with the teeth had been crushed flat and reduced to a powder. The tibia is of a mature coyote but is small. Hibbard (personal communication) found it slightly smaller than any coyote tibias at the University of Michigan, and the bone is smaller than that of any of 25 skeletons in the Mid-western University collection, although some female skeletons have tibias nearly as small.

Borophagus diversidens Cope

1892. *Borophagus diversidens* Cope, Proc. Acad. Nat. Sci. Philadelphia, 44:326. Holotype from the Blanco.

Referred specimens.—A skull, jaws and partial skeleton (MU 8034) of a young adult from the Carter Quarry, isolated bones and teeth (Dalquest, 1969: 118).

The above material has been described elsewhere (Dalquest, 1969), and the taxonomic history and status of the species discussed.

The big bone-eating dog must have been common when the Blanco deposits were forming. A number of uncatalogued scraps from other quarries attest to the distribution of the species throughout the deposits. The countless thousands of chips and fragments of bone from horses, camels, and other large mammals seem to have been derived largely from the feeding of *Borophagus*. In every quarry, many bone chips bear distinct marks made by the teeth of large scavengers, doubtlessly mainly *Borophagus*.

Family MUSTELIDAE

Canimartes cumminsi Cope

1893. *Canimartes cumminsi* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 52. Holotype from the Blanco.

Canimartes cumminsi was a moderately large mustelid. The holotype includes the posterior parts of a skull with jaws and molar teeth (Cope, 1893), parts of which are still preserved in the collection of the University of Texas. Other forms and specimens have been referred from time to time to the genus *Canimartes* but later removed to other mustelid genera (Gazin, 1937; Zakrzewski, 1967). *Canimartes* seems to be a monotypic genus, still known only from the holotype.

Spilogale rexroadi Hibbard

1941. *Spilogale rexroadi* Hibbard, Amer. Midland Nat., 26:342. Holotype from the Rexroad Formation of Meade County, Kansas.

Referred specimens.—Lower jaw fragment with M₁ (TTU-P 6271 CQ), upper M¹, canine and incisor (TTU-P 6272-6274 CQ), probably belonging to one individual.

This diminutive spotted skunk was described from the Rexroad local fauna of Meade County, Kansas, and later reported (Dalquest, 1972a) from the late Pliocene Beck Ranch local fauna of Scurry County, Texas. The Blanco specimens are tiny, but are a trifle larger than the holotype and Scurry County teeth. The lower carnassial is 5.7 long, versus 5.2 for the holotype and 5.6 for each of the Scurry County specimens. Other Kansas teeth range from 5.3 to 6.0 in length. The upper first molar measures 4.1 along the labial edge, versus 3.8 in the upper molar from the Beck Ranch, and 5.4 wide versus 4.9 in the Beck Ranch tooth. The upper molar is also a bit more "notched" on the labial edge, and more constricted medially, but these features are variable in spotted skunks. The teeth of *Spilogale rexroadi* are smaller than those of living forms of *Spilogale*, other than the tropical species, *S. pygmaea* Thomas. The Blanco is the third record station for the species.

Family HYAENIDAE

? Chasmaporthetes johnstoni (Stirton and Christian)

1940. *Ailuraena johnstoni* Stirton and Christian, J. Mamm., 21:445. Holotype from the Cita Canyon local fauna of Texas.
1941. *Chasmaporthetes johnstoni* Stirton and Christian, J. Mamm., 22:198. (*Ailuraena* referred to genus *Chasmaporthetes* Hay).

Referred specimen.—Upper first molar (TTU-P 6275, RQ).

The upper molars of *Chasmaporthetes* are unknown, but the referred tooth is utterly different from that of any known North American carnivores. It most closely resembles the upper first molars of some of the Old World viverrids, such as the larger mongooses. The tooth is much larger, of course, measuring about 8.9×17.4 . The crown is somewhat eroded, which makes exact measurement difficult. One external root, presumably the posterior, is smaller and more lingually placed than the other external root, and the tooth is presumably from the right side of the jaw. The tooth shows moderate wear, and the kind of wear is like that exhibited in mongooses with moderately worn teeth.

Family FELIDAE

Felis cf. *lacustris* Gazin

1933. *Felis lacustris* Gazin, J. Mamm., 14:251. Holotype from the Hagerman local fauna of Idaho.

Referred specimens.—Ulna lacking top of olecranon (TTU-P 6276, RQ), radius (TTU-P 6277, MQ), and left second metacarpal (TTU-P 6278, MQ).

Felis lacustris was a cat intermediate in size between the puma and the lynx. It is known from numerous specimens representing much of the skeleton from Idaho (Bjork, 1970), and is also recorded from the Rexroad local fauna of Kansas. There are specimens from the Beck Ranch local fauna of Texas in the Midwestern University collection that closely match the fossils from the Blanco. The radius of *F. lacustris* is uniquely straight and flat anteriorly, as noted by Bjork (1970), a character shared by the radii from the Beck Ranch and the Blanco. Without dentitions, however, the identity of the Blanco cat must remain provisional.

The metacarpal resembles that of a puma but is very straight. Measurements are: greatest length, 96.3; proximal end, 15.0×8.9 ; midshaft, 10.2×8.5 ; distal end, 13.1×11.8 .

Felis (Dinofelis) palaeoonca Meade

1945. *Panthera palaeoonca* Meade. Univ. Texas Publ., 4401:521. Holotype from the Blanco.

Referred specimens.—Left fourth metatarsal lacking distal tip (TTU-P 6279) and upper left carnassial (TTU-P 6280), both MQ.

The holotype is a skull and associated lower jaws. Meade noted that the skull and mandible resembled those of the modern jaguar but that the teeth were longer, especially the carnassial (Savage, 1960).

The isolated carnassial listed is beautifully preserved. It is about the size of large jaguar carnassials in the Midwestern University col-



FIG. 5.—*Felis (Dinofelis) palaeoonca* Meade, upper left carnassial (TTU-P 6280) in labial view, showing ectoparastyle.

lection and a bit smaller than the carnassial of the holotype of *F. palaeoonca* (30.0 versus 33.0 in holotype). The tooth differs markedly from the upper carnassial of other large modern cats in the much longer blade of the metacone (12.2), with the consequent shortening of the anterior part of the tooth. There is also a distinct accessory cusp (ectoparastyle) at the anterior external corner of the tooth that is rare in modern jaguars.

The metatarsal is the size of the fourth metatarsal of a lioness, and is referred to *F. palaeoonca* on the basis of its size. It is relatively too slender to have belonged to a sabertooth cat. The proximal diameter is 19.4×15.4 ; midshaft 12.7×11.3 .

Kurten (1972) has placed *Felis palaeoonca* in the Old World genus, *Dinofelis* Zdansky. The relationship of *F. palaeoonca* to cats presently placed in *Dinofelis*, as pointed out by Kurten, seems convincing. However, the magnitude of the differences separating *Felis* from *Dinofelis* seems to be more on the order of those separating subgenera than of those separating genera.

The flattened upper canine of *P. palaeoonca* seems to be distinctive, as is the elongated metacone of P^4 . However, an ectoparastyle, lacking in the holotype of *P. palaeoonca*, is present in TTU-P 6280. An ectoparastyle is present in some specimens of *Panthera onca*, *con.* Kurten (1972:4).

? Homotherium

Referred specimen.—Basal portion of a canine tusk (TTU-P 6281, MQ).

Only the basal half of the tusk was present. The greatest diameter is 29.0×13.6 . The fossil compares closely with *Ischyrosmilus* and *Homotherium* but is not actually identifiable. The base of the tusk

is thicker and more curved than that of *Machiarodus* from the Coffee Ranch local fauna (Hemphillian) of Texas.

ORDER PROBOSCIDEA

Family GOMPHOTHERIIDAE

Rhynchotherium praecursor (Cope)

1893. *Tetrabelodon shepardii*, Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 57
 1893. *Dibelodon praecursor* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 62.
 1923. *Rhynchotherium falconeri* Osborn, Amer. Mus. Novit., 99:1-4.
 1935. *Serridentinus praecursor*, Osborn, Proc. Nat. Acad. Sci., 21:404-412.
 1936. *Serbelodon praecursor*, Osborn, Proboscidea, 1:1-802.
 1955. *Mammut* [*praecursor*], Johnston and Savage, Univ. California Publ. Geol. Sci., 31:51-74.
 1972. *Serbelodon* (?) *praecursor*, Skinner and Hibbard, Bull. Amer. Mus. Nat. Hist., 148:1-148.

The presence of inferior-tusked mastodons in the Blanco has been known since Cope (1893) figured a lower jaw and referred it to *Tetrabelodon shepardii* Leidy. The second molar of the jaw was greatly worn and the third molar moderately worn. In the same paper, Cope figured and described an unworn third lower molar of a mastodon, lacking the anterior crest, as the holotype of a new species, *Dibelodon praecursor*. Later, Osborn (1923) made the lower jaw figured by Cope, the holotype of a new species, *Rhynchotherium falconeri*, and this apparently has been accepted by all workers to the present time. The isolated molar has had varied treatment. Osborn (1935) placed it in the genus *Serridentinus*, but the following year changed his mind and put it in *Serbelodon*, calling it an upper, not lower, third molar. Johnston and Savage (1955:37) thought Cope's *Dibelodon praecursor* referable to the genus *Mammut*, *sensu lato*, but Skinner *et al.* (1972) returned questionably to Osborn's combination, *Serbelodon praecursor*.

Thus, both the lower jaw and the isolated molar, figured and described by Cope more than 80 years ago, have ever since been placed in separate genera and species. Actually, as a careful examination of Cope's figures shows, the isolated molar and the third molar in the lower jaw are similar. The molar in the jaw is much worn anteriorly, and figured one-half natural size. The isolated molar is figured full size, and is unworn. However, it is apparent that the unworn molar, when worn to the level of the occlusal surface of the molar in the jaw, would have almost exactly the same size and enamel pattern. In May 1973, I was able to examine the type of *Dibelodon praecursor* at the University of Texas and compare it with a cast of the holotype (jaw) of *Rhynchotherium falconeri*. The molar of *R. falconeri* is a few

millimeters longer, a few millimeters broader anteriorly, more tapered posteriorly, and narrower at the posterior end than is the molar of *D. praecursor*. The differences are minor and scarcely obvious to the naked eye. In both teeth, there were five crests, the anterior worn away in the holotype of *R. falconeri* and broken away in that of *D. praecursor*. In both teeth, the fifth crest consists of only two cusps. In the holotype of *R. falconeri*, the two cusps are simple and of approximately equal size. In the holotype of *D. praecursor*, the external cusp is larger than the internal and would develop a trace of an anterior spur when at the proper stage of wear. In the major crests, the patterns of the two teeth are almost identical, both having simple ectotrefolds and short transverse ridges lingually. The crests are high and wedge shaped in lateral view. The valleys are deep, and at the bottom of each valley, on the lingual side, is a single tiny tubercle. In the holotype of *R. falconeri*, the tubercle between second and third crests is the largest; in the holotype of *D. praecursor*, the tubercle between the third and fourth cusps is the largest.

Cope (1893) stated that the holotype tooth of *Dibelodon praecursor* had deposits of "cementum" in the valleys, and this statement was repeated by Osborn (1936). This "cementum" has since been almost completely removed but enough remains to show that it was the smooth, marly, yellowish-tan material that occasionally adheres to teeth and bones from the Blanco. For example, one camel jaw in the Midwestern University collection is almost completely invested in the material. It is an adventitious, inorganic deposit, not cementum.

The only differences separating the holotypes of *Dibelodon praecursor* and *Rhynchotherium falconeri* are minor details. The differences are far less than one would expect in the range of variation in a single species of proboscidian. The two nominal species represent a single biological species, for which the proper name is *Rhynchotherium praecursor* (Cope).

Meade (1945) referred two molars (TMM 31177-1, 31177-23) to *Rhynchotherium falconeri*, but Johnston and Savage (1955) referred the same teeth to *Mammot*, *sensu lato*. I have studied these teeth. They are right and left lower third molars, so similar in details that they appear to be mirror images of each other. Doubtless, they are teeth of a single individual. The teeth are enamel caps only, with dentine undeveloped. There are four major crests, relatively high and wedge shaped. The first four crests have simple trefolds externally and short ridges internally. They are the size of, and have the enamel pattern of, the holotypes of *D. praecursor* and *R. falconeri*. The only differences of note are the presence of three cusps in the posterior (fifth) crest rather than two and stronger development of the small

cusps in the lingual valleys. The differences are minor and well within the range of variation to be expected in a species of proboscidian. I agree with Meade that these teeth are *Rhynchotherium*.

Osborn (1936) treated the Blanco mastodons in a hasty manner, as noted by Meade (1945). In the account of *Serbelodon praecursor*, Osborn refigured three of Cope's drawings. The caption stated that the illustrations are of "three referred teeth from the Blanco of Texas." In fact, there are only two teeth, the two left-hand figures being occlusal and lateral views of the same tooth. However the two teeth do have simple ectotrefolds and the internal halves of the crests are simple transverse ridges. Probably they are the second lower molars of *Rhynchotherium praecursor*.

Although Cope (1893) referred these teeth, perhaps by accident or error, to *Dibelodon tropicus*, it is clear that he intended a lower jaw to be the holotype of that species. Thus *Dibelodon tropicus* is a synonym of *Stegomastodon successor* (Cope), not *Rhynchotherium praecursor* (Cope).

***Stegomastodon mirificus* Leidy**

1858. *Stegomastodon mirificus* Leidy, Proc. Acad. Nat. Sci. Philadelphia, 10:11. Holotype from uncertain locality in Nebraska.
1892. *Mastodon successor* Cope, Proc. Acad. Nat. Sci. Philadelphia, 44:227. Holotype from the Blanco.
1893. *Dibelodon humboldtii*, Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 62, in part.
1893. *Dibelodon tropicus* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 62, in part.
1924. *Stegomastodon texanus* Osborn, Amer. Mus. Novit., 154:3. Holotype from the Blanco.
1936. *Stegomastodon successor*, Osborn, Proboscidea, vol. 1, American Mus. Press, p. 671.
1955. *Stegomastodon mirificus*, Savage, Univ. California Publ. Geol. Sci., 31:54.

Referred specimens.—Four lower jaws or jaw rami (TTU-P 6184, MU 7103, MU 7122, MU 8927); three fragmentary tusks (TTU-P 7203-7204, MU 8927); 15 isolated separately catalogued cheek teeth (TTU-P 6648-6662); and numerous postcranial elements (all LQ). Also, material at the University of Texas (see Meade, 1945:523-524).

Mastodons of this genus have relatively short jaws with a short, down-turned, spoutlike groove for the tongue in the lower jaw symphysis, lack lower tusks, and have slender, rounded, upper tusks without enamel. The cheek teeth are bunodont, the cusps, when unworn, appearing as rounded cones. There are six or more transverse crests on the third molars.

The enamel pattern of the teeth is extremely variable. In the holotype of *Stegomastodon successor* (Cope), from the Blanco, the teeth are quite simple, with simple trefoils and a few isolated, simple intermediate cones. In the holotype of *Stegomastodon texanus* Osborn, also from the Blanco (Osborn, 1924), the enamel pattern of the molars is extremely complicated. Meade (1945) stated that "the posterior ridges and cones not only become progressively larger with advancing age of the individual, but that posterior accessory conelets and cones are added as well, during and after eruption of the tooth." Meade was referring, of course, only to the third molars, in which the posterior part of the tooth is still deep in the jaw, and enamel might still be formed here, while the anterior edge of the tooth has erupted. It seems reasonable that some additional enamel might be added to the posterior end of a third molar after the front edge is in use, but more than this is involved. Some unerupted third molars have extremely complicated enamel patterns, such as the M³ illustrated by Savage (1955) from Cita Canyon, Texas, and some teeth in the University of Texas collection. Furthermore, a range of variation almost equal to that seen in the third molars is seen also in M¹ and M², and in these short teeth, it is not possible that enamel might be added after eruption.

Meade (1945) placed *Stegomastodon texanus* Osborn in the synonymy of *Stegomastodon successor* (Cope), and I agree that the range of variation in teeth in *Stegomastodon* jaws and undoubted isolated *Stegomastodon* teeth from the Blanco encompasses the characters of the two nominal species. Savage (1955), after a study of the *Stegomastodon* material from the Cita Canyon local fauna, referred all specimens from both Cita Canyon and the Blanco to *Stegomastodon mirificus* (Leidy) described from Nebraska. I am following Savage, with some hesitation. The species of *Stegomastodon* from the middle Pleistocene of Texas, as from the Seymour Formation (Hibbard and Dalquest, 1966), remains to be determined. It is probably distinct from the Blanco species.

Stegomastodon is represented by good material from the Blanco. In addition to the holotype jaws of *S. successor* and *S. texanus*, there are two lower jaws with the cheek teeth of both sides and a jaw ramus with the teeth and symphysis in the Midwestern University collection, and Meade (1945) listed "several partial skulls and mandibles" in the University of Texas collection.

Probably, some 100 or more isolated mastodon teeth from the Blanco are preserved in collections. Those with very complicated enamel patterns are doubtless *Stegomastodon*, and most of those with

simpler patterns probably are also. However, in view of the known presence of mastodons other than *Stegomastodon* in the Blanco local fauna, these teeth must be considered with caution.

The tusks of the Blanco *Stegomastodon* are known from a number of specimens in the University of Texas collection and three in the Texas Tech University collection. The tusks of the adult are relatively small and slender, round in cross-section, and gently but uniformly curved, and lack enamel. However, the tusk of an immature specimen (MU 7122) found close to, and doubtless belonging to, the same individual as does a lower jaw (MU 7103), has a small area of enamel at the tip. The distal part of the tusk is curiously worn and abraded, probably from contact with the trunk of the animal. The tip is worn away in an irregular fashion, but enamel is present where the tusk had a diameter of about one inch.

In the University of Texas collection is the tip (about four inches long) of the tusk of a juvenile mastodon (TMM 31195-10). It is round in cross-section and completely covered with enamel. This tusk too is probably that of *Stegomastodon*, and it appears that *Stegomastodon*, like some other proboscidians without enamel on the tusk of adults, had enamel-covered tusks when very young.

Undetermined mastodon material

Meade (1945) mentioned three lower third molars of mastodons that he thought might be referable to a species of *Rhynchotherium* but not *R. falconeri* (*R. praecursor*). The identification of these and some other mastodon teeth from the Blanco cannot be determined until similar teeth are found in jaws.

One tooth germ (TTU-P 6663) deserves special mention. It is probably an upper or lower second molar. The three major crests are formed by slender, elongated cusps that appear almost fingerlike in lateral view. Near their bases the cusps are somewhat wrinkled but it is obvious that no true trefoil pattern would be formed with wear. There are a few, small, intermediate conules between the large external and internal cusps of each major crest. The fourth crest consists of a row of anteroposteriorly flattened, rather triangular, cusps with strong posterior inclination. This crest forms a fringelike row, bent away from the other crests. This tooth is certainly not *Stegomastodon* and is probably not *Rhynchotherium*, although no teeth other than lower third molars and the greatly worn M_2 in the holotype have been referred definitely to *Rhynchotherium praecursor*. The crests are unlike the wedge-shaped crests of the genus *Mammut*.

This tooth probably represents a kind of mastodon other than *Stegomastodon* or *Rhynchotherium*.

Also representing another kind of mastodon is a tiny tusk in the University of Texas collection (TMM 3179-35). As preserved, the tusk is 88 millimeters long, but the proximal part is broken away. It is straight and round-oval in shape, and clearly is the inferior tusk of a mature mastodon. The tip is worn flat, and at the wear facet measures about 10×8 . The distal 20 millimeters are covered by heavy enamel but there is only dentine posterior to the abrupt termination of the enamel. The tusk on one side, probably the medial side, posterior to the enamel-covered tip, is worn by abrasion of the trunk or tongue. The tusk is not from *Rhynchotherium*, which has a flat inferior tusk covered with enamel on the upper side, or *Stegomastodon*, which has no inferior tusks.

There is evidence, then, that one or more kinds of mastodons other than *Rhynchotherium* and *Stegomastodon* were part of the Blanco local fauna, but identification must depend on discovery of lower jaws.

ORDER PERISSODACTYLA

Family EQUIDAE

***Nannippus phlegon* (Hay)**

1893. *Equus minutus* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 67. Holotype from the Blanco.
1899. *Equus phlegon* Hay, Amer. Geol., 24:345-349. Replacement name for *E. minutus* Cope.
1926. *Hipparion (Nannippus) phlegon*, Matthew, Quart. Rev. Biol., 1:139-185.
1936. *Nannippus phlegon*, Gazin, Proc. U.S. Nat. Mus., 83:281-320.

Referred specimens.—Lower jaws with complete dentition (TTU-P 6282, RQ, figured by Dalquest and Donovan, 1973); left lower cheek-tooth series (TTU-P 6283, RQ); associated right P²-P⁴, left P²-M¹, (separately numbered TTU-P 6284-6289, 6206, RQ); three associated upper teeth (TTU-P 6290, RQ); two worn associated upper teeth (TTU-P 6293, RQ); 37 isolated upper (TTU-P 6294-6330) and 34 isolated lower (TTU-P 6331-6362, 6291-6292) cheek teeth; a few postcranial elements.

Cope (1893) figured the tooth that is the holotype of the species, and the tooth is still preserved in the collection of the University of Texas. Matthew (1926) mentioned finding "skulls, feet, etc." at the Blanco in 1924. This material has never been figured. Dalquest and Donovan (1973) figured an excellent pair of lower jaws from the Blanco.

Nannippus phlegon seems to be the most highly specialized of the late Pliocene and earliest Pleistocene species of *Nannippus*. All of

the more complete material and most of the isolated teeth came from the diatomite layer of the Red Quarry or the lacustrine deposits immediately beneath it. *Nannippus* may have fed extensively on the succulent vegetation of reeds, grasses, and other semiaquatic species inasmuch as most of the fossils found were associated with fossilized remains of aquatic plants. Here, *Nannippus* was the most common species of large mammal, although remains of *Equus simplicidens* and ground sloths also were present. Elsewhere, remains of *Nannippus* were rare.

***Equus (Dolichohippus) simplicidens* Cope**

1892. *Equus simplicidens* Cope, Proc. Amer. Phil. Soc., 30:124. Holotype from the Blanco.

1972. *Equus (Dolichohippus) simplicidens*, Skinner *et al.*, Bull. Amer. Mus. Nat. Hist., 148:1-147.

Referred specimens.—Six lower jaws with teeth, all more or less fragmentary (TTU-P 6363-6364, CQ; TTU-P 6365-6366, RQ; TTU-P 6367-6368, MQ), 23 upper (TTU-P 6369-6391) and 12 lower (TTU-P 6392-6403) cheek teeth; numerous postcranial elements.

Cope (1893) reported that remains of this large horse were "abundant" in the Blanco, and it is true that scraps of horse teeth are widely scattered in the deposits. This results in large part from the resistant, hard nature of horse teeth. Complete bones and teeth are uncommon. Matthew (1924a) mentioned two partial skeletons and a skull (briefly described) from the Blanco; the skull, upper dentition, and limb bones were figured later (Matthew, 1926). However Meade (1945) reported only two maxillaries, a lower jaw fragment, and isolated teeth and bones. The Midwestern University material includes only one lower jaw ramus with well-preserved teeth. The others, and especially the jaw fragments and teeth from the Red Quarry, are poorly preserved.

As compared with Pleistocene species of *Equus*, the teeth of *E. simplicidens* are relatively short crowned. The highest of the 26 upper cheek teeth measures, from the notch between the roots to the top of the protocone, about 80 millimeters. A few show considerable curvature similar to, but less than, the curvature often seen in the upper teeth of *Pliohippus*. The protocones are relatively short and wide but are large. The upper dentition is quite *Pliohippus*-like. In the lower molars, the valley between the protoconid and hypoconid invariably penetrates between the metaconid and metastylid. In the premolars, the metaconid and metastylid are pillared. The valley between metaconid and metastylid of the lower cheek teeth is usually V shaped or flat bottomed with angular sides. It is not U shaped.

***Equus cumminsi* Cope**

1893. *Equus cumminsi* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 67. Holotype from the Blanco.

Referred specimens.—Upper M³ (TTU-P 6407, MQ), lower cheek tooth (TTU-P 6408, RQ), lower cheek tooth (TTU-P 6409, RQ), articulated phalanx 1 and 2 (TTU-P 6410, RQ).

This species was described from three broken upper teeth, two of which were figured (Cope, 1893). Distinguishing characters are relatively small size (as compared to *E. simplicidens*) and simple enamel lakes of the upper teeth. The teeth are low crowned and seemingly from aged animals, although Cope (*op. cit.*, 67) claimed that the supposed diagnostic characters were not due to age, and were shown also by the third, unfigured, specimen, with a crown 47 millimeters long.

Hibbard (1938) and Meade (1945) thought that the small size and simple enamel pattern of the holotype teeth resulted from wear and that the teeth were from aged individuals of small-sized *Equus simplicidens*. However, Hibbard (1944) later abandoned this opinion and referred a lower jaw of a horse from Kansas to *Equus cf. cumminsi*. Others (for example, Strain, 1966) have also referred specimens to this species.

Study of the Blanco horse material convinces me that there is a species represented that is smaller than, and distinct from, *Equus simplicidens* but still a primitive form of *Equus*. Some of the type material of *E. cumminsi* still is preserved in the collection of the University of Texas. The tooth marked "type" is the one figured by Cope (1893, pl. 23, fig. 1). It is badly broken, weathered, and greatly worn. The very simple enamel lakes described by Cope probably do result from senility. However, the tooth is very small, anteroposterior length, as preserved, 24.2 (measurement taken May 1973). It is scarcely conceivable that a molar of *E. simplicidens* could be so small. Inasmuch as there is better evidence of the presence of a small species of *Equus* in the Blanco fauna, the tooth doubtless is a worn tooth of this small species, and the name *Equus cumminsi* is valid.

In the University of Texas collection, there is a set of three lower teeth (TMM 31166-3), stored together under one number and similar in color and state of preservation. They are almost certainly from one individual horse and probably are P₃, M₁, and M₂, although the premolar might be P₄. The largest tooth is as large as a molar, but not as large as a premolar, of *Equus simplicidens* and is probably a P₃. The next-largest tooth is markedly smaller than the P₃ and is probably M₁. The P₄, apparently missing, should be intermediate in size between these two teeth. The smallest tooth is very small and must be

M₂. In none of these three teeth does the valley between protoconid and hypoconid penetrate between metaconid and metastylid, although it approaches the junction in the presumed M₂. In neither of the two larger teeth, at least one of which must be a premolar, are the metaconid-metastylid strongly pillared, as are the premolars of *E. simplicidens*.

Of the two lower teeth in the Midwestern University collection, TTU-P 6408 measures 24.1 × 13.9, and the protoconid-hypoconid valley reaches, but does not enter, the metaconid-metastylid isthmus. The crown height is about 38. Number TTU-P 6409 measures 24.4 × 13.9; crown height, 35. Again the protoconid-hypoconid valley approaches, but does not enter between, the metaconid-metastylid isthmus. Both of these teeth are so small that they must be worn molars, but in the molars of *E. simplicidens*, even in specimens as greatly or more greatly worn, the protoconid-hypoconid valley penetrates deeply between metaconid and metastylid. These two lower teeth are referred to *E. cumminsi*.

In the lower part of the diatomite at the Red Quarry, the articulated proximal and medial phalanges of a horse were discovered, and nearby was a partial splint bone. The toe bones are much larger than those of *Nannippus* but are smaller than those of *Equus simplicidens*. Diameters of the proximal ends of the largest *Nannippus* (TTU-P 6411), *E. cumminsi* (TTU-P 6412), and smallest *E. simplicidens* (TTU-P 6413) proximal phalanges from the Blanco are, respectively: 21.2 × 23.8; 30.0 × 40.8; 32.1 × 49.5. The length of the *Nannippus* bone is 48.8; that of the *E. simplicidens*, 78.5. The distal end of the *E. cumminsi* proximal phalanx (TTU-P 6412) is greatly eroded and partially missing, but the estimated length is about 85. Measurements of *Nannippus* (TTU-P 6413), *E. cumminsi*, and *E. simplicidens* (TTU-P 6414) medial phalanges are: proximal diameter, 18.5 × 23.8; 26.8 × 38.9; 30.0 × 45.7; greatest length, 28.8, 42.6, 48.0.

Also found is an upper third molar from the Marmot Quarry. The tooth is low crowned (36 high) but not excessively worn. The lakes are simple, the styles are strong. The protocone is elongated (10.1 long) and slender, as the protocones of *E. simplicidens* almost never are. The tooth is very small (24.0 × 22.6). It, too, is referable to *E. cumminsi*.

Equus cumminsi has been referred by several workers to the subgenus *Asinus* but the only material representing the species consists of the teeth and toe bones listed in this account and questionably referred lower jaws from elsewhere than the Blanco. Reference to subgenus must await better topotypical material.

ORDER ARTIODACTYLA

Family TAYASSUIDAE

Platygonus bicalcaratus Cope

1893. *Platygonus bicalcaratus* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 68.
Holotype from the Blanco.
1903. *Platygonus texanus* Gidley, Bull. Amer. Mus. Nat. Hist., 19:476. Holotype from the Blanco.

Referred specimens.—Partial skull, shattered and lacking portions posterior to orbits but dentition complete except for incisors and right M^3 (TTU-P 6415, CQ); posterior half of right lower jaw with P_4 - M_3 (TTU-P 6416, CQ); lower jaw fragment with M_2 - M_3 (TTU-P 6417, LQ); right jaw ramus of piglet with DP_2 - DP_4 and crown of unerupted permanent M_1 (TTU-P 6418, CQ); articulated front leg from radius-ulna to hoofs (TTU-P 6419, CQ); articulated hind leg from middle of tibia to hoofs, lacking tip of one metatarsal and two phalanges (TTU-P 6420, CQ); numerous isolated tusks, teeth and postcranial elements (TTU-P 6630-6647, 6665, 6669-6692).

This species was described on the basis of a tooth fragment. Gidley (1903a) figured two fine palates from the Blanco, referring one of them to Cope's species and describing the other as a new species. Meade (1945) described additional material and showed that some of the characters considered diagnostic by Gidley were individual variants but still thought that there were two species in the Blanco. Hibbard and Riggs (1949) found that the characters thought diagnostic by Meade were also variable and referred Gidley's *Platygonus texanus* to *P. bicalcaratus*. The characters of both *P. bicalcaratus* and *P. texanus*, as listed by Gidley and by Meade, are apparent in the present collection. Some unerupted teeth have very high cusps, whereas others have relatively low ones. Some have the major cusps quite close together; in others the cusps are well separated. Some teeth do show the tapirlike features mentioned by Gidley. Extreme variation is apparent in all characters mentioned, including the relative development of the heel of M^3 and M_3 . The large size of the Blanco peccary tends to accentuate the variation in dental features.

Few writers have emphasized the large size of *P. bicalcaratus* and the variation in size of adults. The largest ones are doubtlessly males, and the largest specimen (jaw fragment, TTU-P 6417) has an M_3 that measures 33.5×17.5 . Jaws with the M_3 less than 25 are probably those of females.

The jaw of an infant pig has the milk dentition almost unworn and the permanent M_1 crown completely developed but not erupted. DP_2 - DP_4 measures 38.6; DP_2 , 8.7×5.4 ; DP_3 , 11.3×6.7 ; DP_4 , 19.1×10.2 .

In the gray clay at the Carter Quarry, two incomplete, articulated peccary legs were found. One was a front leg and one a back. They were several yards apart but on the same level and might not have come from the same individual. They are from individuals of similar size and are probably from females.

The tip of the olecranon is missing from TTU-P 6419, but the greatest length of the radius-ulna was about 210. The conjoined metacarpals measure: greatest length, 95.4; proximal end, 17.2 × 30.0; midshaft, 12.1 × 23.5; distal end, 17.4 × 33.8. The proximal phalanges measure: greatest lengths, 38.6, 39.6; medial phalanges, 27.7, 29.0; unguis phalanges, 33.3, 35.5.

In the back leg (TTU-P 6420), the proximal half of the tibia, the tip of the external metatarsal, and external phalanges one and two are missing. The unguis phalanges are slightly damaged. Selected measurements are: metatarsal, greatest length, 104.1, proximal end, 24.0 × 27.0, midshaft, 13.7 × 21.9, distal end, ?; greatest length of calcaneus, 79.9; astragalus, 42.3; proximal phalanx, 40.5; medial phalanx, 28.4.

Family CAMELIDAE

Remains of four, possibly five, kinds of camels have been found at the Blanco. Material representing the giant camel, *Titanotylopus spatulus*, includes nearly complete skulls, lower jaws, and a skeleton. A small, slender-limbed camel, *Tanupolama blancoensis*, is known from a skeleton (Hibbard and Riggs, 1949), lower jaws, and isolated elements. The little camel is rare but fossils are distinctive and easily recognized. A third species of camel is moderately large and has the advanced dental characters of the Pleistocene genus *Camelops*. This taxon is rare and is known definitely only from lower jaws. The fourth kind of camel, apparently known only from limb elements, has caused much confusion and speculation. This large, exceedingly long-limbed camel seems to be confined to the Blanco local fauna.

Meade (1945) first recognized the presence of the long-legged camel fossils in the Blanco. However, Matthew, in 1924, had found the skeleton of a small camel with long, slender limbs at the Blanco and proposed, in manuscript, new generic and specific names for the specimen. The manuscript was never published, and Meade had never seen the skeleton. Meade supposed the skeleton to be the large, long-legged species and used Matthew's name, *Leptotylopus percelsus*, for the large, slender limb bones he had found; but as used by Meade, the name remains a *nomen nudum*. Hibbard and Riggs (1949) later examined the skeleton collected by Matthew and found it to belong to

the small camel, *Tanupolama blancoensis*, named by Meade (1945) in the same paper where he had used the name *Leptotylopus percellus*. Meade (1945) first discovered the long, slender limb bones of the larger camel, and recognized their novelty, but through a technical error left them without a name.

Hibbard and Riggs (1949:855, 857) thought the long, slender limb bones found by Meade might go with the lower jaws he had referred to *Camelops* or to the genus *Pliauchenia*. Inasmuch as no described species of either genus has such limbs, this implies that the Blanco camel is an undescribed taxon.

On the basis of lengths of the limb elements as given by Meade, Webb (1965) thought that the fossils might be extreme variants of *Titanotylopus*. Had Webb seen the specimens, however, he would not have made this error. The bones are not only longer than most or all *Titanotylopus* limb elements, they are far more slender and different in proportions.

During the present investigations, part of an articulated back leg of the long-legged camel was found. The tarsal elements and distal end of the tibia were present but too rotted to recover. The metatarsal and phalanges, except the unguis phalanges, are fairly well preserved. This specimen and the limb bones, and perhaps some vertebrae, at the University of Texas, seem to be the only certain representatives of the species. No cranial or dental materials have been found in association with the limb bones. Most type specimens of camel species are cranial or dental elements. However, it is necessary to have a name for the large, long-legged camel, and unmistakable association of name and limb elements requires use of a limb bone as the holotype of the species described below, for which I propose the generic name:

Blancocamelus new genus

Distribution.—Known only from the Blanco Formation, uppermost Pliocene or earliest Pleistocene, Blancan age, Crosby County, Texas.

Diagnosis.—A large camel with exceedingly long, slender limbs. Limbs longer than and relatively more slender than the limbs of any known living or extinct large camel.

Etymology.—Genus named for the Blanco Formation of Crosby County, Texas.

Type species.—The type and only known species of this genus is described below:

Blancocamelus meadei new species

Holotype.—Metacarpal (TMM 31179-20).

Type locality.—Blanco Formation, Crosby County, Texas. According to Meade (1945:520), the *Leptotylopus* [*Blancocamelus*] specimens came from his quarry 9, "650 yards NW of Crawfish ranch house, on S. side of draw, 17 feet above basal contact, in gray sand lens immediately above 'flaggy limestone' member." See also Meade's (*op. cit.*, 510) map.

Distribution.—Known definitely only from the Blanco Formation, uppermost Pliocene or lowermost Pleistocene, Crosby County, Texas.

Referred specimens.—Metatarsal with articulated phalanges except ungual phalanges (TTU-P 6421, isolated find 100 yards west of Carter Quarry); radius-ulna (TMM 31179-28), tibia (TMM 31193-2), proximal phalanges (TMM 31176-39, 31176-35), medial phalanx (TMM 31193-2).

Diagnosis.—Limb bones exceedingly long and relatively slender. Probably the longest-limbed of known extinct or living camels.

Description and comparisons.—The limb bones of *Blancocamelus meadei* are very long, in the upper size range or exceeding the maximum length of limb bones of species of *Titanotylopus*, the giant camels. The limb bones are, however, relatively more slender, rounded in cross section and less transversely flattened, than the bones of the giant camel. The two forms are quite unlike in appearance (Fig. 6).

The limb bones of *Blancocamelus meadei* resemble those of *Tanupolama blancoensis* in proportions. They are, however, much larger. Measurements of comparable bones of *Blancocamelus* (Meade, 1945) and of a large male *Tanupolama blancoensis* (Hibbard and Riggs, 1949) are: metacarpal, 465 versus 610; tibia-fibula, 530 versus 650; largest proximal phalanx, 130 versus 142. The proximal phalanx measuring only 121 (Meade, 1945) probably belongs to *Tanupolama*.

The metatarsal with articulated phalanges (TTU-P 6421) is a bit smaller than the bones listed by Meade, and might have belonged to a female. Its greatest length is about 540, versus 428 in *Tanupolama*.

Direct comparison of *Blancocamelus* to *Camelops cf. traviswhitei* is not possible because the latter species is definitely known from the Blanco only by lower jaws. However, if, as suspected (see account of *C. traviswhitei*), some of the small metapodials referred to *Titanotylopus* by Meade actually belong to *Camelops*, *Blancocamelus* differs from *Camelops cf. traviswhitei* in a similar fashion but to a greater degree than it differs from *Titanotylopus*.

Etymology.—The species is named for Grayson Meade.



FIG. 6.—Metatarsals and proximal phalanges of camels: *Blancocamelus meadei* (TTU-P 6421), right and *Titanotylopus spatulus* (Cope) (MU 8812), left. Both are from specimens found in articulation. White rectangle is 5 centimeters long.

Remarks.—For measurements of type and referred specimens at the University of Texas, see Meade (1945:538). These specimens were reexamined and I agree with Meade that all belong to the same species. Skinner *et al.* (1972) mentioned some elongated camel vertebrae in the University of Texas collection that they thought might belong to the long-legged camel. Akersten (1972) referred a fragment of a radius-ulna to the long-legged camel and concluded that the taxon was without a name.

***Camelops* cf. *traviswhitei* Mooser and Dalquest**

1945. *Camelops* cf. *kansanus*, Meade, Univ. Texas Publ., 4401:537.

1975. *Camelops traviswhitei* Mooser and Dalquest, Southwestern Nat., 19: 341-345. Holotype from Aguascalientes, Mexico.

Referred specimens.—Right and left lower jaws with symphysis and roots of canines, cheek teeth of both sides (TMM 31181-212); five lower jaw rami (TMM 31181-134, 14, 8, 142, 175); lower jaw fragment with P₄-M₂ (TTU-P 6422).

Meade (1945) correctly suspected that the *Camelops* specimens from the Blanco might belong to a species undescribed at the time he was working. Mooser and Dalquest (1975) described a new species of *Camelops* from Aguascalientes, in central Mexico, on the basis of skulls and lower jaws and tentatively referred limb bones. The Blanco lower jaws resemble the Mexican camel in having sharply V-shaped lakes, without cementum, in the lower cheek teeth, and having the enamel of the lakes very thin on the labial side and thick on the lingual side. Other kinds of *Camelops* have the lakes of the cheek teeth of bent-oval shape, blunt at the ends, and outlined evenly with thick enamel. Because only lower jaws from the Blanco and Aguascalientes can be compared, and because lower dentitions of *Camelops* are so variable in size of teeth, positive reference of the Blanco *Camelops* must be deferred. It is possible that better material might show the Blanco *Camelops* to be a species distinct from *C. traviswhitei*. Some postcranial material at the University of Texas was referred by Meade to *Camelops*. The material is certainly of normal *Camelops* appearance. It might be mentioned also that some of the smallest metapodials in the University of Texas collection, some labeled "*Gigantocamelus*," are small enough to belong to *Camelops*.

Hibbard and Riggs (1949) named *Pliauchenia cochrani* from the Rexroad Formation of Kansas. These authors noted the *Camelops*-like features of the dentition and figured a referred phalanx and broken metatarsal of *Camelops*-like proportions. The lakes of the

teeth of this species are like those of typical Pleistocene *Camelops*, cement-filled and blunt-ended. The characters of the species are surprisingly like those of *Camelops mexicanus* (del Castillo), from the late Pleistocene of the Valley of Mexico. This form also has a small P_1 , a small P_3 (both teeth missing in typical *Camelops*), and the lakes of the cheek teeth are bent-oval in shape and filled with cementum.

Webb (1965) considered *Pliauchenia cochrani* to be somewhat intermediate between the genera *Megatylopus* and *Camelops*, and referred the species to the genus *Megatylopus* because the lower P_3 is present. This is a reasonable treatment, but it should be noted that the Hemphillian *Megatylopus matthewi* Webb, the Blanco *Camelops*, and the Mexican *C. traviswhitei* have in common lakes of the cheek teeth that lack cementum, are sharply "V" shaped, and have thick enamel on the lingual sides but thin enamel on the labial sides. On the other hand, *Megatylopus cochrani* and typical Pleistocene *Camelops*, as well as *Camelops mexicanus*, have cementum-filled, bent-oval lakes with uniformly thick enamel borders.

Hibbard and Riggs (1949:855) suggested that the limb bones from the Blanco, here described as *Blancocamelus meadei*, belonged with the lower jaws Meade referred to *Camelops*. Inasmuch as *Blancocamelus* is known by four limb bones (disregarding phalanges), and *Camelops* is known from lower jaws, it is tempting to think that the fossils might all pertain to one species. However, as Meade noted (1945:537), there is a quantity of typical *Camelops* postcranial material in the University of Texas collection, all of which is very different from the slender, elongated bones of *Blancocamelus*. Apparently this material was not found in actual association with the *Camelops* jaws, but no specimens of *Camelops* seem to have been taken at the quarry where the *Blancocamelus* bones were found (Meade, 1945:520). If the *Camelops* cf. *traviswhitei* jaws belong to *Blancocamelus*, the *Camelops*-like postcranial material is unassigned. Furthermore, the jaws of *Camelops* from the Blanco seem too small to belong to the same kind of camel as do the limb bones of *Blancocamelus*. Jaw TMM 31181-175 is complete from incisor bases to the angle, and TMM 31181-212 has much of the symphysis. These jaws are of normal *Camelops* proportions and are not elongated. To judge from the limb bones, *Blancocamelus* probably had larger jaws.

***Titanotylopus spatulus* (Cope)**

1893. *Pliauchenia spatula* Cope, 4th Ann. Rept. Geol. Surv. Texas, p. 70.
Holotype from the Blanco.
1945. *Gigantocamelus spatula*, Meade, Univ. Texas Publ., 4401:531.
1965. *Titanotylopus spatulus*, Webb, Bull. Los Angeles Co. Mus., 1:35.

Referred specimens.—Most of skeleton with fragmentary skull, almost complete lower jaws, most of limbs, and parts of the axial skeleton (MU 8812, CQ); nearly complete skull (MU 9225, MQ); isolated jaw fragments, teeth, and postcranial elements, in Midwestern University collection. Many almost complete to fragmentary skulls, lower jaws, and postcranial elements in the University of Texas collection (see Meade, 1945, for list and measurements).

The skull, dentition and some of the limb bones of the giant camel have been well figured and described by Meade (1945) and Hibbard and Riggs (1949). The males of this species are larger than the females, have larger and especially stouter canines, and have a lower first premolar, which is lacking in females. The skeleton in the Midwestern University collection is apparently a male and the nearly complete skull is also a male.

Webb (1965) considered *Gigantocamelus* Barbour and Schultz to be congeneric with *Titanotylopus* Barbour and Schultz, but Skinner *et al.* (1972) retain *Gigantocamelus* as a valid genus. They suggest a possibility that *Titanotylopus* might pertain to the long-legged camel herein named *Blancocamelus*. The type species of *Titanotylopus* is *T. nebraskensis*, based on fossils from Nebraska, but I am aware of no material from Nebraska like the limb bones of *Blancocamelus*. Hibbard and Riggs (1949) listed an elongated camel thoracic vertebra from the Rexroad Formation of Kansas, and Skinner *et al.* (1972) suggested that it might pertain to the camel here named *Blancocamelus*. I have not seen the specimen, but one thoracic vertebra associated with the *Titanotylopus* skeleton from the Blanco has a very long neural spine, like the specimen from Kansas. The identity of the Kansas vertebra must remain in doubt, but *Blancocamelus* is to date known with certainty only from the Blanco.

Cope's (1893) holotype of *Pliauchenia* [*Titanotylopus*] *spatulus* is a lower jaw and was well figured. There can be no doubt as to the identity of Cope's holotype and of the lower jaw belonging to the present skeleton. The skeleton has the large, stout, transversely flattened metapodials that are usually associated with this giant camel. Webb's (1965) suggestion that the holotype of *Titanotylopus nebraskensis* is a female of another species of the same genus of giant camel seems reasonable.

The isolated skull (MU 9225) and the skeleton (MU 8812) are unusually complete and will be described in detail elsewhere. The collection includes two fragmentary lower jaws with the milk dentition and a few deciduous teeth.

***Tanupolama blancoensis* Meade**

1945. *Tanupolama blancoensis* Meade, Univ. Texas Publ., 4401:535. Holotype from the Blanco.

Referred specimens.—Holotype lower jaw (TMM 31181-126), two lower jaw fragments with dentitions (TMM 31176-25, 31182-42), maxillary fragment (TMM 31176-5), and a few isolated teeth and foot bones in the Texas Tech University collection.

The little camels of the genus *Tanupolama* remain poorly understood although Lundelius (1972) has recently given a fine account of the Late Pleistocene *T. mirifica* from Florida and the Texas coast. In some Pleistocene local faunas, as the Gilliland local fauna of Knox County, Texas (Hibbard and Dalquest, 1962) and the Cedazo local fauna of Aguascalientes, central Mexico (Mooser and Dalquest, in preparation), two species of *Tanupolama* occurred sympatrically. The specimens from the Blanco indicate that *T. blancoensis* was a relatively large, stilt-legged species. A few postcranial elements are relatively small. These might have belonged to females, but the amount of sexual dimorphism in this genus is unknown.

Camelid, undetermined

Among the proximal phalanges of camels in the Midwestern University collection is a specimen that cannot be referred to any genus or species (TTU-P 6423, Fig. 7). The specimen is an isolated find, from the Marmot Quarry. Measurements are: greatest length, 106.8; proximal end, 36.0 × 50.3; midshaft, 23.2 × 28.8; distal end, 27.6 × 42.2. The phalanx is so broad and flat that, at first glance, it seems to belong to a horse. However, the articular surfaces show that it is definitely of a camel. It is too stout to be *Tanupolama*, although it is slightly shorter than phalanges of that genus from the Blanco. It differs from both *Tanupolama* and *Blancocamelus* in being almost flat on the posterodorsal surface, rather than having an elevated dorsal shoulder. From *Titanotylopus* it differs in being much flatter dorsoventrally, with both articular surfaces less laterally expanded. It is of a mature animal and there is no indication of fracture or other abnormality. It differs so radically from other camel phalanges from the Blanco that it may well represent a taxon other than the four known genera. Alternatively, it might be the proximal phalanx of *Camelops* cf. *traviswhitei*.

Family ANTILOCAPRIDAE

Antilocaprid, undetermined

Referred specimens.—Lower jaw fragment with M₁-M₂ (TTU-P 6424, RQ), lower jaw fragment with DP₃-M₁ (TTU-P 6425, RQ), lower jaw fragment with DP₂-M₁ (TTU-P 6664, RQ), calcaneus (TTU-P 6427, MQ), median phalanx (TTU-P 6428, RQ), ungual phalanx (TTU-P 6429, CQ), proximal end of proximal phalanx (TTU-P 6426, CQ), cuboid (TTU-P 6430, CQ).



FIG. 7.—Proximal phalanges of camels from the Blanco: left to right, undetermined camelid (TTU-P 6423); *Titanotylopus spatulus* (MU 8812); *Blanco-camelus meadei* (TTU-P 6421); *Tanupolama blancoensis* (MU 7119). White rectangle is 5 centimeters long.

Antilocaprid remains are usually uncommon but widely distributed in early Blancan local faunas of the western United States. So far as I am aware, most of the material is not specifically identifiable. Meade (1945) referred a jaw fragment and part of a tooth from the Blanco to *Capromeryx*. I have seen this material and think it and the specimens listed above are not *Capromeryx* but a very different kind of antilocaprid.

Only jaw fragments, teeth, and foot bones are available from the Blanco, but these are distinctly larger than are those of *Capromeryx* fossils from the Slaton Quarry of Texas or the Rancho La Brea of California. The bones and teeth represent a species about 25 per cent smaller than the living species of *Antilocapra*, and both teeth and foot bones are thinner and more transversely compressed than are corresponding elements of all antilocaprid genera with which they were compared. Identity of the Blanco antilocaprid must await discovery of the horn core, for most antilocaprid genera and species are based on the characters of horn cores.

Family CERVIDAE

***Odocoileus* cf. *brachyodontus* Oelrich**

1953. *Odocoileus brachyodontus* Oelrich, J. Mamm., 34:376. Holotype from the Rexroad Formation of Meade County, Kansas.

Referred specimen.—Fragment of antler (TTU-P 6431, MQ).

The fragment is only about 35 millimeters long, and averages about 12 in diameter. It is slightly eroded, but one end has remains of what seem to be the characteristic, roughened surface of the burr of a normally shed antler. The fragment is nearly straight. The antler fragment must have come from a yearling male and probably was shed in the early spring of the year. The antler fragment can be matched in size and straightness by spike bucks of *Odocoileus virginianus* from the Edwards Plateau of Texas, where the deer are greatly dwarfed. If the fragment is from the base of a normally shed antler, the deer probably weighed less than 50 pounds.

PALEOECOLOGY

Meade (1945) thought the Blanco local fauna accumulated in a large lake, the fossils being bones of animals bogged down in mud or killed by carnivores. The diatomite beds represent one locality where there was a lake or pond, but the absence of any aquatic vertebrates here suggests that the pond was seasonal, like many of the lakes on the High Plains today. A few aquatic snail shells do occur in the sandy mud beneath the diatomite, along with abundant fossils of reeds and aquatic plants. However the lake was of restricted area as shown by the extent of the lacustrine deposits, and at most probably covered about 10 acres. No aquatic vertebrate remains were found in the lacustrine sediments. No microtine rodent remains were present there, though the marsh would be normal habitat for such mammals. The only aquatic vertebrate fossil found anywhere in the Blanco is a single tooth of a large alligator, taken in the Low Quarry. Land tortoises are not uncommon in the fauna, but pond turtles are absent. No fishes, amphibians, beavers or otters were found.

Rodents are usually the best indicators of ecological conditions, and the Blanco rodents indicate semi-arid grassland habitat. The commonest form is the cotton rat, a grassland species. Common also are pocket mice and ground squirrels, which are primarily prairie and desert animals. The pocket gopher is fossorial but avoids brush or woodland habitat. The kangaroo rat and small cricetines, though less common, are also prairie mammals. Only the woodrat indicates denser cover or rocky talus, and woodrats are represented by only a single tooth.

Most of the herbivores, and all of the common ones, probably were grazers, including the glyptodon, mastodons, camels, antilocaprid and horses. Some browsers are represented, including ground sloths and deer. The peccary probably required some brush or woodland cover. Such heavier cover may have grown along streams and

ponds, and in shaded valleys. The abundant fossil hackberry seeds at the Red Quarry prove the abundance of this tree near water, and if the hackberry was present, the cottonwood almost certainly was present too.

The evidence suggests that the Blanco local fauna represents one rather uniform habitat: grassy plains with narrow belts of trees fringing watercourses and in the shaded parts of valleys. Conditions were almost identical to those of the High Plains and Texas Panhandle today where not modified by agriculture.

AGE OF THE FAUNA

The age of the Blanco has been the subject of much discussion. Cope (1893:46) recognized that the Blanco local fauna was intermediate between late Tertiary and Pleistocene faunas and termed it "more nearly and strictly Pliocene." Osborn (1903), in his description of *Glyptotherium texanum*, stated that the holotype came from the lower Pleistocene, and was surely aware that the specimen was from the Blanco. Gidley (1903b:624) definitely stated that the Blanco was Pliocene. Thereafter the Pliocene age of the Blanco was accepted until Evans and Meade (1945) and Meade (1945) maintained that the Blanco was early, perhaps earliest, Pleistocene.

In his arguments, Meade (1945:516-519) tried to show that not merely the Blanco local fauna, but Blancan faunas in general, were of early Pleistocene age. Later authors have generally accepted a Blancan Age extending from the late Pliocene through the early Pleistocene, and typified by a characteristic fauna with index mammalian genera and species. They have usually accepted Meade's thesis as applying to an early Pleistocene age for the Blanco local fauna, but not, as he intended, for all Blancan faunas. Yet, the available faunal list for the Blanco local fauna indicated closer correlation with the accepted Blancan Pliocene local faunas than with Blancan Pleistocene faunas.

The absence of microtine rodents and aquatic mammals from the Blanco makes correlation with other Blancan local faunas difficult, for most known Blancan local faunas are from more northern areas, where microtines are abundant and beavers and otter are present. The best-known Blancan Pliocene local fauna is the Rexroad local fauna of Meade County, Kansas.

The Rexroad local fauna is known from several collecting sites. The largest number of species is known from Rexroad locality 3. However, some species known from the Rexroad local fauna have not been recorded at locality 3 (for example, *Reithrodontomys*

rexroadensis, *Titanotylopus spatulus*). The list of Rexroad mammals in the following correlation chart is primarily from Skinner *et al.* (1972) with regard to Rexroad locality 3 mammals, with additions of published species records from other Rexroad localities.

Of the 45 kinds of mammals identified in the Blanco local fauna, 32 have equivalents (same or similar species) in the Rexroad. There are, of course, many species known from the Rexroad that have not been found in the Blanco. Twenty-eight identified genera are common to both local faunas. Fourteen species are the same in both faunas, and four others are perhaps referable to the same species. In many instances, species identified in one local fauna have their equivalents in the other local fauna identified only to genus. Better material will doubtless show that some, perhaps most, of these are also identical.

On the other hand, *Hesperoscalops* and *Stegomastodon* are represented in each fauna by different species. More material may show that there are still other distinctions between the two local faunas that are not the result of geographic distance or ecological differences in the two localities.

The similarity of the two local faunas is apparent. The Blancan was a long time interval, perhaps as long as three million years (Bjork, 1970) and Blancan local faunas are difficult to place in sequence. Examination of the comparison table of Skinner *et al.* (1972) shows no other Blancan local fauna to resemble the Blanco local fauna as closely as does the Rexroad. The Blanco has no markedly advanced elements, and the mole and pocket gopher are comparatively primitive.

Faunal comparison suggests that the Blanco is of about the same age as the Rexroad, at most only slightly younger.

The Guaje volcanic ash bed exposed in the roadcut just north of Mount Blanco (Izett *et al.*, 1972) has been dated at 1.4 million years BP. This ash bed, however, lies nearly at the surface of the ground and is separated by 30 or more feet of weathered caliche rubble from the uppermost rocks that might be part of the Blanco Formation. The vertebrate fossils come from much deeper in the sediments.

Volcanic ash settles in water-filled depressions in the existing land surface. Its age is not that of the underlying rocks; it might be slightly or greatly younger. It does furnish a minimum date for underlying sediments. At the Blanco the ash may have settled in a deflation basin in the surficial, post-Blancan deposits. It indicates only that the Blanco local fauna is more than 1.4 million years old.

Whether the Blanco is Pliocene or Pleistocene in age will depend on the concept of the extent in time of the Pleistocene. In any event, the Blanco local fauna is either latest Pliocene or earliest Pleistocene in age.

TABLE 1.—Comparison of the Blanco local fauna with the Rexroad local fauna of Kansas.

Blanco local fauna	Rexroad local fauna equivalent
	Order Insectivora
<i>Sorex taylori</i>	<i>Sorex taylori</i>
<i>Hesperoscalops blancoensis</i>	<i>Hesperoscalops rexroadi</i>
	Order Chiroptera
bat, near <i>Tadarida</i>	
	Order Edentata
<i>Glyptotherium texanum</i>	
<i>Megalonyx leptostomus</i>	<i>Megalonyx</i> sp.
<i>Glossotherium</i> near <i>chadmalense</i>	<i>Glossotherium</i> sp.
	Order Lagomorpha
<i>Hypolagus</i> sp.	<i>Hypolagus regalis</i>
<i>Nekrolagus</i> cf. <i>progressus</i>	<i>Nekrolagus progressus</i>
	Order Rodentia
<i>Paenemarmota barbouri</i>	<i>Paenemarmota barbouri</i>
<i>Spermophilus</i> sp. large	
<i>Spermophilus</i> sp. medium	
<i>Spermophilus</i> cf. <i>howelli</i>	<i>Spermophilus howelli</i>
<i>Geomys</i> sp.	<i>Geomys</i> (<i>Nertogeomys</i>) <i>minor</i>
<i>Perognathus</i> cf. <i>rexroadensis</i>	<i>Perognathus rexroadensis</i>
<i>Perognathus</i> cf. <i>pearlettensis</i>	<i>Perognathus pearlettensis</i>
<i>Prodipodomys centralis</i>	<i>Prodipodomys centralis</i>
<i>Onychomys</i> sp.	<i>Onychomys gidleyi</i>
<i>Reithrodontomys</i> sp.	<i>Reithrodontomys rexroadensis</i>
<i>Bensonomys</i> sp.	<i>Bensonomys eliasi</i>
<i>Baiomys</i> sp.	<i>Baiomys rexroadi</i>
<i>Peromyscus</i> near <i>kansasensis</i>	<i>Peromyscus kansasensis</i>
<i>Neotoma</i> cf. <i>quadriplicatus</i>	<i>Neotoma quadriplicatus</i>
<i>Sigmodon medius</i>	<i>Sigmodon medius</i>
	Order Carnivora
<i>Canis lepophagus</i>	<i>Canis lepophagus</i>
<i>Borophagus diversidens</i>	<i>Borophagus</i> sp.
<i>Canimartes cumminsi</i>	
<i>Spilogale rexroadi</i>	<i>Spilogale rexroadi</i>
? <i>Chasmaporthetes johnstoni</i>	
<i>Felis</i> cf. <i>lacustris</i>	<i>Felis lacustris</i>
<i>Panthera</i> (<i>Dinofelis</i>) <i>palaeoonca</i>	
? <i>Homotherium</i>	Homotheriini, undetermined
	Order Proboscidea
<i>Rhynchotherium praecursor</i>	
<i>Stegomastodon mirificus</i>	<i>Stegomastodon rexroadensis</i>
<i>Mastodon</i> , undetermined	
	Order Perissodactyla
<i>Nannippus phlegon</i>	<i>Nannippus phlegon</i>
<i>Equus simplicidens</i>	<i>Equus simplicidens</i>
<i>Equus cumminsi</i>	

TABLE 1.—Continued.

Order Artiodactyla	
<i>Platygonus bicalcaratus</i>	<i>Platygonus bicalcaratus</i>
<i>Blancocamelus meadei</i>	
<i>Camelops</i> cf. <i>traviswhitei</i>	
<i>Titanotylopus spatulus</i>	<i>Titanotylopus spatulus</i>
<i>Taupolama blancoensis</i>	<i>Taupolama blancoensis</i>
Camelid, undetermined	
Antilocaprid, undetermined	
<i>Odocoileus</i> sp.	<i>Odocoileus brachyodontus</i>

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