# The Pearce-Sellards Series

No. 38 September 15, 1983

An occasional publication of the Texas Memorial Museum, The University of Texas at Austin, 2400 Trinity Street, Austin, Texas 78705

## Mammals of the Coffee Ranch Local Fauna Hemphillian of Texas

*Walter W. Dalquest*

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# MAMMALS OF THE COFFEE RANCH LOCAL FAUNA HEMPHILLIAN OF TEXAS

by Walter W. Dalquest*

## ABSTRACT

The Coffee Ranch local fauna is the type of the Hemphillian Land Mammal Age. Fossils from the Coffee Ranch quarry have been known since 1930 and have been the basis for numerous publications, but no complete account of the fauna has been given. The present report is based on more than one thousand specimens gathered over twenty-two years, including both microvertebrates and large mammals. Thirty-eight taxa are listed, of which the following are described as new: *Scalopus (Hesperoscalops) ruficervus, Eptesicus hemphillensis, Comancheomys* n. gen., *Comancheomys rogersi, Progeomys* n. gen., *Progeomys sulcatus, Calomys (Bensonomys) coffeyi, Neotoma (Paraneotoma) minutus.* The Coffee Ranch local fauna is thought to be of middle Hemphillian age, younger than the Higgins and similarly aged local faunas but older than the Yepomera and Ocote local faunas of Mexico.

## INTRODUCTION

The Coffee Ranch quarry, Hemphill County, Texas, furnished the vertebrate fossil assemblage that is the type local fauna of the Hemphillian Land Mammal age (Wood et al, 1941). An understanding of this local fauna is essential for correlation of other local faunas of Hemphillian age from North America. Fossils collected at the Coffee Ranch during the past fifty years are numerous, well-preserved, and represent a variety of species. Several institutions have made collections at the Coffee Ranch, and a number of publications have been based on these collections. To date, however, all publications dealing with the Coffee Ranch local fauna, other than faunal lists, have concerned single species or small groups of related forms. Field parties from Midwestern State University have made collections at the Coffee Ranch quarry since 1956, with concentrated efforts in the summers of 1963 and 1964, and smaller collections on many occasions since. The material obtained, more than one thousand catalogued specimens, furnishes the basis for this report. Here, for the first time, the complete fauna of the Coffee Ranch quarry is considered.

## ACKNOWLEDGMENTS

I wish especially to thank Mr. and Mrs. Walter Coffee of Miami, Texas, who allowed me to collect at the Coffee Ranch quarry over the years. Mr. Coffee also operated the heavy machinery that permitted access to rich sediments that were previously unavailable. Many students and friends aided in the excavation and collection of fossils over the years, and the following persons worked for days to months at the quarry: Thomas Beddow, Rose Carpenter, John Carter, Jack Cearley, Richard Palmer, Larry Pierce, Frank Judd, Dennis Parmley, and Walter Riddle.

Funds for this study were made available by Midwestern State University, through the interest and cooperation of Dr. Travis White and Dr. Jesse Rogers. Several persons have aided in identification of fossils, notably the late Dr. Claude Hibbard, University of Michigan, and Bob Slaughter, Southern Methodist University. Dr. Gerald Schultz allowed me to study some critical material in the collections at West Texas State University, while Dr. Wann Langston Jr., Dr. Ernest L. Lundelius and Dr. John A. Wilson permitted me to use the collections at The University of Texas at Austin. Photographs were made by Dr. Norman Horner, Midwestern State University, and drawings by Margaret Stevens, Lamar University. Manuscript edited by Jane Sullivan; typeset and layout by María L. Martínez.

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## HISTORICAL

Vertebrate fossils were discovered at the Coffee Ranch by Reed and Longnecker in 1928 in the course of a survey of the geology of Hemphill County, but their report did not appear until 1932. Parties from the University of California made collections and excavated in the present quarry between 1928 and 1930. The first publication based on material obtained was an account of the bone-eating dog *Osteoborus* by Matthew and Stirton (1930a), followed by a paper on the horses of the fauna (Matthew and Stirton, 1930b). Burt (1931) described the sabertooth cat *Machairodus,* and Stirton completed and published in Matthew's name (1932) an account of the rhinoceros fossils. A new species of deer, *Pediomeryx hemphillensis,* was described by Stirton (1936) and Stirton (1938) gave measurements of the jaw of an antilocaprid from the fauna.

Thereafter fossils from the Coffee Ranch were mentioned in a number of papers, but no new contributions added to our understanding of the fauna for nearly thirty years, until Webb (1965) named and described a new species of camel, *Megatylopus matthewi.* Dalquest (1969) gave an account of the carnivores and later of the camels (1980), and of the horse *Hesperohipparion stirtoni* (1981). A brief description of the small horse *Nannippus lenticularis* was given by Dalquest and Donovan (1973), incidental to the description of another species.

Schultz (1977:70-76) presented an updated list of the Coffee Ranch mammals, along with comparisons of the Coffee Ranch local fauna with Hemphillian local faunas from elsewhere in Texas and Oklahoma.

Fossils from the Coffee Ranch are in the collections of the University of California, West Texas State University, The University of Texas at Austin, and, according to Schultz (1977), the Denver Museum of Natural History and the Frick Laboratory of the American Museum of Natural History, in addition to the large collection at Midwestern State University.

The abbreviation TMM refers to the collection of the Texas Memorial Museum and MWU to that of Midwestern State University.

## AGE AND CORRELATION

Until recently the Hemphillian Land Mammal Age was considered to belong to the middle Pliocene epoch (Wood et al, 1941). According to the correlation of Berggren and Van Couvering (1974), the latest part of the Hemphillian straddles the Miocene-Pliocene boundary. Only land mammal age names are used here.

The geology of the Coffee Ranch quarry was described by Dalquest (1969) and is not repeated here. The tentative date of the volcanic ash bed that tops the Coffee Ranch quarry given by Boellstorff (1976), 5.3 million years, appears to be too recent. The 6.6-million age given by Izett (1975), based on zircon fission tracks, is more reasonable but must be considered a minimum date (Schultz, 1977). The hard, glassy ash at the Coffee Ranch quarry seems to be unsuitable for accurate dating, and the age of the sediments and fauna is probably greater than 6.6 million years BP.

The Coffee Ranch local fauna is a unit fauna and represents vertebrates that lived at the site during one relatively brief time interval. The closed depression in which the sediments accumulated may have formed and filled in a few centuries or less. Certainly some of the layers of volcanic ash more than a foot thick are of uniform texture throughout and lack stratification. Thus they were probably formed during one heavy rainstorm or rainy interval.

Wood et al (1941) give a list of index fossils of the Hemphillian age, as well as a list of characteristic genera and lists of genera that make their first and last appearance in the Hemphillian. Advances in vertebrate paleontology during the past forty years require only slight modifications to update these original lists. In the following lists, generic names are those used by Wood et al, and the names in parentheses that follow are those currently accepted or those that require comment.

Index fossils: *Agriotherium, Dipoides* (occurs in the Blancan), *Ilingoceros, Plesiogulo.*
First appearance: ground sloths, *Lutravus, Machairodus, Taxidae (Pliotaxidae).*
Last appearance: *Aphelops, Blastomeryx* (not Hemphillian), *Mylagaulus, Osteoborus* (confined to Hemphillian), *Pliauchenia (Alforjas), Pliohippus (Dinohippus), Prosthenops, Sphenocephalos, Teleoceros.* (Species of *Pliohippus* may occur in the earliest Hemphillian).
Characteristic fossils: *Hypolagus, Megatylopus, Nannippus, Neohipparion (Hesperohipparion). (Hypolagus* occurs in the Blancan as does *Nannippus,* and both may occur in the Clarendonian).

A number of genera of large mammals appear to be confined to the Hemphillian, including, among others, *Osteoborus, Plesiogulo, Pliotaxidea, Dinohippus, Hesperohipparion,* and when Hemphillian vertebrate microfaunas are better known, additional index fossils may be recognized. Even though the Hemphillian represents a long period of time and progressive evolutionary changes are readily seen in elements of chronologically successive faunas, Hemphillian faunas on the whole are quite distinctive, and there seems to be little utility in applying formal names to divisions of the Hemphillian.

Schultz (1977) has informally separated the Hemphillian into early and late divisions. Such informal divisions can be readily modified to reflect new discoveries and are useful tools in correlation and discussion. Schultz's Early Hemphillian faunas include an admixture of Clarendonian holdover genera (e.g., *Aelurodon, Cormohipparion, Calippus)* and relatively primitive forms of typical Hemphillian genera. His Late Hemphillian (including latest Hemphillian) faunas include what is probably the mid-range of the Hemphillian Land Mammal Age, leaving no room for the later faunas that show some admixture of Blancan genera along with advanced species of the typical Hemphillian genera.

I suggest a three-part informal division of the Hemphillian Land Mammal Age: Early Hemphillian, as conceived by Schultz; Mid-Hemphillian, to include the Coffee Ranch local fauna and correlatives, and Late Hemphillian, to include local faunas that indicate some transition to the Blancan Land Mammal Age.

MacFadden (1977:788) has also used a three-part division of the Hemphillian age: early, medial and late. However, correlations and examples are not given, and the Higgins local fauna of Texas, listed by MacFadden (1977:789) as late Hemphillian, is early Hemphillian.

Correlation of Hemphillian local faunas is complicated by several factors: 1) collections may represent different ecological conditions; 2) differences in faunas may result from past geographical distribution; 3) collections may be biased (most early collections consist almost exclusively of remains of large mammals); 4) variety and number of species are inconsistent in different collections; 5) material is incompletely described and illustrated. Some faunas described from California and Oregon are obviously Hemphillian but are difficult to correlate with local faunas from the mid-continent, at least at this time. Hemphillian faunas from Florida have been described only in part (e.g., Hirshfeld and Webb, 1968), and there is insufficient data to correlate them with better-known faunas.

Schultz (1977) includes the Arnett local fauna of Oklahoma and the Higgins and Box T local faunas of Texas in the early Hemphillian. All three faunas contain *Aelurodon validus* (Hay and Cook), *Cormohipparion* cf. *occidentale* (Leidy), and species of *Pliohippus,* characteristic Clarendonian forms, along with *Osteoborus* sp., *Megatylopus* sp., *Hesperohipparion* sp., and *Asterohippus* sp., all of which are Hemphillian genera. The McGehee Farm local Fauna of Florida (Hirschfeld and Webb, 1968) contains *Pliometanastes,* seemingly an early Hemphillian genus, and *Calippus,* a Clarendonian and early Hemphillian genus, and the fauna must be early Hemphillian in age. The upper Snake Creek of Nebraska is probably also early Hemphillian.

Mid-Hemphillian faunas are numerous and include among others the Kimball of Nebraska (Schultz and Martin, 1970), Rhino Hill, Edson, Lost Quarry and Found Quarry of Kansas (Bennet, 1979), Optima of Oklahoma (Savage, 1941), Coffee Ranch (present report) and Goodnight (Cope, 1893) of Texas, and Chamita of New Mexico (MacFadden, 1977). Lindsay and Tessman (1974:6) list numerous Hemphillian faunas from Arizona, but identifications are only to genera. The White Cone local fauna (Baskin, 1979) seems to be Mid-Hemphillian.

Late Hemphillian faunas include the Axtel, Christian Ranch, Currie Ranch and Smart Ranch local faunas of Texas. These were listed by Schultz (1977) as latest Hemphillian. The genera listed for these local faunas are typical of the Hemphillian but include species advanced over those of the Coffee Ranch and correlatives (e.g., *Osteoborus hilli, Astrohippus* cf. *stocki, Dinohippus* cf. *mexicanus).* No Blancan genera are included, but resemblance of the faunas to the Yepomera local fauna of Chihuahua is suggested by the advanced species of equids present. The Yepomera is a late Hemphillian fauna (the Blancan *Paenamarmota* is present), and the Ocote of Guanajuato is probably even younger (horses are slightly more advanced and Blancan genera *Paenamarmota* and *Palaeolama* are present, along with a peccary very close to *Platygonus.*)

Local faunas showing even greater transition to Blancan faunas may yet be discovered. The Sawrock Canyon local fauna of Kansas (Hibbard, 1964) and the Buis Ranch local fauna of Oklahoma (Hibbard, 1954) may be representative of such, but the larger mammals of these faunas are poorly known. The Sawrock Canyon fauna contains *Osteoborus progressus,* an aberrant hyaenoid dog of Hemphillian age (Richey, 1979) and *Titanotylopus,* a camelid of Blancan age. Both the Sawrock Canyon and Buis Ranch faunas include numerous species of rodents and other small mammals, and more exact placement of the faunas in the chronologic series may be expected.

The Coffee Ranch local fauna is of relatively early Hemphillian age. It and the closely correlative Kimball (Nebraska), Edson Quarry (Kansas) and Optima (Oklahoma) faunas contain comparatively primitive species of Hemphillian genera, as best seen in the horses but similarly reflected in other forms. For such faunas, the term mid-Hemphillian is appropriate.

## SYSTEMATIC LIST OF SPECIES

Order Insectivora
  Family Soricidae
    Soricid, unidentified
  Family Talpidae
    *Scalopus (Hesperoscalops) ruficervus* n. sp.
Order Chiroptera
  Family Vespertilionidae
    *Eptesicus hemphillensis* n. sp.
Order Edentata
  Family Mylodontidae
    mylodont ground sloth
Order Lagomorpha
  Family Leporidae
    *Hypolagus* cf. *H. vetus* (Kellogg)
Order Rodentia
  Family Mylagaulidae
    *Mylagaulus* cf. *M. monodon* (Cope)
  Family Eomyidae
    *Comancheomys rogersi* n. gen., n. sp.
  Family Sciuridae
    *Citellus* sp.

Family Geomyidae
*Progeomys sulcatus* n. gen., n. sp.
Family Heteromyidae
*Perognathus* sp.
*Prodipodomys* (?)
Family Cricetidae
*Calomys (Bensonomys) coffeyi* n. sp.
*Calomys* (?)
*Peromyscus* sp.
*Neotoma (Paraneotoma) minutus* n. sp.
Order Carnivora
Family Canidae
*Osteoborus cyonoides* (Martin)
*Canis davisi* Merriam
*Vulpes shermanensis* (Hibbard)
Family Ursidae
*Indarctos oregonensis* Merriam, Stock and Moody
Family Mustelidae
*Plesiogulo marshalli* (Martin)
*Pliotaxidea* cf. *P. nevadensis* (Butterworth)
Family Felidae
*Pseudaelurus hibbardi* Dalquest
*Machairodus* cf. *M. coloradensis* Cook
*Felis proterolyncis* Savage
Order Proboscidea
Family Gompotheriidae
Unidentified gompothere
Order Perissodactyla
Family Rhinoceratidae
*Aphelops* cf. *A. kimballensis* Tanner
*Teleoceras* sp.
Family Equidae
*Dinohippus interpolatus* (Cope)
*Astrohippus ansae* (Matthew and Stirton)
*Nannippus lenticularis* (Cope)
*Nannippus* sp.
*Hesperohipparion stirtoni* Dalquest
Order Artiodactyla
Family Tayassuidae
*Prosthenops graffhami* Schultz and Martin
Family Camelidae
*Megatylopus matthewi* Webb
*Alforjas taylori* Harrison
*Hemiauchenia vera* (Matthew)
Family Cervidae
*Pediomeryx hemphillensis* Stirton
Family Antilocapridae
*Texoceros* cf. *T. altidens* (Matthew)

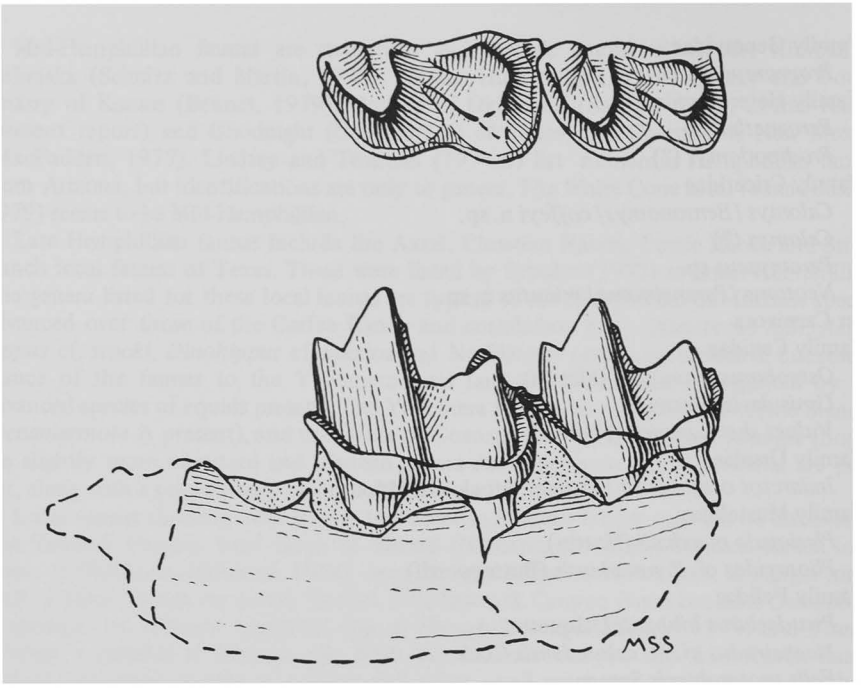



Figure 1.–Lower jaw fragment of *Limnoecus* (?) (41261-49), with $M_2$-$M_3$, in occlusal and labial views.

## ACCOUNTS OF SPECIES

### Order Insectivora

### FAMILY SORICIDAE

Soricid, unidentified
(Fig. 1)

A fragment of the lower jaw of a shrew (TMM 41261-49) contains $M_1$ and $M_2$ and the alveoli of $M_3$, but portions of the jaw in front and back of the molars are missing. The diagnostic features of antemolars and articular facets are lost, and the specimen is not identifiable even to genus. However, the molars appear very similar to those of *Limnoecus tricuspis* Stirton (Repenning, 1967). Faint traces of pigment may be detected on the tooth enamel. Alveolar length of $M_1$-$M_3$ measures 3.8; $M_1$ measures 1.8 x 1.0 (breadth of talonid); $M_2$, 1.4 x 1.0.

### FAMILY TALPIDAE

*Scalopus (Hesperoscalops) ruficervus* n. sp.
(Fig. 2)

**Holotype.**–Lower jaw fragment with $M_2$-$M_3$, TMM 41261-32.

**Referred material.**–$M_1$ (MWU 11538), 2 $M_2$s, (MWU 11537, 11539), $M^1$ (MWU 11536), humerus (MWU 11533).

**Type Locality.**–Coffee Ranch Quarry, 17 km NE Miami, Hemphill County, Texas, 1.5 m below the volcanic ash bed.

**Age.**–Middle Hemphillian, more than 6.6 ± 0.8 million years BP (Izett, 1975:202).

**Etymology.**–The species is named for its occurrence on the slopes of the valley of Red Deer Creek.

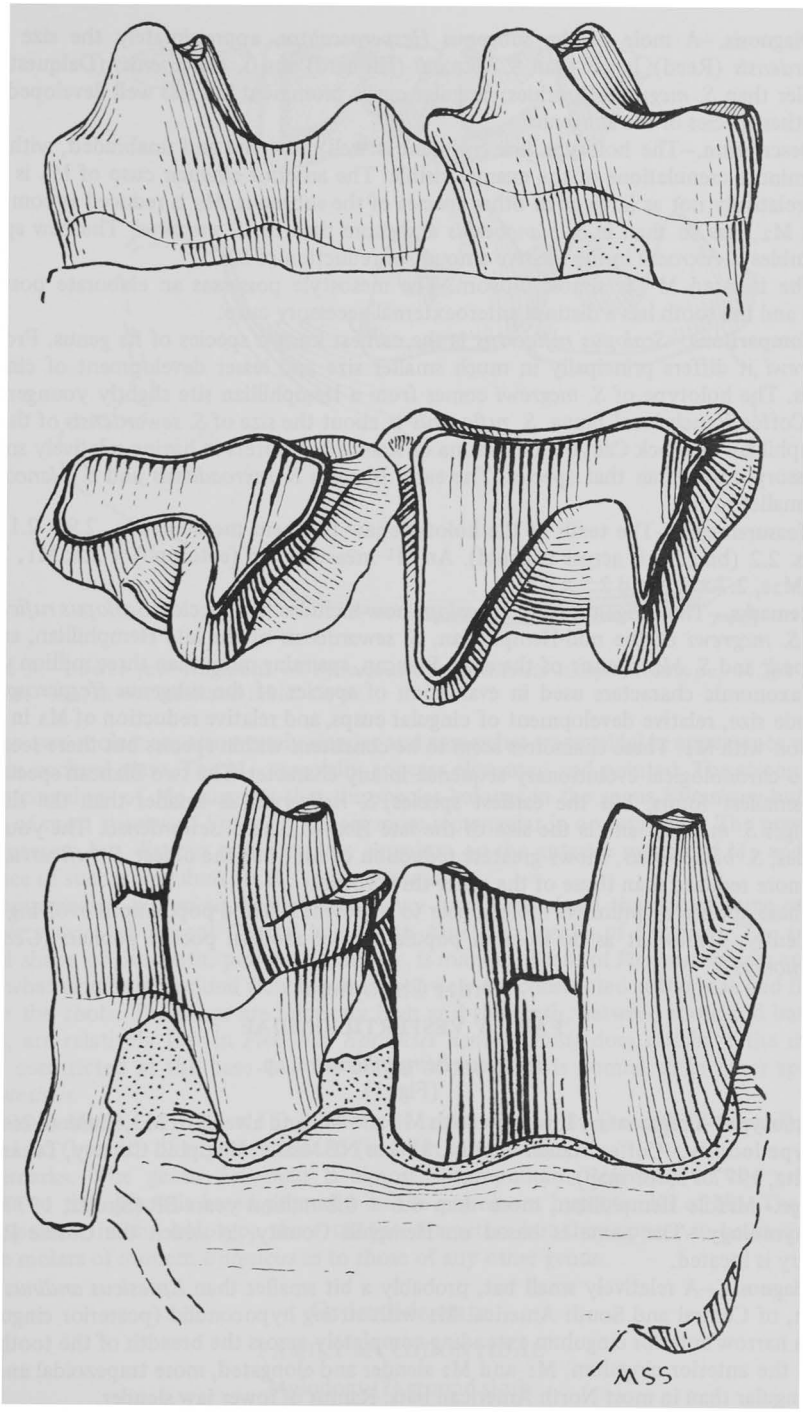



**Figure 2.**—Lower jaw fragment of *Scalopus (Hesperoscalops) ruficervus* n. sp. (holotype, 41261-32), with $M_2$–$M_3$, in lingual, occlusal and labial views.

**Diagnosis.**—A mole of the subgenus *Hesperoscalops,* approximately the size of *S. sewardensis* (Reed), larger than *S. rexroadi* (Hibbard) and *S. blancoensis* (Dalquest) and smaller than *S. mcgrewi* Voorhies; cingular cusps prominent but less well developed than on other species of the subgenus.

**Description.**—The holotype jaw fragment is well preserved and unabraded, with even the minute crenulations of the enamel visible. The anterior cingular cusp of $M_3$ is large, but relatively not as large as in other species of the subgenus. $M_3$ is reduced as compared with $M_2$, less so than in *S. blancoensis* and more than in *S. mcgrewi.* The new species resembles *S. rexroadi* in the relative amount of reduction of $M_3$.

The isolated $M^1$ is almost unworn. The mesostyle possesses an elaborate posterior flare and the tooth has a distinct anteroexternal accessory cusp.

**Comparisons.**—*Scalopus ruficervus* is the earliest known species of its genus. From *S. mcgrewi* it differs principally in much smaller size and lesser development of cingular cusps. The holotype of *S. mcgrewi* comes from a Hemphillian site slightly younger than the Coffee Ranch local fauna. *S. ruficervus* is about the size of *S. sewardensis* of the late Hemphillian Sawrock Canyon local fauna of Kansas but differs in having relatively smaller accessory cusps than that species. The early Blancan *S. rexroadensis* and *S. blancoensis* are smaller forms.

**Measurements.**—The teeth of the holotype jaw fragment measure: $M_2$, 2.9 x 2.1; $M_3$, 2.7 x 2.2 (breadth is across trigonid). An $M^1$ measures 3.5 (ectoloph) x 2.5; $M_1$, 2.9 x 2.1; $M_2$s, 2.7 x 2.2 and 2.5 x 2.6.

**Remarks.**—The subgenus *Hesperoscalops* now includes five species: *Scalopus ruficervus* and *S. mcgrewi* of the mid-Hemphillian, *S. sewardensis* of the late Hemphillian, and *S. rexroadi* and *S. blancoensis* of the early Blancan, spanning more than three million years.

Taxonomic characters used in evaluation of species of the subgenus *Hesperoscalops* include size, relative development of cingular cusps, and relative reduction of $M_3$ in comparison with $M_2$. These characters seem to be consistent within species but there seems to be no chronological evolutionary sequence in any character. The two Blancan species are the smallest forms, but the earliest species, *S. ruficervus*, is smaller than the slightly younger *S. mcgrewi* and is the size of the late Hemphillian *S. sewardensis.* The youngest species, *S. blancoensis*, shows greatest reduction of $M_3$, but the oldest, *S. ruficervus*, has $M_3$ more reduced than those of the other three forms.

These species of primitive mole appear to represent isolated populations evolving independently, somewhat as do isolated populations of modern pocket gophers (*Geomys, Thomomys).*

## Order Chiroptera

### FAMILY VESPERTILIONIDAE

*Eptesicus hemphillensis* n. sp.
(Fig. 3)

**Holotype.**—Fragmentary lower jaw with M1 and M2 and alveoli of M3, TMM 41261-33.

**Type locality.**—Coffee Ranch Quarry, 17 km NE Miami, Hemphill County, Texas (see Schultz, 1977:71, for map).

**Age.**—Middle Hemphillian, more than 6.6 ± 0.8 million years BP (Shultz, 1977:80).

**Etymology.**—The name is based on Hemphill County, in which the Coffee Ranch Quarry is located.

**Diagnosis.**—A relatively small bat, probably a bit smaller than *Eptesicus andinus* J.A. Allen, of Central and South America. $M_2$ with strong hypoconulid (posterior cingulum) and a narrow anterior cingulum extending completely across the breadth of the tooth. $M_1$ lacks the anterior cingulum, $M_1$ and $M_2$ slender and elongated, more trapezoidal and less rectangular than in most North American bats. Ramus of lower jaw slender.

**Description.**—The holotype jaw fragment is the only known specimen. The ramus has been broken off just in front of $M_1$ and behind $M_3$, and only the alveoli of $M_3$ remain. $M_1$ and $M_2$ appear to be almost unworn; the jaw is from a young-adult bat.

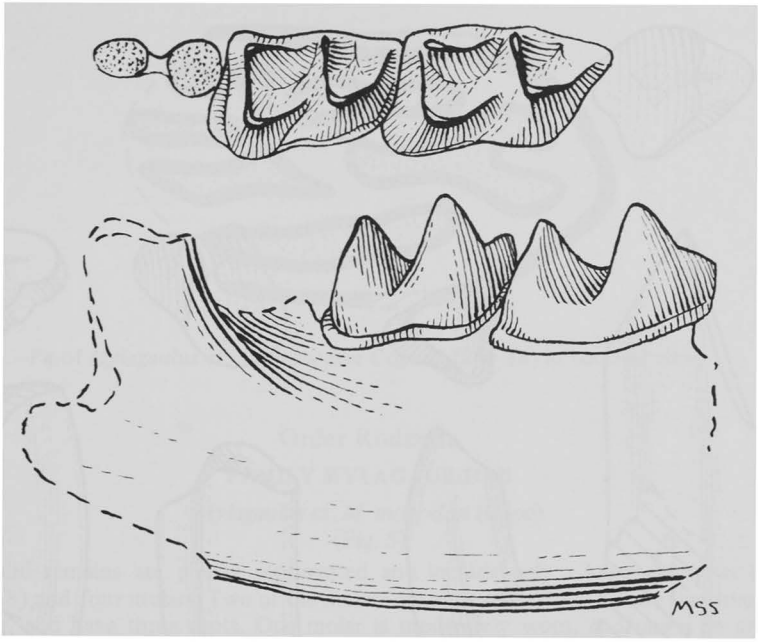



Figure 3.–Lower jaw fragment of *Eptesicus hemphillensis* n. sp. (holotype, 41261-33), with $M_1$ -$M_2$, in occlusal and labial views.

The two molars are transversely slender and somewhat trapezoidal in appearance when seen in occlusal view. The $M_1$ especially appears elongated and pointed. The strong posterior cingulum of $M_2$ suggests that the species belongs in the genus *Eptesicus,* but the teeth of most species of *Eptesicus* appear more rectangular in occlusal view. The presence of a narrow but distinct and complete cingulum on the anterior margin of $M_2$ and the absence of such a cingulum on $M_1$ seems unusual.

**Comparisons.**–*Eptesicus hemphillensis* may have been about the size of some of the smaller species of Recent Central and South American species of *Eptesicus.* The trapezoidal shape of the teeth, pointed anteriorly, is marked. Teeth of *Plecotus* species appear somewhat similar in occlusal view but in lateral view are constricted at the base and flared above the roots. The cusps are relatively high and the teeth, between roots and base of cusps, are relatively low in *Plecotus. Eptesicus hemphillensis* does not have the molar teeth constricted at the base and the height of the cusps is normal, as in other species of *Eptesicus.*

**Measurements.**–$M_1$, 1.6 x 1.0 (breadth of trigonid) and .85 (breadth of talonid); $M_2$, 1.4 x 1.05 (breadth of trigonid) and .85 (breadth of talonid).

**Remarks.**–The genus *Eptesicus* is almost cosmopolitan. Reference of the present species to this genus is based primarily on the prominent hypoconulid of $M_2$. The two teeth present in the holotype show unique characters but they appear to be as similar to the molars of modern *Eptesicus* as to those of any other genus.

## Order Edentata

### FAMILY MYLODONTIDAE

Mylodont (?) ground sloth
(Fig. 4)

Four well-preserved ground sloth teeth were recovered at the Coffee Ranch Quarry. These appear to be upper second molariform, TMM 41261-37, 18.7 x 18.8; lower second

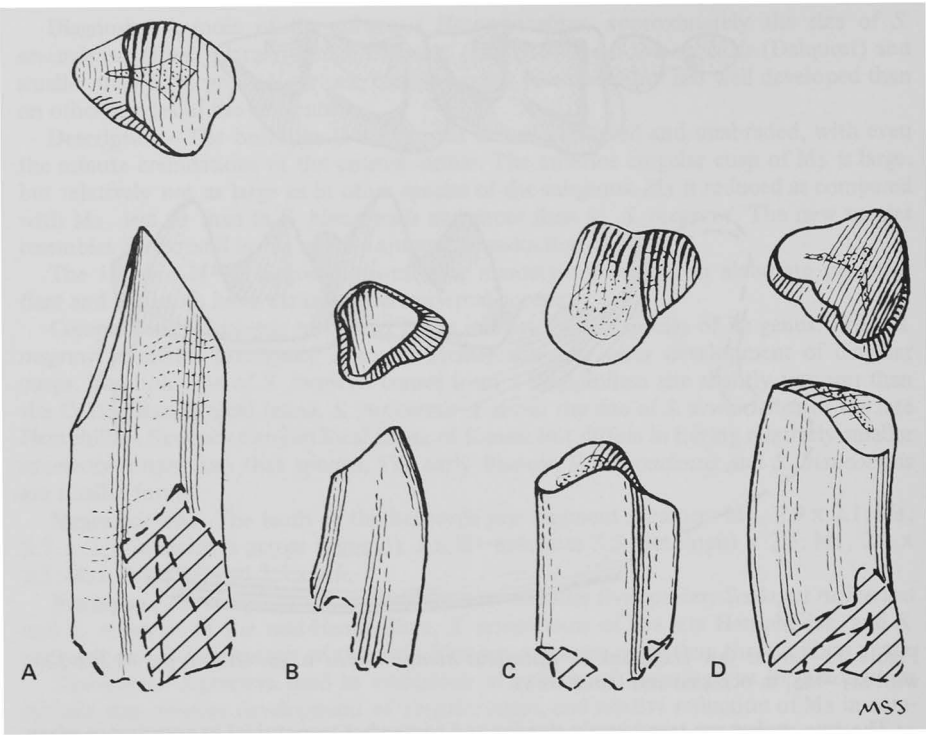



Figure 4.—Teeth of mylodont ground sloth (A. 41261-34, B. 41261-35, C. 41261-36, and D. 41261-37) in occlusal and lateral views.

molariform, 41261-36, 15.3 x 20.9; lower caniniform, TMM 41261-35, 15.6 x 13.7; lower caniniform, TMM 41261-34, 21.8 x 17.3.

Most ground sloth remains of Hemphillian age appear to be referable to the family Megalonychidae, but the present specimens seem to belong to the Mylondontidae. Without the $M_3$, definite reference even to family is uncertain. The present specimens may represent the earliest occurrence of mylodont ground sloths in temperate North America.

## Order Lagomorpha

### FAMILY LEPORIDAE

*Hypolagus* cf. *H. vetus* (Kellogg)

*Lepus vetus* Kellogg, 1910, Univ. California Publs., Dept. Geol. 5:436.
*Hypolagus vetus,* Dice, 1917, Univ. California Publs., Dept. Geol. 10:181.

Rabbits must have been abundant at the Coffee Ranch in Hemphillian time, for, although no skulls or jaws were recovered, isolated teeth are abundant. There are two $P^2$s (MWU 11612), each with two grooves, and 7 $P_3$s (4 young, 3 adults, also MWU 11612), many isolated complete and fragmentary premolars and molars (MWU 11614) and some post-cranial elements (MWU 11613, MWU 7864). The $P_3$s are heart-shaped in cross section and have the enamel pattern of *H. vetus.* Teeth of the three adults measure, respectively, 3.2 x 3.0; 3.6 x 3.2; 3.5 x 3.0. Anterior and posterior edges of the valleys of the upper molars and premolars are crenulated. I see no characters to separate these teeth from those of *H. vetus,* which has been recorded from Clarendonian to early Blancan localities scattered over much of the United States.

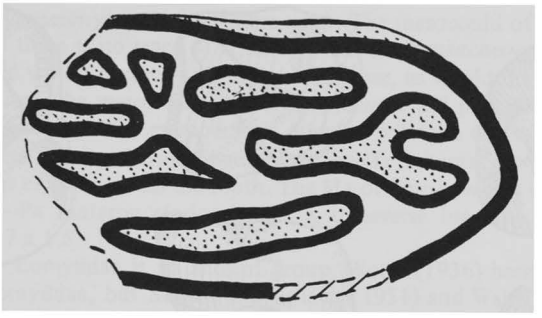


Figure 5.–$P_4$ of *Mylagaulus* cf. *M. monodon* Cope (41261-38) in occlusal view.

## Order Rodentia

### FAMILY MYLAGAULIDAE

*Mylagaulus* cf. *M. monodon* (Cope)
(Fig. 5)

Mylagaulid remains are poorly represented and include only a lower premolar (TMM 41261-38) and four molars. Two of the molars are worn almost to the base, are triangular in shape, and have three roots. One molar is moderately worn, and one is an unworn lower tooth.

The $P_4$ is moderately worn. It measures 12.2 x 6.4, crown height 14.1. There are eight lakes, including the Y-shaped anterofossettid. The tooth agrees in general with premolars of *Mylagaulus monodon.* Most Hemphillian mylagaulids have been hesitantly referred to this species. Hemphillian mylagaulids appear to be uncommon in the Great Plains area.

### FAMILY EOMYIIDAE

*Comancheomys* n. gen.

**Genotype.**–*Comancheomys rogersi* n. sp.

**Diagnosis.**–A large eomyid rodent, slightly larger than *Kansasimys dubius* Wood and differing from *Kansasimys* in having hypsodont rather than brachydont teeth, lower first molar with well-developed cingulum extending completely across tooth, and posterior valley of $P_4$ extending to base of hypoconid rather than being a short notch posterior to entoconid.

**Etymology.**–The genus name is based on the Comanche Indian tribe. Until the 1800s the type locality was near the heart of Comanche country.

*Comancheomys rogersi* n. gen., n. sp.
(Fig. 6)

**Holotype.**–Lower left first molar, TMM 41261-41.

**Referred material.**–Lower left fourth premolar (TMM 41261-39) and lower right third molar (TMM 41261-40).

**Type locality.**–Coffee Ranch Quarry, 17 km NE Miami, Hemphill County, Texas, 1.5 m beneath the volcanic ash bed.

**Age.**–Middle Hemphillian, more than 6.6 ± 0.8 million years BP (Izett, 1975:202).

**Diagnosis.**–Eomyid with bunolophodont teeth, smaller than *Ronquillomys wilsoni* Jacobs, and larger than *Kansasimys dubius* Wood. The teeth are high crowned with bulbous cusps and strong roots. In the $M_1$, anterior and posterior cingula are strong and extend nearly across the tooth, and the posterior valley of $P_4$ is long, extending to the base of the hypoconid.

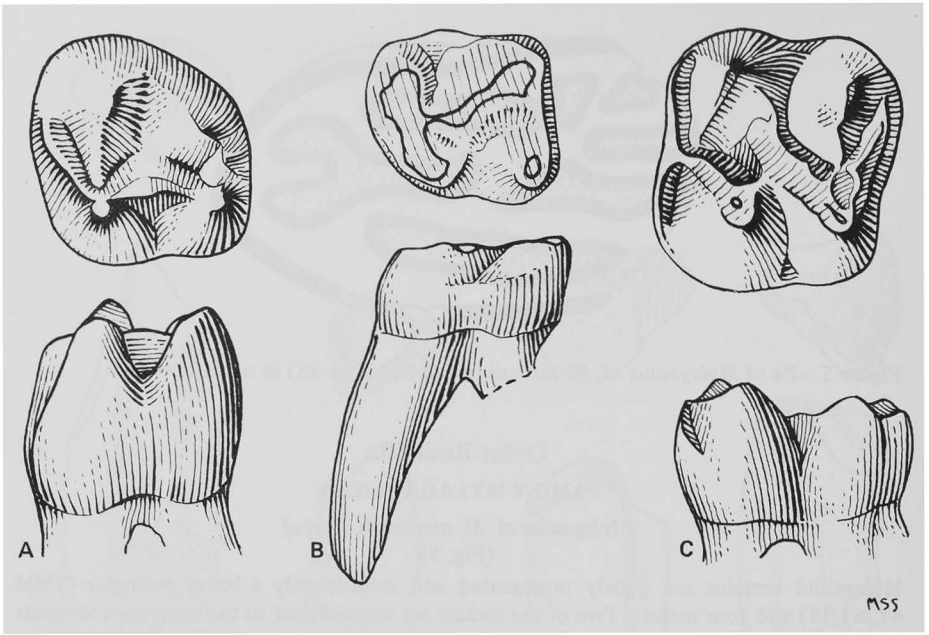



Figure 6.–Cheek teeth of *Comancheomys rogersi* n. gen., n. sp. A. P4 (41261-39) in occlusal and lingual views. B. M3 (41261-40) in occlusal and labial views. C. M1 (holotype, 41261-41), in occlusal and lingual views.

**Description.**–The P4 is strongly hypsodont, and only the tips of the conical protoconid and hypoconid show wear. Protoconid and hypoconid are connected by the simple, trenchant mesoconid. The unworn metaconid and entoconid are simple crests. The M1 (holotype) is strongly hypsodont with the bases of large roots. The anterior cingulum is strong, decreasing in height as it extends labially and lingually from the protoconid. The protoconid is broadly connected to the mesoconid. The hypoconid is more narrowly connected to the mesoconid, and is connected to the posterior cingulum by a sharp ridge. The posterior cingulum is narrow but sharp and extends across the tooth. Entoconid and metaconid are transversely elongated and simple. The M3 is more worn than the other two teeth. The hypoconid is a rounded cusp. The protoconid and mesoconid are united at this stage of wear and form a diagonal crest. Hypoconid and entoconid are broadly united into a transverse crest, and this crest is narrowly joined to the mesoconid. The third molar appears more brachydont than the anterior teeth, and the posterior root is very large. The anterior root has been broken away.

**Comparisons.**–Only two eomyid rodents have previously been described from the Hemphillian Land Mammal Age. *Ronquillomys wilsoni* Jacobs, from the Redington local fauna of Arizona, is a large species with bunodont teeth. It additionally differs from *Comancheomys rogersi* in having the M1 with larger and more prominent mesoconid and a small and short rather than long posterior cingulum. *Comancheomys rogersi* is larger than *Kansasimys dubius* and differs in having hyposodont rather than brachydont teeth. The P4-M2 of *Kansasimys* was illustrated by Wood (1936) in occlusal aspect only. Wood's figure has been repeated elsewhere (e.g. Stehlin and Schaub, 1951), but no lateral view of the lower dentition has been given. Wahlert (1978) states that the teeth are low crowned. The lower cheek teeth of *Kansasimys dubius* are more worn than those of *Comancheomys rogersi*, making detailed comparisons difficult. However, the long and simple posterior valley of the P4 of *Comancheomys* seems to be a fundamental character and would not

resemble that of *Kansasimys* even with more wear. The mesoconid of the $M_1$ of *Kansasimys* is small, and there is no trace of a mesolophid. In *Comancheomys,* the mesoconid of $M_1$ is larger and would become still larger with wear, as would the small mesolophid. With additional wear, the mesolophid of *Comancheomys* will pass diagonally across the tooth, while in *Kansasimys* the mesoconid is oriented with the central axis of the tooth. In *Kansasimys* there is no posterior cingulum on the $M_1$, whereas the posterior cingulum of *Comancheomys* extends across the tooth. The $M_3$ of *Kansasimys* is unknown.

**Measurements.**–$P_4$ (anteroposterior length x transverse breadth), 2. 2 x 2.4; $M_1$, 2.2 x 2.35; $M_3$, 1.7 x 1.5.

**Remarks.**–The Eomyiidae is an ancient group. Wood (1936) hesitantly placed *Kansasimys* in the Eomyiidae, but Stehlin and Schaub (1951) and Wahlert (1978 are more definite. Jacobs (1977) described a genus of Eomyid from the Redington local fauna of Arizona which with *Comancheomys* from the Coffee Ranch local fauna makes three eomyid genera from the mid- to later Hemphillian of the Central United States. The three genera are clearly related though quite distinct from each other and may mark a late but minor radiation of the family.

**Etymology.**–The species is named for Dr. Jesse Rogers, vice-president of Midwestern State University, in recognition of his support of the work at the Coffee Ranch Quarry.

## FAMILY SCIURIDAE

### *Citellus* sp.

The collection consists of 25 isolated teeth of a species of ground squirrel. They represent a sciurid larger than *Citellus kimballensis* Kent but slightly smaller than *C. dotti* Hibbard. The squirrel was a relatively primitive form of the *Otospermophilus* type and was smaller than the living rock squirrel *C. variegatus.* In $M^1$ and $M^2$ the metaloph is a trenchant ridge set off from the protocone by a sharp and distinct valley. The metaconule is sometimes a small but distinct cusp or sometimes entirely absent so that the metaloph is a sharp ridge from metacone to the valley separating it from the protocone. In $M_1$ and $M_2$, protolophid and metalophid outline a relatively large, oval lake that is separated from the protoconid by a broad, deep valley.

There are no complete $P^4$s. Measurements of some complete teeth are: 2 $M^1$s, 2.1 x 3.0; 2.2 x 2.9; 3 $M^2$s, 2.4 x 2.9; 2.4 x 3.2; 2.5 x 3.0; 3 $M^3$s, 2.5 x 2.5; 2.5 x 2.7; 2.7 x 2.7; 1 $P_4$, 2.1 x 1.9; 2 $M_1$s, 2.3 x 3.0, 2.3 x 3.1; 1 $M_2$, 2.6 x 2.7; 1 $M_3$, 2.9 x 3.1.

The Coffee Ranch ground squirrel probably is an undescribed species but the material does not seem adequate to establish a new name.

## FAMILY GEOMYIDAE

### *Progeomys* n. gen.

**Genotype.**–*Progeomys sulcatus,* n. sp.

**Diagnosis.**–A small pocket gopher with shallowly sulcate upper incisors, strongly rooted cheek teeth, and no or only the slightest beginnings of dentine tracts on the cheek teeth.

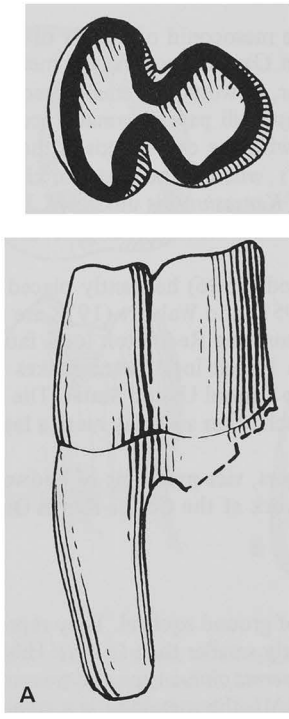
**Etymology.**–The genus name is based on the presumed position of the type species as ancestral to the modern *Geomys.*

### *Progeomys sulcatus* n. sp.
(Fig. 7)

**Holotype.**–Lower fourth premolar, TMM 41261-42.

**Referred material.**–Incisor fragments, MWU 11578 and TMM 41261-43; two isolated lower premolars, MWU 11573; molar, MWU 11576. The holotype and referred specimens come from the same general area in the quarry but were not associated. Since all represent a geomyid of one size, they are presumed to be conspecific.

**Type locality.**–Coffee Ranch Quarry, 17 km NE Miami, Hemphill County, Texas, 1.5 m beneath the volcanic ash bed.



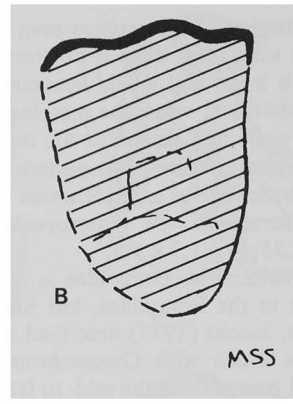




Figure 7.—A. $P_4$ of *Progeomys sulcatus* n. gen., n. sp. (holotype, 41261-42), in occlusal and labial views. B. Upper incisor fragment (41261-43 of *Progeomys sulcatus* n. gen., n. sp., in occlusal view.

**Age.**—Middle Hemphillian, more than 6.6 ±0.8 million year BP (Izett, 1975:202).

**Etymology.**—The name is based on the grooves of the upper incisors.

**Diagnosis.**—Upper incisors grooved, though much less deeply so than in latest Hemphillian, Blancan, Pleistocene and Recent species of *Pliogeomys* and *Geomys;* innermost (lingual) groove faint but distinct; outer (labial) groove deeper but more shallow than in *Geomys;* lower premolars strongly rooted; almost no development of dentine tracts on the sides of the premolars.

**Description.**—The holotype premolar is only moderately worn and shows an hourglass occlusal figure. It and the other two lower premolars are relatively low-crowned as compared with premolars of *Geomys.* The roots are strong and are almost parallel to the vertical axis of the tooth, not divergent as in heteromyids. The anterior root is larger and longer. The reentrant valleys are rather V-shaped, not as sharply V-shaped as is usually the case in *Thomomys,* but more so than the U-shaped valleys typical of *Geomys.* One tooth has a small notch (valley) in the enamel of the anterior face of the tooth, a condition rarely seen in *Thomomys* and apparently never in *Geomys.* In two teeth the enamel terminates at a relatively uniform level at the bottom of the crown, but in one tooth it ends on the sides of both trigonid and talonid, somewhat higher than on the anterior and posterior faces. This may be the beginning of the dentine tracts typical of the teeth of *Geomys.* The enamel has been partly chipped away on the sides of one tooth, but on the others it is complete.

Both incisor fragments are somewhat eroded but do not appear to be abraded. The shallow grooves are in the position of the deep grooves of *Geomys,* one narrow groove near the inner border of the incisor and a deeper groove on the central face of the enamel. Other than in shallowness, the grooves are typical of those of the incisors of *Geomys.*

The referred molar is oval in cross section, without dentine tracts, and the enamel on anterior and posterior faces is equally thick. It may be an upper molar.

**Measurements.**–Transverse breadth of incisor fragments: 1.7, 1.8; lower premolar (holotype), 1.8 x 1.9; isolated premolar, 1.9 x 1.7; referred molar, 1.1 x 1.8.

**Remarks.**–Shotwell (1967) has described primitive pocket gophers from Oregon ranging from the Clarendonian *Pliosaccomys* through Hemphillian *Parapliosaccomys* to modern *Thomomys.* All of these forms had asulcate incisors, as in living *Thomomys.* Lindsay (1972) has suggested that both *Thomomys* and *Geomys* are derived from *Parapliosaccomys,* but the presence of pocket gophers with grooved incisors in the Coffee Ranch local fauna shows that the *Thomomys* and *Geomys* lines were already divergent in mid-Hemphillian time.

The Coffee Ranch gopher is approximately at the stage of evolution of *Parapliosaccomys oregonensis* Shotwell, or a bit more primitive. The Oregon animal has the beginnings of dentine tracts on the $P_4$s but these are scarcely indicated in *Progeomys.* Hemphillian pocket gophers of Oregon and California have asulcate incisors and they (*Parapliosaccomys*) are ancestral to the western pocket gopher genus *Thomomys.* The genus *Progeomys* of the Hemphillian of Texas, with shallowly grooved incisors, is doubtless ancestral to the eastern pocket gopher genus *Geomys.* Both *Thomomys* and *Geomys* are end products of lineages that were separated through Hemphillian, Blancan and Pleistocene times. *Pliosaccomys* may be the common ancestor of *Geomys,* through *Progeomys* and *Pliogeomys,* and *Thomomys* through *Parapliosaccomys.*

*Pliogeomys* Hibbard, from the latest Hemphillian Buis Ranch local fauna of Oklahoma, has grooved incisors like *Geomys* (Hibbard, 1954) and well-rooted premolars like *Progeomys* but also has well-developed dentine tracts that extend up to or slightly past the middle of the tooth crown. There are only the faintest of suggestions of dentine tracts on the premolars of *Progeomys sulcatus. Progeomys* is probably ancestral to *Pliogeomys,* and the latter is intermediate between *Progeomys* and *Geomys* in the nature of the lower dentition.

*Parageomys tobinensis* Hibbard is of Pleistocene age. It is primitive in having an uninterrupted enamel border (no dentine tracts) on the $P_4$, but seems otherwise typical of *Geomys. Parageomys* occurs too late in time to be involved in the evolution of *Geomys,* for rootless cheek teeth, deeply grooved incisors, and well-developed dentine tracts on the premolars were already established in early Blancan *Geomys.*

Some species of Blancan *Geomys* had rooted cheek teeth, at least in advanced age. Evolutionary changes in lower dentitions from mid-Hemphillian *Progeomys* through late Hemphillian *Pliogeomys* to Blancan *Geomys* involve deepening of the grooves in the upper incisors, development of rootless teeth, and development of dentine tracts on the premolars and molars that reach nearly to the top of the tooth crown.

## FAMILY HETEROMYIDAE

### *Perognathus* sp.

Six teeth are of a large species of pocket mouse. One molar was broken in measuring, and one tooth is a fragment only. This fragment shows the sinuous enamel border sometimes seen in the anterior edge of first upper molar of *Perognathus hispidus* at the proper stage of wear. Measurements of complete teeth are: 2 $P^4$s, 1.2 x 1.5, 1.2 x 1.4; lower molar, 1.3 x 1.8.

Until more complete material is obtained the identification of the Coffee Ranch pocket mouse is not practical.

### *Prodipodomys* (?)

One tooth (MWU 11572) may be the molar of a kangaroo rat. It is subtriangular in occlusal pattern and has thick enamel. The roots are closed. Measurements are 1.1 x 1.8.

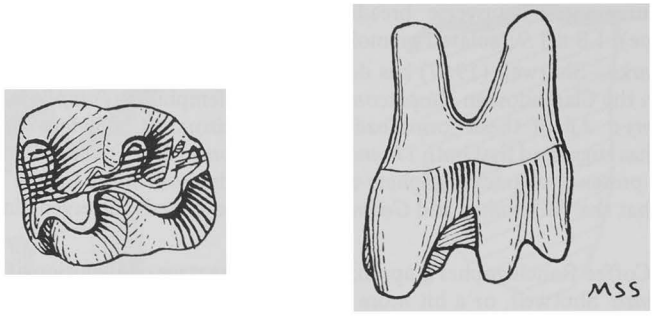



Figure 8.–$M^2$ of *Paronychomys* (?) (41261-44) in occlusal and labial views.

## FAMILY CRICETIDAE

### *Paronychomys* (?)
(Fig. 8)

An upper second molar (TMM 41261-44) is from a grasshopper mouse. The tooth shows the unique wear pattern of *Onychomys,* where the lingual cusps are flattened while the labial cusps remain long. The $M^2$ is larger than the average $M^2$ of living *Onychomys leucogaster* (1.6 x 1.3) but can be matched by selected specimens. It is as hypsodont as teeth of the modern species. The cusps, especially the lingual cusps, are not as greatly separated as in *O. leucogaster,* and the intervening valleys are narrower, though still broad. Second molars, it should be noted, do not possess many distinctive characters, and if first molars were available, greater differences might be detected.

Jacobs (1977) has placed grasshopper mice of the Hemphillian Redington local fauna of Arizona in a new genus, *Paronychomys,* and Baskin (1979) referred a new species from the White Cone local fauna of Arizona to this same genus. *Paronychomys* was distinguished from *Onychomys* (Jacobs, 1977:516) by higher crowned cheek teeth, especially $M_1$, due to added height between bases of cusps and bases of crowns, and relatively unreduced $M_3$. Reduction in size of $M_3$ is a specific character in living *Onychomys; O. torridus* has the third molar more reduced than does *O. leucogaster.* The size of $M_3$ compared with size of $M_2$ in *Paronychomys tuttlei* (Jacobs, 1977:Plate 1) can be matched in selected specimens of *O. leucogaster.*

Crown height of the single $M^2$ from the Coffee Ranch is difficult to assess. In size the tooth is like the $M^2$ of *Paronychomys tuttlei* Jacobs of the Redington local fauna. It is hesitantly referred to *Paronychomys,* and better material is required before generic or specific identification is possible. The tooth does show that grasshopper mice were present in sandy grasslands about the Coffee Ranch Quarry in Hemphillian times as they are today.

### *Calomys (Bensonomys) coffeyi* n. sp.
(Fig. 9)

**Holotype.**–Lower jaw fragment with $M_1$-$M_3$, lacking incisor and jaw ramus posterior to $M_3$, TMM 41261-46.

**Referred material.**–Eight lower jaw fragments with teeth, 6 maxillary fragments with teeth, and numerous isolated teeth.

**Type locality.**–Coffee Ranch Quarry, 17 km NE Miami, Hemphill County, Texas, 1.5 m beneath the volcanic ash bed.

**Age.**–Middle Hemphillian, more than 6.6 ± 0.8 million years BP (Izett, 1975:202).

**Etymology.**–This species is named for Mr. and Mrs. Walter Coffee, in recognition of their many courtesies extended over the years of excavation on their property, where the fossil quarry is located.

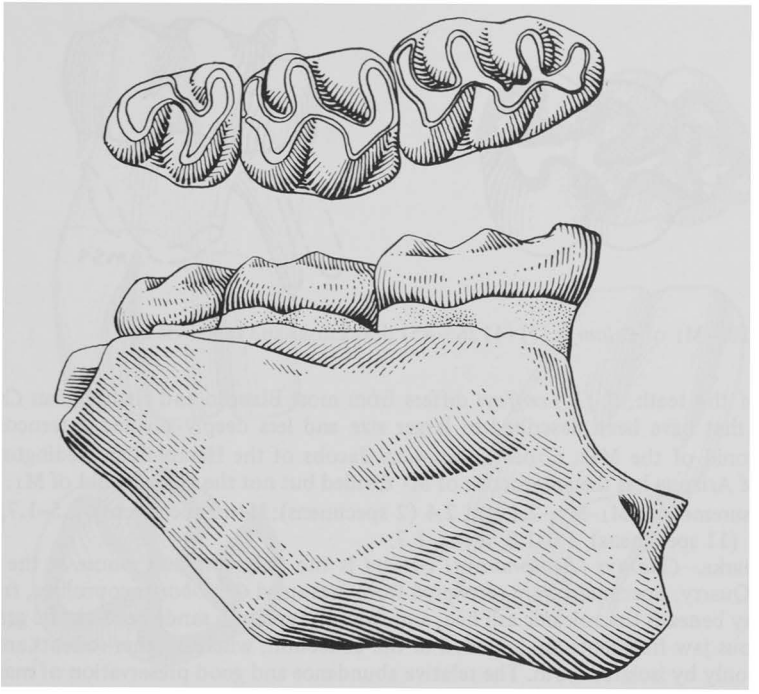


Figure 9.–Lower jaw fragment of *Calomys (Bensonomys) coffeyi* n. sp. (holotype, 41261-46) in occlusal and lateral views.

**Diagnosis.**–A mouse approximately the size of the living *Peromyscus maniculatus* but with brachydont teeth; five principal cusps (anteroconid, protoconid, metaconid, entoconid, hypoconid) simple and prominent, without accessory styles or lophs; posterior cingulum moderately developed; anterocone and anteroconid of upper and lower M1s notched anteriorly, so that cusp is divided in light to moderate stages of wear, and notching of upper M1 slightly deeper than that of a lower M1, so that the divided cusp persists into slightly later stages of wear; mental foramen located high upon jaw ramus.

**Description.**–The holotype jaw fragment was recovered from a fist-sized mass of clay and bone chips thought to be the coprolite of a bone-eating dog, *Osteoborus*. The teeth are only moderately worn and are well preserved.

Nine $M_1$s (MWU 11597-11605), including almost unworn to moderately worn teeth, are consistent in size and characters: brachydont and simple with the anteroconid showing a distinct but not deep division. $M_2$s are also simple and have a well-developed anterior cingulum. $M_3$s are triangular and little reduced in size as compared with $M_2$. Eleven $M^1$s are available; all are simple brachydont teeth with divided anterocones. $M^2$s and $M^3$s are of simple structure without outstanding characteristics.

Many upper incisors of small rodents were found at the Coffee Ranch. At least some of these must have belonged to *Calomys (Bensonomys) coffeyi*, but none of the incisors of proper size for the species are grooved.

**Comparisons.**–The divided anterocone and anteroconid of the M1s of *Calomys (Bensonomys) coffeyi* and dorsally-situated mental foramen indicate close relationship with *Calomys (Bensonomys) yazhi* Baskin and *C. (B.) gidleyi* Baskin, of the Hemphillian age White Cone local fauna of Arizona. From *C. (B.) yazhi, Calomys coffeyi* differs in much larger size and less deeply notched anterocone and anteroconid of the M1s. From *C. (B.) gidleyi, C. (B.) coffeyi* differs in less deeply notched anteroconid of $M_1$ and less inflated

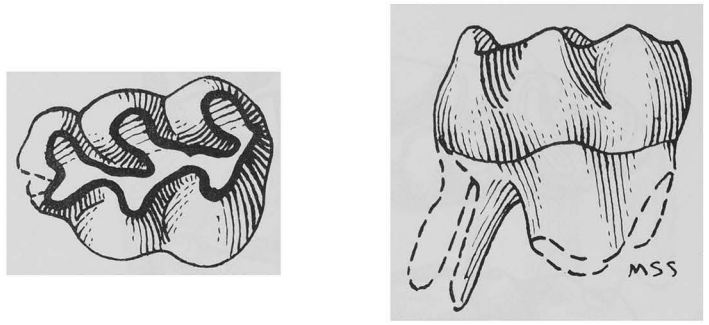



Figure 10.—$M_1$ of *Calomys* (?) (41265-45) in occlusal and labial views.

cusps of the teeth. *C. (B.) coffeyi* differs from most Blancan and Hemphillian *Calomys* species that have been described in larger size and less deeply divided anterocone and anteroconid of the M1s. *Copemys vasquezi* Jacobs of the Hemphillian Redington local fauna of Arizona has the anterocone of $M^1$ divided but not the anteroconid of $M_1$.

**Measurements.**—$M_1$-$M_2$, 2.4 and 2.4 (2 specimens); $M_1$ (9 specimens), 1.5-1.7, mean, 1.6; $M^1$ (11 specimens), 1.6-1.8, mean, 1.7.

**Remarks.**—*Calomys (Bensonomys) coffeyi* is the only common mouse at the Coffee Ranch Quarry. Specimens were recovered from presumed *Osteoborus* coprolites, from the gray clay beneath the volcanic ash bed, and from the greenish sands beneath the gray clay. Numerous jaw fragments are included in the collection, whereas other rodents are represented only by isolated teeth. The relative abundance and good preservation of material is reminiscent of *Sigmodon* fossils in some Blancan and Pleistocene sites, and suggests similar grass-dwelling habits. Probably *Calomys* constructed runways through the prairie grasses quite close to the quarry site and had habits similar to those of the living *Sigmodon* and *Baiomys.*

A recent paper by Baskin (1978) has clarified our understanding of many Hemphillian and Blancan cricetid rodents of the United States. It is clear that the now largely neotropical Hesperomini were abundant and varied in North America, at least from Kansas southward through California and Texas, during the Hemphillian and Blancan land mammal ages. Material representing this tribe has been found in most local faunas of proper age that have supplied microvertebrate remains.

*Calomys* (?)
(Fig. 10)

A lower first molar of a large cricetine (TMM 41261-45) has the anteroconid divided as in *Calomys.* The tooth measures 2.1 x 1.5. It has been compared with teeth of *Peromyscus californicus* and *P. floridanus,* the largest extant *Peromyscus* of the United States, and is equal in size to or larger than those forms. Resemblance to the $M_1$ of the holotype jaw of *Peromyscus pliocenicus* Wilson is close, both in size and details of enamel pattern. Both have the anteroconid of $M_1$ divided, and the Coffee Ranch mouse may belong to the tribe Peromyscini. *P. pliocenicus* comes from an early Hemphillian age deposit in Kern County, California, and identity with the Coffee Ranch tooth is improbable. The Coffee Ranch tooth doubtless represents an undescribed species but the single tooth is insufficient to establish a new name.

*Peromyscus* sp.

An $M^1$ (MWU 11583) and a worn $M^2$ (MWU 11584) are of a species of very large cricetine, equaled in size among living species of *Peromyscus* only in the subgenus *Megadontomys* from tropical Mexico. The $M^1$ measures 2.2 x 1.5 and is stouter and more massive than the $M_1$ of *Calomys* ? previously described. The tooth was slightly

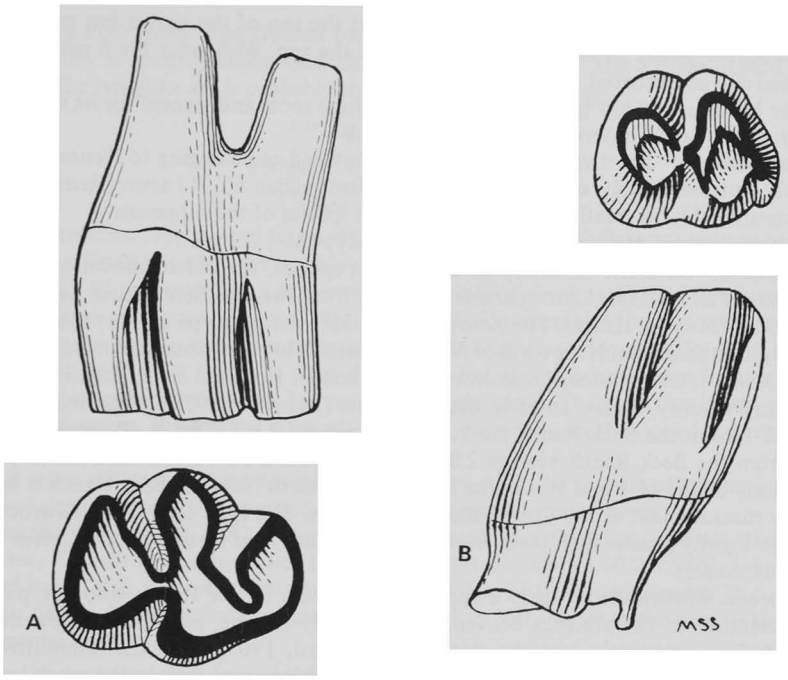



Figure 11.–A. $M^2$ (41261-47) of *Neotoma (Paraneotoma) minutus* n. sp. in lingual and occlusal views. B. $M_3$ of *Neotoma (Paraneotoma) minutus* n. sp. (holotype, 41261-48) in occlusal and lingual views.

damaged in collecting and repaired in the field, but the anterocone appears not to have been divided as in the Hesperomini. The $M^2$ is equally large but too worn to furnish helpful distinctions.

These specimens show the existence of a giant *Peromyscus*-like mouse at the Coffee Ranch Quarry but are insufficient to characterize the species. Several species of large *Peromyscus*-like mice have been described from Hemphillian faunas, and the present teeth may be referable to one of these.

*Neotoma (Paraneotoma) minutus* n. sp.
(Fig. 11)

**Holotype.**–Lower third molar, TMM 41261-48.

**Paratype.**–Upper second molar, TMM 41261-47.

**Type locality.**–Coffee Ranch Quarry, 17 km NE Miami, Hemphill County, Texas, 1.5 m beneath the volcanic ash bed.

**Age.**–Middle Hemphillian, more than 6.6 ± 0.8 million years BP (Izett, 1975:202).

**Etymology.**–The specific name is based on the very small size of the type teeth.

**Diagnosis.**–A woodrat of the subgenus *Paraneotoma,* with the enamel pattern of the $M_3$ forming an S, size very small, smallest of known woodrats of the subgenus.

**Description.**–The holotype tooth is well preserved; roots are still open but are beginning to close. The tips of the talonid and trigonid are just beginning to show wear and disclose the apical pits typical of *Neotoma* at this stage of wear. A specimen of the modern *N. micropus* at the same stage of tooth wear, showing similar apical pits, measures 223 mm in total length and appears scarcely half grown.

The median valleys of the $M_3$ are shallow at the top of the crown but much deeper and almost opposite to each other just beneath the top. With wear the S pattern will be exposed and accentuated.

The $M^2$ is a tiny but typical tooth. It bears three roots and, except for its small size, is like the $M^2$ of species *Neotoma*.

**Comparisons.**–The two teeth are readily identified as belonging to *Neotoma* and are slightly but measurably smaller than the late Hemphillian *N. (P.) sawrockensis* Hibbard, and considerably to greatly smaller than Blancan species of the subgenus.

**Measurements.**–Holotype $M_3$, 1.8 x 1.5; paratype $M^2$, 2.2 x 1.7.

**Remarks.**–Until the discovery of the present species, the oldest known woodrat was *Neotoma (Paraneotoma) sawrockensis* Hibbard, from the late Hemphillian Sawrock Canyon local fauna of Kansas. The holotype is an $M^1$, the paratype an $M_2$; thus neither is directly comparable with the teeth of *N. (P.) minutus*. However, abundant material referred to *Neotoma (Paraneotoma)* cf. *sawrockensis* is known from the Beck Ranch local fauna of Scurry County, Texas, an early Blancan fauna (Dalquest, 1978). Mean measurements of 7 $M^2$s from the Beck Ranch are 2.5 x 2.0, versus 2.2 x 1.7 for *N. (P.) minutus*. Seven $M_3$s from the Beck Ranch average 2.0 x 1.6, versus 1.8 x 1.5 for the $M_3$ of *N. (P.) minutus*. None of the $M^2$s and $M_3$s in the large series of teeth from the Beck Ranch is as small in any measurement as the Coffee Ranch specimens. The type teeth from Sawrock Canyon are slightly smaller than teeth from the Beck Ranch, but teeth from the Coffee Ranch are even smaller.

It seems worthwhile to apply a species name to the Coffee Ranch woodrat, partly to call attention to the presence of *Neotoma* this early in time, and also to show that the species fits consistently into the size cline (Hibbard, 1967) from the diminutive mid-Hemphillian *N. (P.) minutus* through the larger *N. (P.) sawrockensis* to the much larger *N. (P.) quadriplicatus* of the early Blancan Land Mammal Age.

## Order Carnivora

The carnivores of the Coffee Ranch local fauna were described by Dalquest (1969). In the more than ten years that have elapsed since this report was published, several name changes have been suggested (Schultz, 1977). Although Schultz listed *Vulpes stenognathus* Savage rather than *V. shermanensis* (Hibbard) for the fox, and *Agriotherium schneideri* Sellards rather than *Indarctos oregonensis* Merriam, Stock and Moody, for the bear, I retain the names used in the 1969 paper until reasons for change have been documented. The following list includes the carnivores known to occur in the Coffee Ranch Quarry.

*Osteoborus cyonoides* (Martin), bone-eating dog
*Canis davisi* Merriam, dog
*Vulpes shermanensis* (Hibbard), fox
*Indarctos oregonensis* Merriam, Stock and Moody, bear
*Plesiogulo marshalli* (Martin), wolverine
*Pliotaxidea* cf. *P. nevadensis* (Butterworth), badger
*Pseudaelurus hibbardi* Dalquest, puma-like cat
*Machairodus* cf. *M. coloradensis* Cook, sabertooth
*Felis proterolyncis* Savage, lynx-like cat

*Felis proterolyncis* is included in the faunal list on the basis of a fragment of a right maxillary containing the unworn P4 (MWU 11879). This tooth measures 13.5 at its greatest length, 6.1 in breadth, and 11.5 at greatest height from tip to base of enamel. It is smaller than all but the smallest carnassial found in a series of 32 bobcat (*Felis rufus*) skulls from various localities in Texas, and it is within the range of variation in tooth morphology of the bobcat. *Felis proterolyncis* was described by Savage (1941) from two fragmentary lower jaws that have teeth similar to but a trifle smaller than teeth

of the living *Felis rufus*. The Optima local fauna, from which the type of *Felis proterolyncis* comes, is geographically and chronologically close to the Coffee Ranch local fauna and the lynx-like cat is probably the same in the two faunas.

## Order Proboscidea

### FAMILY GOMPOTHERIDAE

#### Unidentified gompother

Mastodon remains are rare and fragmentary at the Coffee Ranch Quarry, perhaps because such large animals avoided the muddy or marshy quarry site. Over the years, only an unworn milk P1, a greatly worn $M_2$, several fragments of cheek teeth, and two lower tusk fragments were recovered. The milk tooth (MWU 3165) resembles the first milk premolar of *Rhynchotherium* from the Ocote local fauna of Guanajuato, Mexico (Dalquest, 1980). It measures 29.3 x 18.3. Roots were developed but the tips have been broken away. There is a low anterior cingulum but no posterior cingulum. There are two crests, each of a single main cusp. The enamel is greatly wrinkled, especially on the tips of the crests and in the intervening valleys.

The worn molar and some tooth fragments show that the crowns of the molars consisted of simple ectotrefoils opposed by simple transverse internal crests.

Tusk fragment MWU 8482 is about 230 mm long and is a portion from near the tip of the tusk. The distal end measures (greatest by least diameters) 40.0 x 26.3; breadth of enamel band 24.8. The proximal end measures 51.3 x 36.0; enamel breadth 26.6. A slab of tusk (MWU 5374) probably comes from a thicker part, closer to the base of the tusk. The enamel band is 45.3 wide.

## Order Perissodactyla

### FAMILY RHINOCERATIDAE

#### *Aphelops* cf. *A. kimballensis* Tanner
(Figs. 12, 13, Table 1)

*Aphelops mutilus* Matthew, 1932, Univ. California Publs., Geol. Sci., 20:421.
*Aphelops kimballensis* Tanner, 1967, Univ. Nebraska State Mus. Bull., 6:2.

Remains of rhinoceroses are among the most common fossils at the Coffee Ranch Quarry, outnumbered only by bones of *Dinohippus interpolatus*. This abundance may result in part from the selective scavenging of the bone-eating dog *Osteoborus*. Whereas relatively few bones of horses and other ungulates survived the activities of the dogs, rhinoceros bones tend to be much more complete. This is not to say that the scavengers did not feed on bones of the rhinoceros, for abundant chips and damaged bones show tooth marks of the dogs. However, complete to nearly complete rhinoceros bones are, compared to fragmentary bones, much more common than those of other large herbivores of the fauna. Two nearly complete skulls, several partial skulls, one nearly complete mandible, numerous more-or-less complete mandibular rami, and bones representing nearly the complete skeleton were recovered. The only articulated material includes six cervical vertebrae. Matthew (1932) also found abundant and relatively complete rhinoceros material at the Coffee Ranch Quarry.

The bones of *Aphelops* from the Coffee Ranch Quarry are cancellous and soft and break readily. When first uncovered they are wet and almost of the consistency of cheese. Even the cheek teeth are soft and brittle; their survival is remarkable.

Tanner (1967) has described a very large rhinoceros from the Kimball local fauna of Nebraska as *Aphelops kimballensis*. No separate diagnosis was given, but the characters of the species include very large size, relatively hypsodont teeth, and cranial and dental distinctions, including loss of the $P_2$.

The Coffee Ranch *Aphelops* agrees with *A. kimballensis* in being equally or nearly as large and in most of its cranial and dental characters, but the adult lower dentition has a large and well-developed $P_2$. This seemed at first to eliminate reference of the Texas

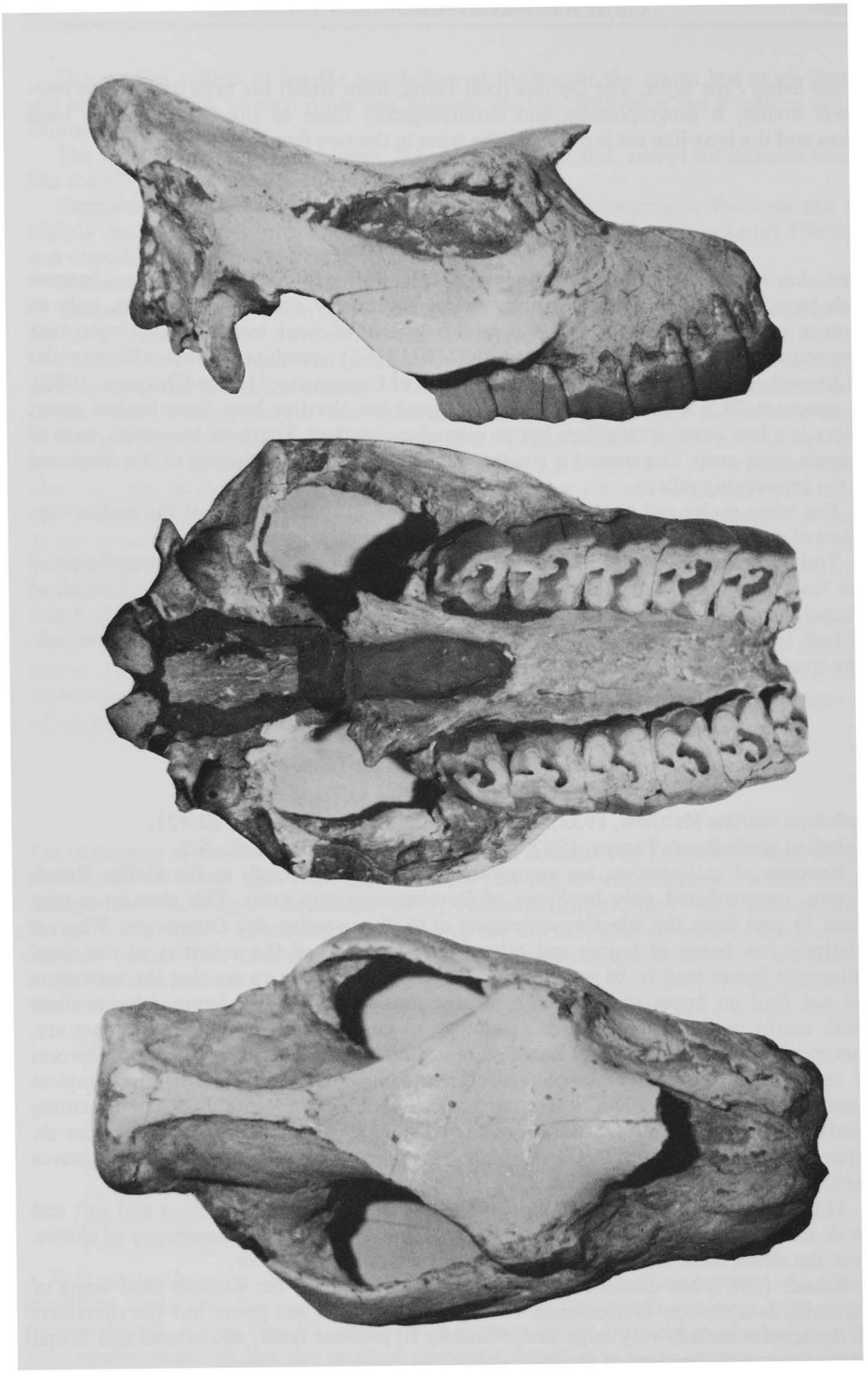


Figure 12.—Skull of *Aphelops* cf. *A. kimballensis* Tanner, MWU 11807, in lateral, ventral and dorsal views.

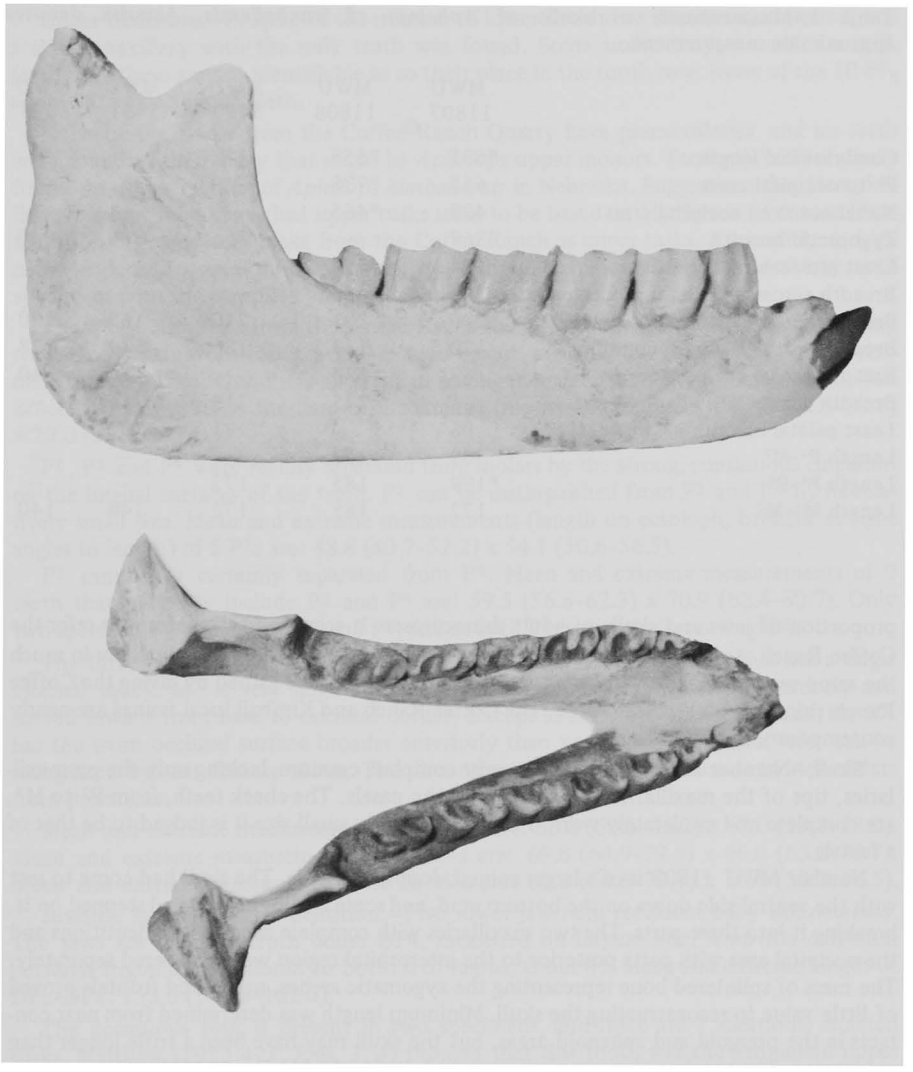


Figure13.–Lower jaw of *Aphelops* cf. *A. kimballensis* Tanner (MWU 7756) in lateral and dorsal views.

animal to *A. kimballensis.* However, study of the photographs of the lower jaw of *A. kimballensis* (referred, Tanner, 1967:8-9) suggests that a large $P_2$ is present, of the usual triangular shape typical of this genus. On the other hand, it appears that the $M_3$ has been lost and the jaw repaired in this position. The skull (holotype) of *A. kimballensis* possesses a good-sized $P^1$ and $P^2$, and retention of these upper teeth while the $P_2$ is lost is unlikely. The cheek-tooth row of the skull is given as 351, versus 280 for the cheek-tooth row of the referred lower jaw; the difference is sufficient to accommodate the $M_3$. With this difficulty removed, resemblance of the Coffee Ranch fossils and *A. kimballensis* skull and referred jaw is close. None of the Texas lower jaws is quite so large as the specimen referred to *A. kimballensis,* but some are nearly so. Doubtless there was variation in size and

Table 1.-Measurements of skulls of *Aphelops* cf. *kimballensis*. Asterisk denotes approximate measurement.

| | MWU 11807 | MWU 11808 | MWU 5430 | MWU 5431 | MWU 6073 |
|---|---|---|---|---|---|
| Condylobasal length | *635 | *658 | – | – | – |
| $P^1$ to occipital crest | 645 | *738 | – | – | – |
| Narial notch to occipital crest | 428 | *465 | – | – | – |
| Zygomatic breadth | 369 | – | 355 | 364 | 380 |
| Least interorbital breadth | 104.5 | *94 | – | – | – |
| Breadth across preorbital processes | 237 | – | – | – | – |
| Breadth across mastoid processes | 200 | 201 | 210 | 165 | 190 |
| Breadth across occipital condyles | 130.5 | 133.5 | 130 | 119 | 128 |
| Breadth across occipital crest | 167 | 134 | – | 124 | 140 |
| Breadth across $M^3$s | – | 225 | 213 | 216 | – |
| Least palatal breadth between $M^3$s | 96 | – | 91.5 | 102 | – |
| Length $P^1$-$M^3$ | *359 | 362 | – | – | – |
| Length $P^1$-$P^4$ | *199 | 185 | 172 | – | – |
| Length $M^1$-$M^3$ | 172 | 185 | 172 | 148 | 140 |

proportion of jaws and skulls of adult rhinoceroses. It seems best, therefore, to refer the Coffee Ranch *Aphelops* to *A. kimballensis*. It differs from *A. mutilus* Matthew in much the same way as does *A. kimballensis*, and nothing would be gained by giving the Coffee Ranch rhinoceros a separate name. The Coffee Ranch and Kimball local faunas are nearly contemporary in age.

**Skull.**–Number MWU 11807 is a nearly complete cranium, lacking only the premaxillaries, tips of the maxillaries and the tips of the nasals. The cheek teeth, from $P^2$ to $M^3$, are complete and moderately worn. From its relatively small size it is judged to be that of a female.

Number MWU 11808 is of a larger animal, doubtless a male. The skull had come to rest with the ventral side down on the bottom mud, and some wading animal had stepped on it, breaking it into three parts. The two maxillaries with complete cheek-tooth dentitions and the occipital area with parts posterior to the interorbital region were recovered separately. The mass of splintered bone representing the zygomatic arches, nasals and frontals proved of little value in reconstructing the skull. Minimum length was determined from near contacts in the ptergoid and sphenoid areas, but the skull may have been a trifle longer than as restored. The specimen represents a young adult, for the $M^3$ is erupted but unworn.

Comparison of the two skulls with the photograph of the holotype skull of *Aphelops kimballensis* disclosed no significant differences. The premaxillaries and nasals of the Nebraska animal were missing and have been restored, but the parts of the nasals present on the female skull from Texas suggest that the nasals might have been shorter than indicated by Tanner (1967).

Comparison of measurements of the Nebraska and Texas male skulls indicates essential similarity in significant features: condylobasal length, Texas, about 658, Nebraska, 672; $P^1$-$M^3$ length, Texas, 340, Nebraska, 351. There is a discrepancy in the measurements of distance from the end of narial notch to the occipital crest: Nebraska, 525; Texas female, 428; Texas male about 465. However, considerable individual variation may be expected between skulls of animals as large as rhinoceroses.

Some measurements of three additional partial skulls are included in table 1. Number MWU 5431 is a young adult, judging from tooth wear; MWU 5430 and MWU 6073 are old adults.

**Upper dentition.**–In spite of the number of lower deciduous dentitions recovered, not a single maxillary with the milk teeth was found. Some isolated upper teeth are milk teeth, but these are not identifiable as to their place in the tooth row. None of the 10 $P^1$s appear to be deciduous teeth.

None of the skulls from the Coffee Ranch Quarry have premaxillaries, and no teeth were found in the quarry that might be *Aphelops* upper incisors. Tanner (1967) similarly found no upper incisors of *Aphelops kimballensis* in Nebraska. Suggestions that Hemphillian *Aphelops* might have had upper tusks seem to be based on Matthew's erroneous identification of lower milk tusks from the Coffee Ranch as upper tusks. Apparently *A. kimballensis* lacked upper tusks, although this cannot be determined with certainty until specimens with the complete premaxillaries are found.

The $P^1$ of *Aphelops* from the Coffee Ranch has a rounded crown with a long, tapering root. One lightly-worn tooth is 89.9 in total height, but only the terminal 27.4 is the enamel-covered crown. One $P^1$ is aberrant in having the root short, blunt, and rounded. Ten isolated $P^1$s measure at the base of the enamel (means and extremes): 27.7 (23.8-30.1) x 29.0 (26.1-34.6).

$P^2$, $P^3$ and $P^4$ were readily separated from molars by the strong, continuous cingulum on the lingual surfaces of the teeth. $P^2$ can be distinguished from $P^3$ and $P^4$ by its relatively small size. Mean and extreme measurements (length on ectoloph, breadth at right angles to length) of 5 $P^2$s are: 48.8 (40.7-52.2) x 54.1 (50.6-56.5).

$P^3$ cannot be certainly separated from $P^4$. Mean and extreme measurements of 9 teeth that probably include $P^3$ and $P^4$ are: 59.5 (56.8-62.3) x 70.9 (62.4-80.7). Only two specimens contain both $P^3$ and $P^4$, and in both $P^4$ is slightly larger than $P^3$.

The three upper molars can be readily separated. $M^3$ is triangular and has but a single internal valley. $M^2$ is very large and has the ectoloph elongated anteroposteriorly and curved inward from base to occlusal border. Except in extremely old individuals, the $M^2$ has the worn occlusal surface broader anteriorly than posteriorly, and most teeth can be recognized by this feature alone. The discontinuous internal cingulum separates molars from premolars.

Mean and extreme measurements for 8 $M^1$s are: 63.0 (60.0-66.2) x 67.0 (59.3-78.0). Mean and extreme measurements for 7 $M^2$s are: 69.8 (64.9-79.8) x 66.0 (63.2-70.7). Mean and extreme measurements for 10 $M^3$s are: 62.3 (54.6-70.4) x 56.4 (50.7-66.5).

**Juvenile lower jaw and dentition.**–Five lower jaw rami represent baby rhinoceroses. The jaws are slender, depth under DP4, measured on lingual side, from the cingulum between trigonid and talonid to bottom of ramus, about 89. Mean and extreme length of $DP_2$-$DP_4$: 153.6 (148.0-162.0).

The deciduous tusk is present in two specimens, and there are 7 additional isolated tusks. Matthew (1932:421, Figs. 3, 4) thought that this tooth was the permanent upper tusk of this species. There is no evidence that Hemphillian *Aphelops* had upper tusks. The deciduous lower tusks are separated from the anterior root of $DP_2$ by a diastema of 70-73. At the anterior end of the ramus just behind the mental foramen, the bone begins to curve upward, and just anterior to the anterior root of $DP_2$ it contracts to a narrow tube enclosing the little tusk. The tusk axis lies at about a 45-degree angle to the main axis of the tooth row.

The deciduous tusks are about 100 long (including the long root), round in cross section, and straight. The crown is usually ball-like unless worn through attrition by the tongue or lips. The enamel-covered crown is usually about 12-15 long and averages 17 in diameter. Just below the crown the tooth is constricted to about 12.5 and then widens again to about 15.

$DP_1$ is present in four of the jaws, and its broken root is present in the fifth. The tooth is vestigial and probably did not penetrate the gums. In three jaws the tooth is rounded; in one it is antero-posteriorly flattened. In three jaws the rounded tip is covered by enamel

for a distance of about 3, but in another there is a mere fleck of enamel present. There is no $P_1$ in the permanent dentition.

The deciduous $P_2$ is a relatively large tooth, as long as or longer than the permanent $P_2$, but more slender. Mean and extreme measurements of 8 specimens (5 in jaws, 3 isolated) are: maximum length, 45.8 (41.3-47.9); maximum breadth, 25.0 (24.4-25.5). The crowns are much lower than those of the permanent $P_2$s and the cingula are less well developed.

$DP_3$ and $DP_4$ are approximately as long as permanent $P_3$ and $P_4$ but are more slender, shorter-crowned, and have the cingula poorly developed. $DP_4$ is longer than $DP_3$ in all five juvenile jaws, but only slightly so. The longest $DP_3$ is less than a millimeter longer than the shortest $DP_4$. Thus $DP_3$ and $DP_4$ cannot be isolated with confidence. Mean and extreme measurements of 5 $DP_3$s are: maximum length, 52.5 (50.5-53.5); maximum breadth, 27.8 (26.5-28.7). Means and extremes for 5 $DP_4$s are: greatest length, 56.8 (54.3-60.3); maximum breadth, 30.5 (29.1-32.1).

**Adult lower jaw and permanent dentition.**—One specimen (MWU 7556) includes both rami, complete dentition including tusks, and angles and ascending rami, though the latter were fractured and needed minor reparation. In this jaw the teeth are but lightly worn and $M_3$, though fully erupted, shows only a bit of wear on the anterior crest. A left ramus (MWU 6944) is essentially complete; dentition is complete save for the tusks; the symphysis is present with alveoli of tusks of both sides; the angle is complete as is most of the ascending ramus, though the condyle is damaged. The premolars and $M_1$ are much worn, $M_2$ is less worn, and $M_3$ only moderately worn.

The description of the lower jaw of *Aphelops* cf. *kimballensis* from the Coffee Ranch is based on the above two jaws. There are ten additional lower jaw fragments containing parts of the permanent dentition, mostly molars, and the description and measurements of the lower cheek teeth are based on teeth of the twelve specimens. Isolated lower teeth posterior to $P_2$ cannot be identified with certainty, and the dozens of isolated lower premolars and molars are not utilized at this time.

Lower jaws MWU 7556 definitely are of a young male, as shown by the large, curved tusks. Only the tips of the tusks project from the large open alveoli, and no wear is apparent. A chip is broken from the bone behind the left tusk and shows the tusk to be more than 185 long, with enamel-covered tusk extending back into the jaw. Some measurements are: length from tip of symphysis to back of angle, 607; length $P_2$-$M_3$, 328; length $P_2$-$P_4$, 149.2; length $M_1$-$M_3$, 177; length of symphysis, 178; height of ascending ramus to top of condyle, 297; depth of ramus under $P_4$, from top of cingulum between talonid and trigonid, 93, depth of ramus under $M_3$, 122; breadth across condyles, 393; breadth across $M_3$s, 183; breadth across $P_2$s, 139.5; breadth across tusk tips, 31.8. The deciduous tusks have been lost but must have persisted in the jaw until $M_3$ was almost erupted.

Lower jaw MWU 6944 is probably also of a male. The tusks are gone but the alveoli are too large to accommodate readily the tusks of a female. Measurements are: length of ramus from tip of symphysis to back of angle, 605; length $P_2$-$M_3$, 292; length $P_2$-$P_4$, 135; length $M_1$-$M_3$, 160.5; height of ascending ramus to top of condyle, 285; depth of ramus under $P_4$, from top of cingulum between trigonid and talonid, 124.

The permanent tusks are as described by Matthew (1932). Tusks of males are long and curved, covered with enamel on the outer suface only, and the enamel-covered portions are dorsoventrally flared so that the vertical height is considerably greater than the diameter of the tusk posterior to the enamel. Tusks of females are smaller, straight, round in cross section, and the enamel-covered portions are not flared. More than 30 isolated tusks, many incomplete, are available.

There are 9 nearly complete male tusks. The straight-line length of the largest is 305; the arc of curvature is 36. The greatest length of enamel is about 140. The greatest vertical depth of the tusk (flare) is 51; breadth at the same point, 43. Length of the second-largest tusk is 240; arc of curvature, 43; maximum length of enamel, 180; greatest vertical depth of tusk, 51; breadth at same point, 44. Others are nearly as large.

There are a dozen nearly complete tusks of females. These have the roots narrowed and are of mature animals. The tusks are straight and not flared. Measurements of the three largest are, respectively: greatest length, 184, 183, 175; length of enamel, 60, 60, 48; diameter at base of enamel, 31 x 30; 28 x 28; 28 x 27.

Tusks of both males and females have the internal (lingual) surfaces greatly worn, but the worn surface is curved. Similar wear surfaces are seen on the tusks of some mastodons. This wear was caused by attrition from the tongue or upper lip. None of the tusks, even of the largest males, show wear at the tips. The tusks were apparently not used in feeding and apparently did not contact the food or ground surface while the animal fed, or wear should be apparent at the tips. It is difficult to see how the animals could have fed on grass or low-growing vegetation without at least the almost procumbent tusks of males striking the ground. The curvature of the male tusks may have brought them up enough to clear the ground to some extent. The straight, smaller tusks of females are less procumbent and may also have cleared the ground to a certain extent. Study of the lower jaw shows that a cropping, forward motion of the head in feeding would have been almost impossible without the tusks hooking into the ground. Yet, the short legs of *Aphelops* indicate that these rhinoceroses must have fed on low-growing plants. Water at the Coffee Ranch quarry was not permanent, and presence of sufficient aquatic vegetation to supply food for such large animals seems unlikely. Probably the margins of the waterhole supported dense growths of reeds or other tall, emergent plants that could be cropped well above ground level, and these might have served as food for the rhinoceroses.

There is no $P_1$ in the permanent lower dentition. It is conceivable that the deciduous $P_1$ might persist for a time after the permanent $P_2$ is erupted, but no available jaws show this.

The $P_2$ is readily recognized by its somewhat triangular shape. Three of these are present in jaws and there are six isolated complete $P_2$s also. Mean and extreme measurements of these 9 teeth, taken near the base where diameters are greatest, are: 44.5 (39.7-49.6) x 31.9 (28.8-33.0).

The other cheek teeth in the lower dentition are not certainly recognizable. Usually, but not always, each tooth in the series is larger than the one preceding it. In the jaws available, $P_3$ is always smaller than $P_4$ and $M_3$ is always the longest tooth in the jaw. In the measurements that follow, (n) is the number of specimens measured. Mean and extreme measurements are: $P_3$ (n=2), 48.7 (41.4-54.0) x 36.8 (35.9-37.6); $P_4$ (n=3), 52.3 (49.0-56.7) x 37.7 (36.9-38.3); $M_1$ (n=7), 56.0 (49.6-64.8) x 36.2 (32.4-37.5); $M_2$ (n=10), 59.5 (51.6-68.5) x 36.4 (34.3-38.2); $M_3$ (n=8), 58.9 (54.7-63.2) x 32.0 (29.4-33.3).

### *Teleoceras* sp.

*Teleoceras* is represented in the entire collection of rhinoceros material from the Coffee Ranch by a single tusk. Tusks of this genus are easily separated from tusks of *Aphelops* because the latter are of almost even diameter throughout their length, crown and root, except at their extremities, whereas tusks of *Teleoceras* narrow immediately beneath the crown and the roots taper from that point. Further, tusks of *Teleoceras* show strong wear surfaces, resulting in oblique terminations, while the tusks of *Aphelops* show only the rounded internal surfaces caused by wear against tongue or nose pad; the tips are never worn away. The tusk at hand (MWU 6942) is definitely from *Teleoceras.*

Matthew (1932) believed that *Teleoceras* did not occur at the Coffee Ranch, but Schultz (1977) included the genus in his list of species from the quarry. *Teleoceras* and *Aphelops* occur together in most Hemphillian deposits of the Great Plains, and the scarcity of *Teleoceras* at the Coffee Ranch probably results from some ecological feature not determinable today.

## FAMILY EQUIDAE

### *Dinohippus interpolatus* (Cope)
(Table 2)

*Hippidium interpolatum* Cope, 1893, Geol. Surv. Texas, 4th. Ann. Rept.: 42. Type from Mulberry Canyon, Armstrong County, Texas.

*Pliohippus interpolatus,* Matthew and Stirton, 1930, Univ. California Publs., Geol. Sci., 19: 356.

*Dinohippus interpolatus,* Quinn, 1955, Univ. Texas Publ., Bureau Econ. Geol., 5516: 43.

*Dinohippus interpolatus* outnumbers all other horse fossils at the Coffee Ranch and is represented in the collection by numerous fragmentary lower jaws and more than 300 isolated teeth. No skulls were found, although an excellent skull was reported and figured by Matthew and Stirton (1930). Maxillary dentitions are poorly represented in the MWU collection, in comparison with lower jaws. Nearly all isolated teeth were saved, and the collection is unusual in the great number of teeth of aged horses. These outnumber teeth of young-adult to moderately old individuals by more than four to one. Teeth of senile animals are often more common than those of younger animals in fossil deposits, but the proportion of aged specimens of *D. interpolatus* at the Coffee Ranch is noteworthy.

Nearly all bones of the skeleton were discovered, but no articulated materials were found. The fragmentary nature of the cranial material, absence of articulated bones, and damage to many of the fossils, are clearly due to scavenging by *Osteoborus.* Many bones show the tooth marks of the hyaenoid dogs, and the large horse may have been a major prey of the dogs.

The upper cheek teeth of *Dinohippus interpolatus* typically have, in contrast to later members of the genus, small, rounded, ungrooved protocones, with the body of the protocone lying entirely posterior to the protoconal isthmus. Lower cheek teeth have rounded metaconids and metastylids, the metaconid invariably larger than the metastylid, especially in the molars. The metaconid-metastylid axis is nearly parallel to the long axis of the tooth, and the cusps are separated by a small but sharply V-shaped linguaflexid. The extoflexids of the molars penetrate deeply into the metaconid-metastylid isthmus and have flat terminations. Lightly worn teeth have the entoflexid slightly to greatly wrinkled.

A poorly preserved palate (MWU 5269) is from an aged horse. $P^2$-$M^3$ measures 153; $P^2$-$P^4$, 81.8; $M^1$-$M^3$, 70.3. Three maxillary fragments have $P^2$-$P^4$ but all are old (crown height less than 30). The $P^2$-$P^4$ lengths are 92.0, 95.0, 98.1 respectively.

Seven $P^2$s range from 32.4 to 36.5 in length and 22.6 to 25.5 in breadth, mean 33.9 x 24.0 measured 35 above the roots. It is not possible to distinguish with certainty among $P^3$, $P^4$, $M^1$ and $M^2$. Ten teeth thought to be $P^2$ or $P^3$ range from 26.8 to 29.3 in length, measured 35 above the roots, mean 27.6. Teeth (34) thought to be $M^1$ and $M^2$ range from 23.7 to 26.4 in length, mean 25.0. Five upper $M^3$s range from 24.6 to 26.2 in length and 22.4 to 23.2 in breadth, mean 25.4 x 22.7. The highest upper tooth, probably a $P^4$, measures 72 on the mesoloph. An upper molar (MWU 4059) was measured at 20-mm increments above the base of the enamel. Length varied as follows: 24.6, 26.5, 28.9. Measurements of teeth are comparable only when taken at a uniform height above the roots; in the present study a uniform height of 35 was used.

There are numerous fragmentary to nearly complete lower jaws in the collection, mostly of colts or senile horses but including a small number of dentitions of fully adult but not aged individuals. Six of these permit measuring the depth and breadth of the ramus under the middle of $P_2$ and $P_4$. The mean depth under $P_2$ is 55.7; range 52.3-62.2; mean breadth is 22.7; range 21.5-24.4. However, the curve is affected by one extremely large individual (MWU 3298), and with this specimen removed the range is 52.3-55.5 x 21.5-23.9. The large specimen is from a relatively old animal but not older than another specimen of average size. Measurements under $P_4$ are: mean depth 74.8 (71.5-82.7); mean breadth, 25.8 (24.9-27.5). Again MWU 3298 is extreme, and when removed the ranges are

Table 2. Measurements of *Dinohippus interpolatus* lower dentitions.

| P2–M3 | P2–P4 | M1–M3 | P2 | P3 | P4 | M1 | M2 | M3 |
|---|---|---|---|---|---|---|---|---|
| 160.0 | 81.6 | 78.5 | 30.0 x 15.3 | 28.1 x 17.2 | 25.1 x 14.4 | 25.7 x 12.0 | 26.3 x 11.1 | – |
| 163.0 | 85.1 | 78.2 | 31.0 x 12.8 | 28.2 x 14.1 | 28.5 x 14.4 | 24.6 x 12.7 | 26.5 x 12.5 | 28.9 x 11.5 |
| 157.0 | 79.0 | 73.6 | 28.8 x 14.8 | 24.3 x 15.2 | 26.1 x 15.3 | 22.5 x 13.4 | 23.3 x 12.6 | 29.3 x 11.2 |
| 167.0 | 84.7 | 81.3 | 40.0 x 15.6 | 28.9 x 17.0 | 26.9 x 16.2 | 25.6 x 15.9 | 26.5 x 12.1 | 30.0 x 10.8 |
| 167.0 | – | 76.9 | – | – | 26.3 x 16.5 | 22.5 x 12.3 | 22.6 x 12.5 | 31.4 x 11.7 |
| 167.0 | 84.7 | 77.7 | 30.0 x 13.4 | 28.1 x 16.1 | 28.3 x 15.4 | 24.2 x 12.8 | 26.1 x 12.1 | 29.0 x 11.7 |
| – | 85.0 | – | 29.7 x 14.8 | 27.3 x 15.5 | 27.8 x 15.0 | – | – | – |
| 164.0 | 82.3 | 80.5 | 28.6 x 14.3 | 26.8 x 16.1 | 26.6 x 16.7 | 24.1 x 13.6 | 25.0 x 13.4 | 30.6 x 12.7 |
| – | 79.1 | – | 25.8 x 14.5 | 26.4 x 15.3 | 25.6 x 13.9 | – | – | – |
| 158.0 | 78.0 | 75.5 | 27.4 x 14.6 | 25.2 x 15.1 | 25.0 x 14.0 | 21.4 x 12.0 | 23.5 x 11.1 | 32.0 x 10.1 |

71.5-73.9 x 24.9-26.0. Even including MWU 3298, the measurements of depth and breadth of the rami are consistent enough to be of value in identification of fully adult *Dinohippus.* The ramus from a young horse with the $M_3$ erupted but unworn measures only 52.1 x 17.0 under $P_2$ and 66.7 x 20.7 under $P_4$.

Ten lower-jaw fragments are from young-adult ($M_3$ showing slight wear) to fully adult horses with moderately worn teeth. Measurements of these dentitions, taken at the occlusal surface, are shown in table 2. The first measurements are of the youngest specimen, with the $M_3$ just coming into wear. The last two are from the oldest individuals; these are fully adult but not greatly worn.

Anteroposterior lengths of isolated lower cheek teeth were measured 35 above the roots. All teeth less than 35 high are excluded. Thirteen $P_2$s average 28.6 (range 26.8-30.5); 52 $P_3$s and $P_4$s combined, mean 26.9 (23.9-29.4); 61 $M_1$s and $M_2$s combined, mean 24.4 (21.5-27.8); 26 $M_3$s, mean 30.6 (28.1-33.8).

Metapodials are quite common in the deposit. Those showing any trace of an epiphysal suture at the distal end are presumed to be young and are therefore excluded, as are specimens showing considerable erosion of the bone surface. Means and extremes of 25 metacarpals are as follows: proximal breadth, 37.3 (30.5-41.2); distal breadth, 36.5 (32.8-39.0); midshaft breadth, 25.4 (23.6-27.7); greatest length, 205.8 (193-224); index of proportion (midshaft breadth/greatest length x 100), 12.3 (11.6-13.4). Means and extremes for 25 metatarsals are: proximal breadth, 37.1 (34.3-42.0); distal breadth, 35.3 (33.0-37.6); midshaft breadth, 23.7 (21.0-26.4); greatest length, 231.0 (217-245); index of proportion, 10.3 (9.5-11.5).

*Astrohippus ansae* (Matthew and Stirton)

*Protohippus ansae,* Matthew and Stirton, 1930, Univ. California Publs., Geol. Sci. 19:361.
*Astrohippus ansae,* Stirton, 1940, Univ. California Publs., Geol. Sci. 25:190.

*Astrohippus* is uncommon at the Coffee Ranch compared with *Dinohippus.* The University of California collection from the Coffee Ranch includes a maxillary fragment (holotype) and twenty lower jaw fragments (Matthew and Stirton, 1939) but the MWU collection includes only a maxillary fragment with rather worn teeth, one good lower jaw ramus with adult dentition, fragmentary material, and isolated teeth.

*Astrohippus ansae* is a small horse with extremely simple, basic, enamel patterns. The borders of the fossettes of the upper teeth are simple or only slightly folded; a hypoconal groove or fossette is almost always lacking; the protocone is a slightly flattened oval, ungrooved, with a distinct heel anterior to the commisure; parastyle and mesostyle are strong but metastyle weak. In the lower cheek teeth, metaconid and metastylid are small, somewhat flattened and separated by a shallow, V-shaped linguaflexid. The ectoflexid does not enter into the metaconid-metastylid isthmus of either molars or premolars. The teeth are marked by extreme simplicity. Apparently there is never a parastylid or pli caballinid.

The maxillary fragment has rather worn $P^3$-$M^2$. Occlusal lengths of these teeth are: $P^3$, 20.9; $P^4$, 21.0; $M^1$, 17.0; $M^2$, 19.1. Measurements of 3 isolated $P^2$s taken 25 mm above the roots are: 23.9, 25.8, 26.3. Twenty-six teeth, probably including $P^3$-$M^2$, range 18.3-23.3. Measurements of 3 $M^3$s are 19.5, 18.9, 21.5.

Occlusal lengths of a lower dentition are: $P_2$-$M_3$, 131.8; $P_3$-$P_4$, 67.5; $M_1$-$M_3$, 64.0; $P_2$, 22.5; $P_3$, 23.6; $P_4$, 23.0; $M_1$, 20.5; $M_2$, 20.9; $M_3$, 23.9. The depth of the ramus under $P_2$ is 46.3. Depth of another jaw ramus under $P_2$ is 47.0. Occlusal lengths of a lower milk dentition are: $DP_2$, 25.9; $DP_3$, 24.6; $DP_4$, 29.0.

Anteroposterior lengths of isolated lower cheek teeth, measured 25 above the roots, are: 4 $P_3$s, 23.2-24.2; 20 teeth, including $P_3$-$M_2$, 18.3-24.3. No isolated $M_3$s were found.

*Nannippus lenticularis* (Cope)

*Protohippus lenticularis* Cope, 1893, Geol. Surv. Texas, 4th Ann. Rept., 41.
?*Hipparion lenticularis,* Gidley, 1907, Bull. Amer. Mus. Natur. Hist. 23:915.
*Hipparion (Nannippus) lenticulare,* Matthew and Stirton, 1930, Univ. California Publs., Geol. Sci. 19:363.
*Nannippus lenticularis,* Stirton, 1940, Univ. California Publs., Geol. Sci. 25:186.

The type locality of this small horse is the Goodnight Beds of Mulberry Canyon, Armstrong County, Texas. The name was based on two upper teeth. The most complete (Cope, 1893, Plate 12, Fig. 1, now TMM 40282-10) should be considered the lectotype. The tooth has been sectioned 25 mm below the crown, and the ectoloph has been damaged since it was figured by Cope (1893) and Osborn (1918), but is otherwise in good condition (August 1978). The tooth closely matches upper teeth from the Coffee Ranch. The tooth is probably $P^4$, for it is relatively large.

*Nannippus lenticularis* fossils are uncommon in the Coffee Ranch sediments but are more common than remains of *Hesperohipparion stirtoni.* No good skull fragments or maxillaries with teeth were recovered, but there are four fragmentary lower jaws with complete or partial dentitions and two lower jaw rami with the deciduous dentitions, as well as many isolated upper and lower cheek teeth.

The upper cheek teeth of *Nannippus lenticularis* do not taper greatly in the upper part of the crown, as do teeth of *Hesperohipparion.* In slightly worn teeth, a deceptive appearance of taper is imparted by the cementum that forms a thickened girdle above the gingiva. The styles are simple and the metastyle, usually strong in *Hesperohipparion,* is weakly developed, almost absent, in the upper part of the crown. The teeth of *Nannippus* are smaller than those of *Hesperohipparion,* but some *Nannippus* premolars may be as large as *Hesperohipparion* molars. Upper cheek teeth are best separated by the shape of the protocone, lenticular in the upper part of the crown, usually rounded in the lower part, and always small, while the protocone of *Hesperohipparion* is elongated and large.

In describing *Nannippus lenticularis,* Cope (1893) emphasized the absolute lenticular shape of the protocone, but Gidley (1907) thought the protocone would become rounded with wear. The lectotype tooth has now been sectioned, and the protocone 20 below the occlusal surface is slightly more rounded. However, even in advanced wear, when the protocone shows a more rounded shape, a trace of the basic lens pattern usually remains. In a few teeth of small size, probably molars, the protocone is elongated almost to the base of the tooth. These teeth have metastyles like those of *Nannippus.*

The fossettes of the upper teeth of *Nannippus lenticularis* are relatively simple. The crowns are relatively low, maximum height about 47 measured from the notch between the roots, in both upper and lower teeth.

Four $P^2$s range from 20.1-23.0, mean 22.0; 23 upper teeth, probably including $P^3$-$M^2$, range from 15.8-20.2; eight $M^3$s range from 15.6-19.9, mean 18.0. Measurements were taken 25 mm above the roots.

The lower cheek teeth of *Nannippus lenticularis* lack the extreme anteroposterior elongation of the upper crown of *Hesperohipparion.* Metaconids and metastylids are rounded, rarely elongated, but their axes are parallel to the long axis of the tooth. Linguaflexids are almost perfectly U-shaped, and apparently there is never a pli caballinid. The pli caballinid is a prominent structure in the lower teeth of *Hesperohipparion.* The ectoflexid is shallow in the premolars, leaving the metaconid-metastylid column on a pillar. In the molars the ectoflexid enters deeply into the metaconid-metastylid isthmus. Parastylids are small, usually isolated columns of enamel, sometimes with faint ridges at the corners of the protoconids and sometimes completely lacking.

Four complete to partial dentitions are available. Occlusal lengths of these dentitions are: $P_2$-$M_3$, 99.2, 105.5; $P_2$-$P_4$, 48.6, 53.5, 56.9, 57.4; $M_1$-$M_3$, 50.7, 52.3; $P_2$, 18.4, 19.0, 20.0; $P_3$, 18.1, 18.6, 18.7, 19.3; $P_4$, 18.0, 18.2, 19.0, 19.4; $M_1$, 15.4, 16.4, 16.7, 17.3; $M_2$, 16.5, 17.8; $M_3$, 18.6, 20.7.

Lengths of isolated lower cheek teeth were measured 25 above the roots. A $P_2$ measured 19.8. Twelve premolars ranged from 17.9-19.8. Thirteen molars ranged from 15.5-17.4. Six $M_3$s ranged from 18.3-23.1, mean 20.4.

Dalquest and Donovan (1973) and Dalquest (1978) thought that *Nannippus lenticularis* was ancestral to later Hemphillian and Blancan species of *Nannippus* (*N. minor* Sellards, *N. lenticularis* Cope, etc.) but MacFadden and Waldrop (1980: 27-35) have shown that this theory is untenable. It now seems that *Nannippus lenticularis* represents a separate line of equid evolution. Distinguishing features separating *Nannippus lenticularis* from the *Nannippus minor-N. beckensis-N. phlegon* line include: protocone of $P^2$ isolated rather than connected to protoselene, except in later stages of wear, and parastylids of lower cheek teeth isolated columns in the cementum rather than a small fold at the anterolabial corners of the teeth or absent. Perhaps *Nannippus lenticularis* should be placed in a separate subgenus or genus but I see little utility to such action at this time.

*Nannippus* sp.

Among the collection of isolated *Nannippus* teeth from the Coffee Ranch, a few stand out by reason of small size. Included are three teeth that might be any of $P^3$-$M^2$, measuring 14.6, 15.3 and 15.4 in anteroposterior length, $M^3$s measuring 15.4 and 16.2; a lower premolar measuring 16.4, and a lower molar measuring 15.1.

These teeth are slightly too large to represent *Nannippus minor* Sellards or *Nannippus aztecus* Mooser and may actually be nothing but unusually small examples of *Nannippus lenticularis*, or they may represent a different species that cannot yet be defined.

*Hesperohipparion stirtoni* Dalquest

*Hipparion (Neohipparion) eurystyle*, Matthew and Stirton, 1930, Univ. California Publs., Geol. Sci. 19:362.

*Neohipparion eurystyle*, Stirton, 1940, Univ. California Publs., Geol. Sci. 25:185.

*Hesperohipparion stirtoni* Dalquest, 1981, Southwest Natur. 25:505-512.

*Hesperohipparion* is the least common of the horses of the Coffee Ranch local fauna. The holotype comes from the Coffee Ranch and consists of a left maxillary fragment with $P^4$-$M^3$ and an associated $M^2$ of the right side. There are also two lower jaw fragments with the milk dentitions and a number of isolated upper and lower cheek teeth. Matthew and Stirton (1930) figure a partial lower jaw with the premolars in place.

*Hesperohipparion* differs from other hipparions in that the ectoflexid of the lower molars does not enter the isthmus of the metaconid-metastylid. Upper teeth are readily separated from other kinds of horse teeth found in the Coffee Ranch Quarry by the elongated, isolated protocones, of which the lingual border is usually straight or concave. Lower cheek teeth vary greatly with wear. In lightly worn teeth, the metaconid and metastylid are widely separated and drawn out, their axes parallel with the long axis of the tooth, and long, prominent pli caballinids. The parastylid is moderately to strongly developed and not isolated in the cementum. The linguaflexid is a long, shallow trough, sometimes, in very early stages of wear, with a lingual-projecting spur dividing the trough into two U-shaped valleys. As the teeth wear down, the metaconids and metastylids converge and become more rounded, though still with their axes parallel to the axis of the teeth. The lingual spur of the linguaflexid vanishes, and the linguaflexid takes on a broad U-shape. With wear, the pli caballinid becomes shorter and smaller but is present almost to the base of the tooth.

Teeth of *Hesperohipparion* are most easily confused with those of *Nannippus*, though *Nannippus* teeth are usually smaller. Worn upper molars of *Hesperohipparion* may be approximately the size of *Nannippus* premolars, and worn lower teeth of *Hesperohipparion* may be the size of *Nannippus* lower teeth. The protocone of the upper teeth of *Nannippus* is distinguished by being small, short, and round or oval, with the lingual border convex. Lower cheek teeth of *Nannippus* lack the pli caballinid, always prominent in *Hespero-*

*hipparion* teeth. The parastylid of *Hesperohipparion* is always a strong fold at the corner of the protoconid. In *Nannippus* it may be a tiny ridge, altogether absent, or (as in *N. lenticularis*) a tiny column of enamel isolated in the cementum.

For measurements and detailed description of this species see Dalquest (1980).

## Order Artiodactyla

### FAMILY TAYASSUIDAE

*Prosthenops graffhami* Schultz and Martin
(Fig. 14, Table 4)

*Prosthenops (Macrogens) graffhami* Schultz and Martin, Bull. Univ. Nebraska State Mus. 10:35, 1975.

Peccary material is not common at the Coffee Ranch, but some good specimens were recovered. No complete skulls were found. An excellent palate contains all of the cheek teeth except the left $P^2$ and $P^3$. There are several partial lower jaw rami, the symphyseal portion of a mandible with one tusk, and some isolated cheek teeth and tusks.

The Coffee Ranch peccary is similar in size to other described late Miocene and Pliocene species of *Prosthenops,* most of which have the upper and lower cheek tooth series measuring from 80 to 90 mm. The upper tooth rows are almost parallel, $P^2$ is rounded, $P^3$ and $P^4$ more quadrate and molariform. The cusps of the cheek teeth have the enamel rather wrinkled, so that a complicated pattern is exhibited when the teeth are lightly to moderately worn.

The lower incisors are almost procumbent. $I_1$ and $I_2$ are small teeth and almost round in cross section. $I_3$ is almost vestigial, the crown somewhat swollen and bulbous. Tusks are large and triangular in cross section. $P_2$ is slender and triangular. $P_3$ and $P_4$ are quadrate and submolariform. The enamel pattern, like that of the upper teeth, appears rather complicated at early stages of wear.

The specimens from the Coffee Ranch resemble in size and morphological detail those figured and described by Schultz and Martin (1975) from the Kimball local fauna of Nebraska. It is possible that, if complete skulls were available, significant differences might be found between peccaries from the Coffee Ranch and Kimball local faunas. However, the Coffee Ranch and Kimball local faunas are closely equivalent in time, and in view of the amount of variation to be expected in a single species of peccary and the close resemblance of specimens from the two local faunas, specific identity is probable.

**Measurements.**–The upper cheek tooth row of the palate (TMM 41261-52) measures: $P^2$-$M^3$, 81.4; $M^1$-$M^3$, 49.0. Breadth of the palate between $P^4$s is 20.6; between $M^3$s, 20.0. Breadth across $P^4$s, 45.2; across $M^3$s, 48.5.

In the lower jaw, length $P_2$-$M_3$ (TMM 41261-51) is 82.6; lengths $M_1$-$M_3$ are (TMM 41261-51) 53.1 and (MWU 6885) 53.3. Depth of ramus under the middle of $P_2$ is 37.5; under the center of $M_3$, 37.0 (MWU 6885). The least breadth across the rami in the symphyseal region is 32.6 (MWU 4939).

### FAMILY CAMELIDAE

The three kinds of camels of the Coffee Ranch local fauna include one large species, *Megatylopus matthewi* Webb, and two relatively small types, *Alforjas taylori* Harrison and *Hemiauchenia vera* (Matthew). These have been dealt with in detail in an earlier paper (Dalquest, 1980), and figures and measurements are given in that report. The camel there named *Pliauchenia hemphillensis* n. sp., was described by Harrison (1979) as *Alforjas taylori.* Unfortunately, Harrison's paper was published too late to withdraw my description, and *Pliauchenia hemphillensis* is a synonym of *Alforjas taylori.*

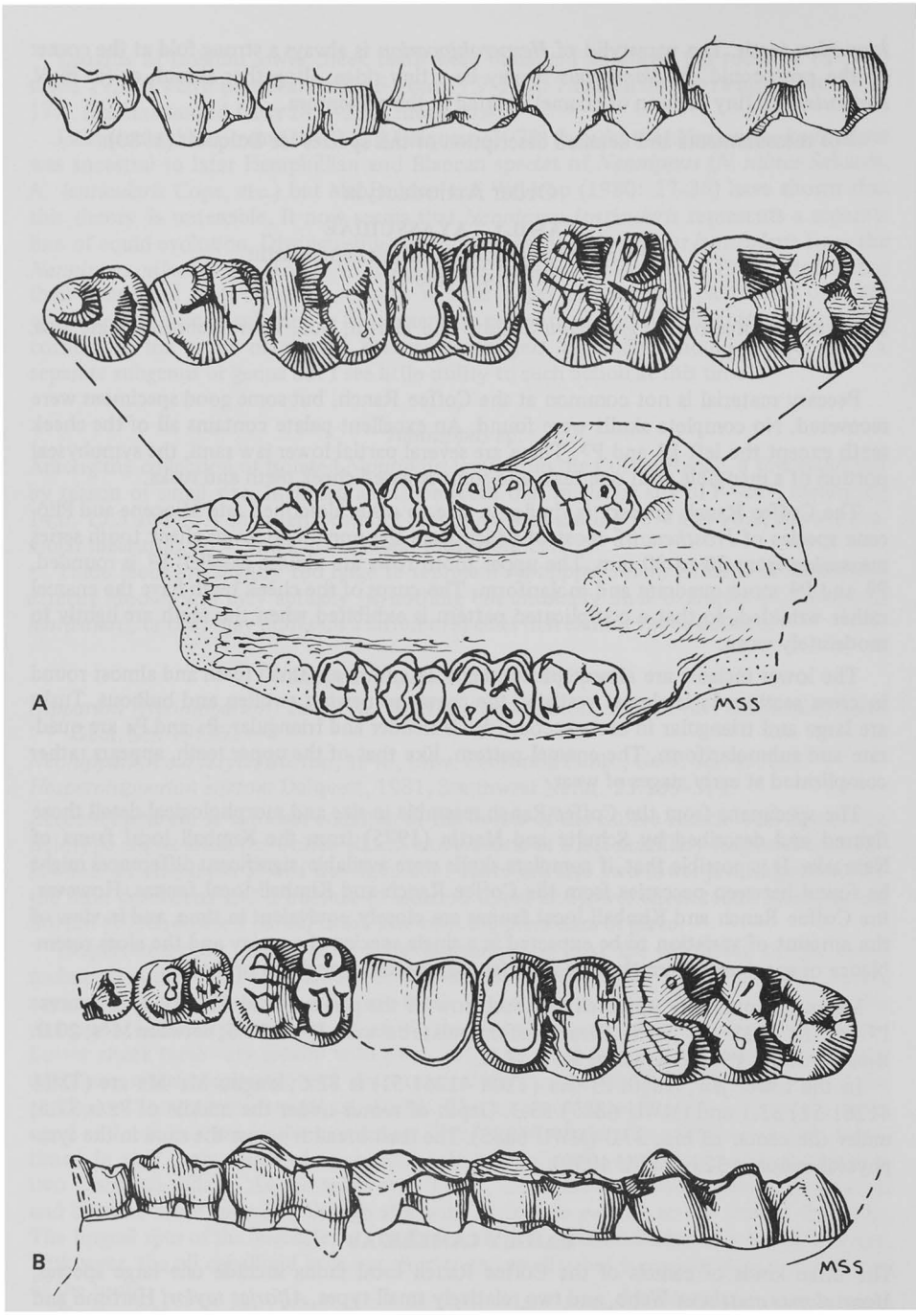



Figure 14.—A. Palate and upper cheek teeth of *Prosthenops graffhami* Schultz and Martin (41261-50), in labial and occlusal views. B. Lower cheek teeth of *Prosthenops graffhami* Schultz and Martin (41261-51) in occlusal and labial views.

Table 3. Measurements of cheek teeth of *Prosthenops graffhami.*

| No. | P2 | P3 | P4 | M1 | M2 | M3 |
|---|---|---|---|---|---|---|
| | | | UPPERS | | | |
| TMM 41261-52 | 9.7 x 8.6 | 10.8 x 10.4 | 13.3 x 11.4 | 13.4 x 12.4 | 16.4 x 15.0 | 19.0 x 14.4 |
| | | | LOWERS | | | |
| TMM 41261-51 | 6.8 x 5.3 | 10.5 x 8.3 | 13.2 x 11.2 | 13.6 x 11.5 | 16.5 x 13.3 | 24.0 x 13.8 |
| MWU 3552 | – | – | – | – | 15.3 x 11.0 | 23.2 x 12.5 |
| MWU 3370 | – | – | – | – | 16.4 x 11.8 | 25.0 x 12.7 |
| MWU 5000 | – | – | – | – | 17.5 x 12.4 | – |
| MWU 3553 | – | – | 13.7 x 10.7 | – | – | – |
| MWU 6885 | – | – | – | – | – | 23.2 x 13.4 |

Table 4. *Prosthenops graffhami,* measurements of tusks.

| Specimen number | Anteroposterior | Transverse | Probable age |
|---|---|---|---|
| | UPPERS | | |
| MWU 3482 | 18.3 | 12.2 | old |
| MWU 3555 | 17.1 | 11.6 | mature |
| MWU 6421 | 15.8 | 9.2 | young |
| | LOWERS | | |
| MWU 4939 | 11.8 | 10.7 | mature |
| MWU 2120 | 13.2 | 11.1 | mature |
| MWU 3557 | 12.6 | 10.2 | mature |
| MWU 3556 | 10.8 | 9.6 | young |
| MWU 6418 | 8.8 | 7.4 | piglet |

## FAMILY CERVIDAE

*Pediomeryx hemphillensis* Stirton
(Fig. 15, Table 5)

*Pediomeryx hemphillensis* Stirton, 1936, J. Mammal. 10:644.
*Yumaceras falkenbachi,* Frick, 1937, Bull. Amer. Mus. Natur. Hist. 69:145, in part.
*Yumaceras falkenbachi,* Dalquest, 1964, Trans. Kansas Acad. Sci. 66:748.

This deer was described from the Coffee Ranch Quarry. I overlooked this when I reported (1964) an aberrant lower jaw with two $P_2$s. The MWU collection includes four lower jaw fragments with all or most of the dentitions, three fragments of lower jaws with molars in place, and some isolated lower teeth. The upper dentition is represented only by isolated teeth. No skulls or horn cores were obtained.

All of the lower jaws lack the angle and ascending ramus. The most complete specimen (MWU 3173) lacks the incisors, and the bone about the alveoli of the incisors is chipped away and damaged. This is the jaw containing the extra $P_2$, mentioned above. The length of the diastema, from the estimated base of the canine alveolus to the anterior edge of the alveolus of the second (normal) $P_2$ is about 95.6. The vertical depth of the ramus at the shallowest point on the diastema is 16.1; the thickness at the same point is 11.3. Depth of the ramus on the lingual side, under the middle of $P_2$, measures (in 3 jaws): 26.0, 28.0, 31.4; under the middle of $M_2$ (4 jaws), 28.8, 29.3, 31.1, 31.2.

Lower jaw MWU 11440 contains the complete milk dentition and permanent $M_1$-$M_3$. The milk teeth are basically like the milk dentition of the whitetail deer (*Odocoileus virginianus*) and lack the fine, vertical striations of the enamel that are present on the permanent teeth. Measurements, taken near the base of the teeth, are as follows: $P_2$, 8.1 x 4.7; $P_3$, 13.0 x 6.8; $P_4$, 19.9 x 10.8. The $P_4$ has three lobes with prominent styles in the lingual reentrants.

Stirton (1936) could not give the complete dental formula of this deer. Enough of the alveoli of the tip of jaw MWU 3173 remains to show that it contained the typical cervid number: 3 incisors and the canine, the latter a bit lateral to and more vertically directed than the $I_3$.

Measurements of some upper teeth are: $P^2$, 7.2 x 10.5; $M^1$, 19.8 x 19.4 and 21.0 x 19.2; $M^2$ or $M^3$, 20.5 x 21.7.

Measurements of lower dentitions ($P_2$-$M_3$) are: (MWU 3463), 89.3; (TMM 41261-50), 91.0; (MWU 3173, excluding anterior $P_2$), 96.1. Measurements of individual teeth that follow were taken on the labial side at the base of the enamel.

## FAMILY ANTILOCAPRIDAE

*Texoceros* cf. *T. altidens* (Matthew)
(Table 6, 7)

*Merycodus altidens* Matthew, 1924, Bull. Amer. Mus. Natur. Hist. 50:200.
*Dorcameryx optimae* Reed and Longnecker, 1928, Univ. Texas Bull. 3231:66 (*nomen nudum*).
*Capromeryx altidens,* Hesse, 1935, J. Mammal. 16:307.
*Texoceros texanus,* Frick, 1937, Bull. Amer. Mus. Natur. Hist. 69:505.

A tiny antilocaprid is represented by a maxillary fragment, a few isolated upper teeth, five fragmentary lower jaws, some isolated lower teeth, a number of complete and partial metapodials, a radius, and some tarsal elements and phalanges. No skull or horn cores were found, even though horn cores were especially sought.

The Coffee Ranch antilocaprid is hesitantly referred to *Texoceros altidens,* a species based on an isloated $M_3$ from the Snake Creek beds of Nebraska. In 1935 Hesse referred specimens from two localities in Kansas to *Capromeryx altidens.* In the same paper he described a new species, *Capromeryx texanus,* from a site in Hemphill County, Texas, 22

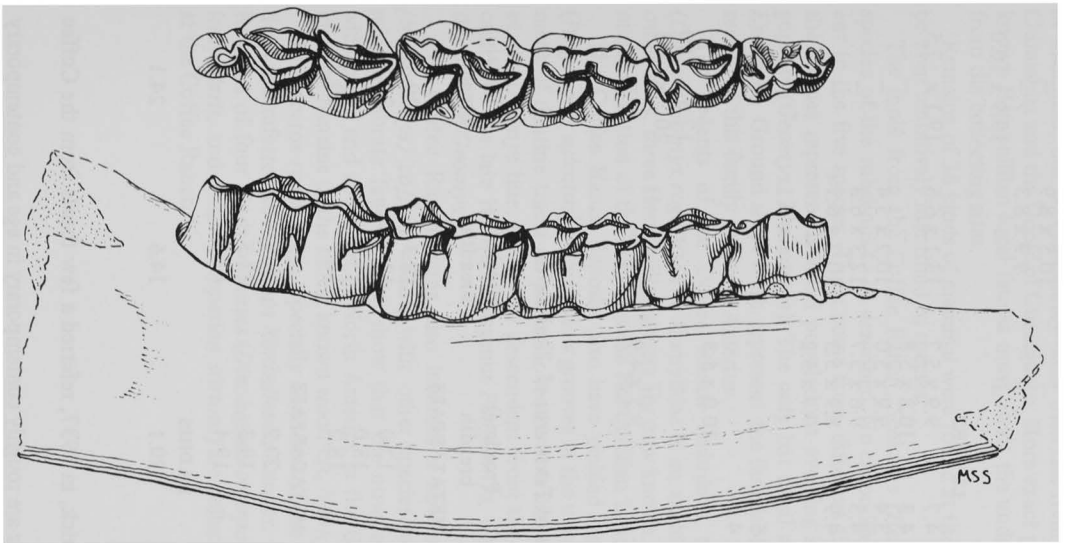



Figure 15.—Lower jaw fragment of *Pediomeryx hemphillensis* Stirton (41261-52) in occlusal and labial views.

Table 5. Measurements of lower cheek teeth of *Pediomeryx hemphillensis*.

| Specimen number | P2 | P3 | P4 | M1 | M2 | M3 |
|---|---|---|---|---|---|---|
| MWU 3173 | 9.8 x 7.0 | 12.7 x 11.2 | 14.3 x 11.2 | 19.0 x 12.9 | 21.2 x 12.6 | 28.8 x 13.1 |
| TMM 41261-50 | – | 12.5 x 9.3 | 13.6 x 11.0 | 16.3 x 13.4 | 19.1 x 14.9 | 26.7 x 15.0 |
| MWU 3463 | – | 12.3 x 8.4 | 13.6 x 10.2 | 17.7 x 13.7 | 20.0 x 13.9 | 26.5 x 14.0 |
| MWU 5460 | 9.2 x 6.5 | 11.1 x 9.0 | 13.1 x 10.0 | 18.0 x 13.3 | 20.5 x 13.5 | – |
| MWU 3182 | 10.4 x 6.7 | 8.8 x 7.7 | – | 18.8 x ? | – | – |
| MWU 3465 | – | – | – | – | – | 25.0 x 14.1 |
| MWU 2977 | – | – | – | – | 20.9 x 14.3 | – |

Table 6. Measurements of cheek teeth of *Texoceros* cf. *T. altidens.*

| Specimen number | P3 | P4 | M1 | M2 | M3 |
|---|---|---|---|---|---|
| | | | UPPERS | | |
| MWU 7365 | 6.3 x 5.7 | 6.8 x 5.8 | 9.2 x 8.4 | 12.4 x 9.1 | 16.5 x 9.2 |
| MWU 3865 | – | 6.8 x 5.8 | 7.8 x 7.7 | – | – |
| MWU 6424 | – | – | – | 10.5 x 8.9 | – |
| MWU 8918 | – | – | – | 9.9 x 8.3 | – |
| MWU 6425 | – | – | – | – | 19.9 x 10.0 |
| | | | LOWERS | | |
| MWU 5636 | – | 8.2 x 4.7 | 9.9 x 5.7 | 13.1 x 6.6 | 19.1 x 7.5 |
| MWU 3561 | 8.1 x 4.8 | 9.9 x 4.3 | 10.8 x 5.8 | – | – |
| MWU 3562 | – | 7.9 x 3.4 | 9.9 x 5.0 | 10.2 x 5.4 | – |
| MWU 1051 | 7.3 x 3.7 | 8.3 x 4.5 | 9.6 x 5.7 | 12.3 x 6.3 | – |
| MWU 3563 | 6.9 x 4.3 | 7.5 x 4.9 | 8.9 x 5.3 | 10.7 x 6.1 | – |
| MWU 4319 | – | – | 9.7 x 5.2 | – | – |
| MWU 4318 | – | – | – | 11.1 x 6.1 | – |
| MWU 6423 | – | 8.5 x 5.1 | – | – | – |
| MWU 6422 | – | 7.5 x 4.0 | – | – | – |
| MWU 3498 | 6.5 x 3.6 | – | 10.0 x 5.3 | – | – |
| MWU 1903 | – | – | – | – | 17.6 x 7.0 |
| MWU 3020 | – | – | – | – | 20.3 x 8.3 |
| MWU 8085 | – | – | 9.5 x 4.9 | – | – |

Table 7. Measurements of limb bones of *Texoceros* cf. *T. altidens.*

| Specimen number | Greatest length | Proximal breadth | Midshaft breadth | Distal breadth |
|---|---|---|---|---|
| | | METATARSALS | | |
| MWU 3473 | 141.0 | – | 12.3 | 20.3 |
| MWU 3855 | 140.0 | 17.0 | 12.4 | 20.1 |
| MWU 3854 | 147.8 | 18.0 | 11.7 | 20.2 |
| MWU 3352 | 135.2 | 18.2 | 11.9 | 20.9 |
| | | METACARPALS | | |
| MWU 1931 | 147.7 | 20.7 | 13.1 | 21.6 |
| MWU 3857 | 126.6 | 19.3 | 12.3 | – |
| MWU 3589 | – | 19.4 | 12.1 | – |
| | | RADIUS | | |
| MWU 6887 | 138.6 | 20.1 | 14.6 | 24.1 |

miles north of the Coffee Ranch. Frick, in 1937, referred a few fossils from the Coffee Ranch to *Texoceros texanus.*

*Texoceros altidens* and *T. texanus* are roughly contemporary in age and contemporary with the Coffee Ranch fossils, as well as with Optima local fauna of Oklahoma from which Frick (1937) described *T. guymonensis.* Lower jaws and dentitions of antilocaprids offer few diagnostic characters at the species level. A partial horn core is known from the Optima site but elsewhere only jaws and teeth have been found. In the absence of diagnostic horn cores, the Coffee Ranch material is referred to the earliest-named species, *T. altidens.*

**Measurements.**—None of the lower jaws contains the P2, but two jaws have the alveolus of P2 and complete P3-M3. The alveolar lengths of the P2-M3 of these tooth rows measure: 67.3 (MWU 3561); 63.3 (MWU 5636). Measurements of individual teeth that follow were made just above the base of the enamel.

## SUMMARY

The Coffee Ranch local fauna is Mid-Hemphillian in age and correlates with the Kimball local fauna of Nebraska, the Edson Quarry local fauna of Kansas, the Optima local fauna of Oklahoma, the Chamita local fauna of New Mexico, and others. It is younger than local faunas such as the Higgins, of Texas, which possess some holdover Clarendonian species of mammals, but is considerably older than late Hemphillian faunas like the Yepomera of Chihuahua and the Ocote of Guanajuato. More exact placement in sequence of the various known Hemphillian local faunas must await the understanding of microvertebrate faunas from the collecting sites.

Remains of 38 kinds of mammal were found at the Coffee Ranch, ten of which cannot be even tentatively identified to species.

The mole from the Coffee Ranch, *Scalopus (Hesperoscalops) ruficervus*, is the fifth species of the subgenus to be described. No chronological evolutionary sequence is apparent in the five species. Three come from different time periods, and it is suggested that the species represent isolated populations evolving independently as do modern pocket gophers (*Geomys, Thomomys*). The only bat fossil represents an early form of the genus *Eptesicus*. Ground sloth teeth represent the family Mylodontidae and may be the earliest record of this family in North America.

The rodents of the Coffee Ranch include a new genus and species of eomyid (*Comancheomys rogersi*). The Eomyiidae is an ancient family, but with discoveries from other sites, three Hemphillian genera are now known. There seems to have been a late but minor radiation of the family in the Hemphillian Land Mammal Age.

The Coffee Ranch deposits also have yielded remains of a species of pocket gopher (*Progeomys sulcatus*) with shallow grooves in the upper incisors and scarcely any development of dentine tracts on premolar teeth. This may be the earliest known pocket gopher of the *Geomys* line. It may be descendent from the Clarendonian *Pliosaccomys* and ancestral to the late Hemphillian genus *Pliogeomys*, which in turn is probably ancestral to the modern *Geomys*.

The Coffee Ranch fauna also includes a new species of cricetid rodent, *Calomys (Bensonomys) coffeyi* which, with other species recently described from Hemphillian microvertebrate faunas, helps show that the now largely neotropical Hesperomini were widespread and abundant in North America in the Hemphillian. The cricetine fauna also includes remains of the oldest known wood rat, *Neotoma (Paraneotoma) minutus*.

Rhinoceros remains are especially abundant at the Coffee Ranch, and (with one exception) are referred to *Aphelops kimballensis* Tanner. The dentition is described in detail. Remains of four kinds of horses (*Dinohippus interpolatus, Astrohippus ansae, Nannippus lenticularis*, and *Hesperohipparion stirtoni*) are collectively the most common megafossils at the Coffee Ranch.

## LITERATURE CITED

Baskin, J.A. 1978. *Bensonomys, Calomys,* and the origin of the Phyllotine group of neotropical cricetines (Rodentia: Cricetidae). J. Mammal. 59:125–135.

———. 1979. Small mammals of the Hemphillian age White Cone local fauna, northeastern Arizona. J. Paleontol. 53:695–708.

Bennett, D.K. 1979. The fossil fauna from Lost and Found quarries (Hemphillian: latest Miocene), Wallace County, Kansas. Occ. Papers Univ. Kansas, Mus. Natur. Hist. 79:1–24.

Berggren, W.C., and J.Van Couvering. 1974. The late Neogene: biostratigraphy, geochronology and paleoclimatology of the last 15 million years in marine and continental sequences. Paleogeogr., Paleoclimatol. Paleoecol. 16:1–216.

Boellstorff, J.D. 1976. The succession of late Cenozoic volcanic ashes in the Great Plains: A progress report. *In* Guidebook, 24th Annual Meeting, Midwestern Friends of the Pleistocene, Stratigraphy and Faunal Sequence–Meade County, Kansas, Guidebook Series 1, Kansas Geol. Surv., 85 pp.

Burt, W.H. 1931. *Machairodus catopicus* Cope from the Pliocene of Texas. Univ. California Publs., Geol. Sci. 20:261–292.

Cope, E.D. 1893. A preliminary report of the vertebrate paleontology of the Llano Estacado. 4th Rept. Geol. Surv. Texas, 1892, 1–137.

Dalquest, W.W. 1964. An unusual ungulate jaw from the Pliocene of Texas. Trans. Kansas Acad. Sci. 747–749.

———. 1969. Carnivores of the Coffee Ranch (Type Hemphillian) local fauna. Bull. Texas Memorial Mus. 15:1–44.

———. 1980. The camels of the Coffee Ranch local fauna (Hemphillian Age) of Texas. J. Paleontol. 54:109–117.

———. 1981. *Hesperohipparion* (Mammalia, Equidae) a new genus of horse from the Hemphillian of North America, with description of a new species. Southwest. Natur. 25:505–512.

———, and Donovan, T.J. 1973. A new three-toed horse (*Nannippus*) from the late Pliocene of Scurry County, Texas. J. Paleontol. 47:34–45.

———. 1978. Phylogeny of American horses of Blancan and Pleistocene age. Acta Zool. Fennici, 15:191–199.

———, and Mooser, O. 1980. Late Hemphillian mammals of the Ocote local fauna, Guanajuato, Mexico. Texas Memorial Mus. Pearce-Sellards Ser. 32:1–25.

Frick, C. 1937. Horned ruminants of North America. Bull. Amer. Mus. Natur. Hist. 69: 1–669.

Gidley, G.W. 1907. Revision of the Miocene and Pliocene equidae of North America. Bull. Amer. Mus. Natur. Hist. 35:865–934.

Harrison, J.A. 1979. Revision of the Camelinea (Artiodactyla, Tylopoda) and description of the new genus *Alforjas.* Univ. Kansas Paleontol. Inst. Paper 95:1–20.

Hesse, C.J. 1935. New evidence of the ancestry of *Antilocapra americana.* J. Mammal. 35:307–315.

Hibbard, C.W. 1954. A new Pliocene vertebrate fauna from Oklahoma. Papers Michigan Acad. Sci., Arts, Letters 39:339–359.

———. 1964. A contribution to the Saw Rock Canyon local fauna of Kansas. Papers Michigan Acad. Sci., Arts, Letters 49:115–127.

———. 1967. New rodents from the late Cenozoic of Kansas. Papers Michigan Acad. Sci., Arts, Letters 52:115–131.

Hirshfeld, S.E., and S.D. Webb. 1968. Plio-Pleistocene megalonchid sloths of North America. Bull. Florida State Mus. 12:213–296.

Izett, G.A. 1975. Late Cenozoic sedimentation and deformation in northern Colorado and adjoining areas. Pp. 179–209 *in* Cenozoic history of the southern Rocky Mountains. Geol. Soc. America Mem. 144.

Lindsay, E.H. 1972. Small mammal fossils from the Barstow Formation, California. Univ. California Publs., Biol. Sci. 93:1–104.

———, and N.T. Tessman. 1974. Cenozoic vertebrate localities and faunas in Arizona. J. Arizona Acad. Sci. 9:3–24.

Matthew, W.D. 1932. A review of the rhinoceroses with a description of *Aphelops* material from the Pliocene of Texas. Univ. California Publs., Geol. Sci. 20:411–480.

———, and R.A. Stirton. 1930a. Osteology and affinities of Borophagus. Univ. California Publs., Geol. Sci. 19:171–216.
———. 1930b. Equidae from the Pliocene of Texas. Univ. California Publs., Geol. Sci. 19:349–369.
MacFadden, B.J. 1977. Magnetic polarity stratigraphy of the Chamita Formation stratotype (MioPliocene) of north-central New Mexico. American J. Sci. 277:769–800.
———, and J.S. Waldrop. 1980. *Nannippus phlegon* (Mammalia, Equidae) from the Pliocene (Blancan) of Florida. Bull. Florida State Mus. 25:1–37.
Osborn, H.F. 1918. Equidae of the Oligocene, Miocene and Pliocene of North America, iconographic revision. Mem. American Mus. Natur. Hist. 2:2–328.
Reed, L.C., and O.M. Longnecker, Jr. 1932. The geology of Hemphill County, Texas. Univ. Texas Bull. 3231:1–98.
Repenning, C.A. 1967. Subfamilies and genera of the Soricidae. Prof. Paper U.S. Geol. Surv. 565:1–74.
Richey, K.A. 1979. Variation and evolution in the premolar teeth of *Osteoborus* and *Borophagus* (Canidae). Trans. Nebraska Acad. Sci. 7:105–123.
Savage, D.E. 1941. Two new middle Pliocene carnivores from Oklahoma with notes on the Optima fauna. Amer. Mid. Natur. 25:692–710.
Schultz, G.E. 1977. Guidebook field conference on late Cenozoic biostratigraphy of the Texas Panhandle and adjacent Oklahoma. Killgore Research Center, West Texas State Univ., Spec. Publ. 1:1–160 (mimeograph).
Schultz, C.B., and L.D. Martin. 1975. A new Kimballian peccary from Nebraska. Bull. Univ. Nebraska State Mus. 10:35–46.
———, M.R. Schultz, and L.D. Martin. 1970. A new tribe of saber-toothed cats (Barbourofelini) from the Pliocene of North America. Bull. Univ. Nebraska State Mus. 9:1–31.
Shotwell, J.A. 1967. Late Tertiary geomyoid rodents of Oregon. Bull. Mus. Nat. Hist. Univ. Oregon 9:1–51.
Stehlin, H.G., and S. Schaub. 1951. Die Trigonodontie der Simplicidentaten Nager. Schweiz. Pal. Abh. 67:1–385.
Stirton, R.A. 1936. A new ruminant from the Hemphill middle Pliocene of Texas. J. Paleontol. 10:644–647.
———. 1938. Notes on some late Tertiary and Pleistocene antilocaprids. J. Mammal. 19: 366–370.
Tanner, L.G. 1967. A new species of rhinoceros, *Aphelops kimballensis*, from the latest Pliocene of Nebraska. Bull. Univ. Nebraska State Mus. 6:1–16.
Wahlert, J.H. 1978. Cranial foramina and relationships of the Eomyoidea (Rodentia, Geomorpha). Skull and upper teeth of *Kansasimys*. Amer. Mus. Natur. Hist. Novitates 2645:1–16.
Webb, S.D. 1965. The osteology of *Camelops*. Bull. Los Angeles Co. Mus. 1:1–54.
Wood, A.E. 1936. A new rodent from the Pliocene of Kansas. J. Paleontol. 10:392–394.
Wood, H.E., et al. 1941. Nomenclature and correlation of the North American Continental Tertiary. Geol. Soc. Amer. Bull. 52:1–48.