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EARLY PLEISTOCENE (IRVINGTONIAN) MAMMALS FROM THE SEYMOUR FORMATION, KNOX AND BAYLOR COUNTIES, TEXAS, EXCLUSIVE OF CAMELIDAE

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The Seymour Formation consists of fluvial and lacustrine sediments, more than 10 meters thick in places, which mantle the Permian bedrock east of the High Plains and south of the base of the Texas Panhandle in north-central Texas. The formation was named by Cummins (1893), mapped by Gordon (1913), and the geology was discussed by Stricklin (1961). Hibbard and Dalquest (1966) summarized the geology and vertebrate paleontology of the Seymour deposits along the South Fork of the Big Wichita River. Studies of the geology of the Seymour Formation currently are underway by other workers and the geology is not dealt with here.

Cummins (1893) reported fossils of mastodons and horses from 14 miles east of Benjamin, Knox County, the first reports of vertebrate fossils from the study area. Cummins (1893) stated "the formation, with its natural barriers, is well represented between the Brazos River and the Big Wichita River between Seymour, in Baylor County, and Benjamin, in Knox County, and I have named its beds the Seymour Beds, for the reason that I first saw them in that vicinity." Hay (1924) mentioned the fossils seen by Cummins and gave "Seymour" as the type locality of the Seymour Formation. This was contrary to Cummin's intentions. There are late Pleistocene terrace deposits near Seymour, along

the Brazos River, but the Seymour Formation itself lies some miles to the west of Seymour. The formation is best represented, as Cummins stated, between Benjamin and Seymour. Hibbard and Dalquest (1966) fixed the type locality where Cummins intended, and described a measured section at a site 0.9 miles north of U.S. Highway 82, about 300 meters east of Texas State Farm Road 267, west part of Lot 10, Block C, Houston and Central Texas Railroad Survey.

Dalquest, aided by students from Midwestern University (now Midwestern State University), began to collect and study the fossil vertebrates of the Seymour Formation in 1956. The study area includes the sands, gravels, and silts of Pleistocene age on both north and south sides of the Big Wichita River from the town of Benjamin, Knox County, east to a point north of the village of Red Springs, Baylor County. The late Claude W. Hibbard joined in collecting efforts in 1956, 1957, and 1962. Papers by Hibbard and Dalquest based on specimens collected include the description of a new species of antilocaprid (1960), an account of the artiodactyls of the Seymour Formation (1962), a general account of the fauna (1966), and description of a new species of round-tailed muskrat (1973).

In 1975, we began a systematic survey of the study area; most of the Pleistocene sediments along both banks of the Big Wichita River were visited and checked for fossils. The collections and data accumulated now permit a more detailed assessment of the fauna and the age of the deposits.

Hibbard and Dalquest included the vertebrate species discovered in the silts, sands, and gravels of the lower part of the Seymour Formation in the Gilliland local fauna. The mammals of the Gilliland local fauna were large species, with the exception of the cottontail and the muskrat. The local fauna correlated with the Rock Creek local fauna of Texas (Cope, 1893; Troxell, 1915; Hay, 1924; Schultz, 1977) and the Holloman local fauna of Oklahoma (Meade, 1953; Dalquest, 1977). These local faunas also consisted almost entirely of large mammal species.

Screen-washing of brown clay from three sites immediately beneath isolated beds of Pearlette volcanic ash in the Seymour Formation yielded a rich fauna named the Vera "faunule": 45 species of mollusks (Getz and Hibbard, 1965); six species of fishes (identified by G. R. Smith and listed by Hibbard and Dalquest, 1966); five species of amphibians (identified by J. A. Tihen and listed by Hibbard and Dalquest, 1966); three snakes (Holman,

1965); two birds (Broadkorb, 1964*a*, 1964*b*); and 12 species of mammals (Hibbard and Dalquest, 1966).

The mammals found in the clay under the volcanic ash were all small species and comparison with the Gilliland local fauna, which consisted almost exclusively of large species, was not meaningful. Volcanic ash, clay, and fossils had accumulated in ponds or lakes that occupied closed depressions in the pre-existing land surface, and, therefore, were younger than the fossils of the Gilliland local fauna. The fauna from under the Pearlette ash in the Seymour Formation correlated closely with the Cudahy local fauna, collected immediately beneath deposits of Pearlette volcanic ash in Kansas. Hibbard and Dalquest applied the name "Cudahy Fauna" to all local faunas collected immediately beneath Pearlette volcanic ash, and termed the fauna from beneath the ash in the Seymour Formation the Vera local faunule of the Cudahy Fauna.

Although the Cudahy local fauna and Vera local faunule were similar, the Borchers local fauna of Kansas, found above a bed of Pearlette ash and presumably younger, appeared to be older than the Cudahy Fauna, based on faunal elements. This led to confusion, resolved in part when it was discovered that there was more than one Pearlette ash event (Izett *et al.*, 1971; Naesser *et al.*, 1971; Boellstorff, 1972). The Pearlette ash of the Seymour Formation is Type O, dated at about 0.6 million years before the present. The ash in the Crooked Creek Formation, which contained the Borchers local fauna, is Type B ash, dated at about two million years ago. Hibbard and Dalquest (1973) corrected their earlier misconceptions, considered the Cudahy Fauna from immediately beneath the Type O volcanic ash to be late Kansan in age, and considered the Gilliland local fauna to be Irvingtonian, preglacial and preKansan but postBlancan in age. The Gilliland local fauna thus was considered younger than the Borchers local fauna but much older than the Vera local faunule.

The major stumbling block in attempts to date the Gilliland and equivalent local faunas was the nature of the fossils. The Vera local faunule consists entirely of small species. The Cudahy local fauna includes many microvertebrate species and an undetermined peccary, a camel, an antilocaprid, and *Equus scotti* and *Asinus calobatus*. Both horses occur in the Gilliland, Rock Creek, and Holloman, local faunas but are "long-range" species, recorded from both Irvington and Rancholabrean local faunas. The few smaller mammals known from Gilliland-type faunas

also are "long-range species" or, as *Proneofiber guildayi* of the Gilliland local fauna, unique but with time-range unknown.

In our survey of the Seymour Formation, we were especially alert for sites that might furnish a microvertebrate fauna from deposits that contain the Gilliland local fauna. In 1978, we chose a site on the Bruce Burnett Ranch where sandy, somewhat calcareous sediments were unusually rich in typical Gilliland large mammal species. The site is the wall of a small canyon a half kilometer south of the type locality of the Seymour Formation as fixed by Hibbard and Dalquest (1966). A jaw of *Hemiauchenia* and teeth of *Equus scotti* and *Tetrameryx seymourensis* were collected there; fragments of *Glyptotherium* scutes and *Stegomastodon* teeth were noted. The site, which we have named the Burnett Quarry, is stratigraphically below the deposits of Pearlette ash that occur less than a half a kilometer to the north. From this site, we washed approximately five tons of matrix. The concentrate formed a large quantity of irregular granules of reddish brown, calcareous grit, and sorting the concentrate was tedious and difficult. The collection of microvertebrates obtained, although limited in species and number, permits much closer correlation of the Gilliland local fauna than was previously possible.

The Gilliland local fauna is stratigraphically below and, therefore, older than the Vera local faunule, but is much younger than believed by Hibbard and Dalquest (1973). The differences in the two faunas (Table 1) cannot be attributed to geographic separation (the Burnett Quarry is less than one kilometer from a site where a typical Vera local faunule was collected). Environmental differences seem unlikely; the vole, *Pitymys llanensis*, was the most common species at both sites. The fossils recovered from the Burnett Quarry are older than those of the Vera local faunule, but the presence of *Microtus paroperarius, Pitymys llanensis*, and *Geomys tobinensis* in both faunas indicates that the difference in age is slight. For practical purposes Cudahy and Gilliland type faunas are contemporary.

We suggest that the term Cudahy Fauna, used for invertebrate and vertebrate faunas recovered in the sediments immediately beneath deposits of Type O Pearlette ash be replaced by Cudahy-type fauna. "Cudahy Fauna" has not been widely accepted and may lead to confusion with the Cudahy local fauna. Cudahy-type local faunas, wherever found, must be almost exactly contemporary. We also suggest that the term Vera "faunule" be replaced

TABLE 1.—*Comparisons of small mammals of the Vera and Gilliland local faunas.*

Vera local fauna	Gilliland local fauna
Sorex cinereus Kerr	*Notiosorex crawfordi* (Coues)
Cyrptotis parva Say	*Eptesicus fuscus* (Palisot de Beauvois)
Blarina cf. *brevicauda* (Say)	*Lepus* sp.
Scalopus sp.	*Sylvilagus* cf. *floridanus* (J. A. Allen)
Spermophilus sp.	*Spermophilus* sp., small
Geomys tobinensis (Hibbard)	*Cynomys ludovicianus* (Ord)
Perognathus sp.	*Castor canadensis* Kuhl
Onychomys sp.	*Geomys tobinensis* (Hibbard)
Microtus paroperarius Hibbard	*Geomys* sp.
Pittmys llanensis (Hibbard)	*Perognathus* sp.
Ondatra annectens (Brown)	*Dipodomys pattersoni* Dalquest and Carpenter
Ondatra sp., large	*Peromyscus cragini* Hibbard
	Onychomys pedroensis Gidley
	Sigmodon cf. *curtisi* Gidley
	Neotoma sp.
	Microtus paroperarius Hibbard
	Pitymys llanensis (Hibbard)
	Proneofiber guildayi Hibbard and Dalquest

with Vera local fauna. Tedford (1970) noted that "Vera faunule" is inconsistent. The term "faunule" is best restricted to stratigraphically separated faunas from a single site. Even though the Vera local fauna is but slightly younger than the Gilliland local fauna, we believe continued separation of the two as local faunas is justified.

ACCOUNTS OF SPECIES

Species accounts are presented for those species known from the Gilliland local fauna. We have no new information concerning the Vera local fauna. Mammals of that fauna were described by Hibbard and Dalquest (1966) and are listed in Table 1. Catalog numbers not preceded by an acronym are in the collection of Midwestern State University. The acronym UMMP refers to the collection of the University of Michigan Museum of Paleontology. All measurements are in millimeters.

Notiosorex crawfordi (Coues, 1877)

One lower jaw fragment (12211) containing the root of the incisor, alveoli of premolars, and m1-m2 was recovered from the

Burnett Quarry. The specimen was identified by C. A. Repenning of the U. S. Geological Survey, who mentioned that this may be the earliest record of the species.

Eptesicus fuscus (Palisot de Beauvois, 1796)

A lower m2 (12212) from the Burnett Quarry is complete and perfectly preserved. A strong cingulum borders the tooth on the anterior, labial, and posterior margins. The tooth is similar in color and type of preservation to other fossils from the quarry. It matches in details of size and structure the lower m2 of modern specimens of the big brown bat. A bat similar or identical to the big brown bat was present when the Gilliland fossils were accumulating. The tooth measures: anteroposterior length, 1.75; transverse breadth, 1.20.

Holmesina septentrionalis (Leidy, 1889)

The giant armadillo must have been rare in the Gilliland local fauna for a single scute (Hibbard and Dalquest, 1966:fig. 5C) is the only specimen that has been discovered.

Glyptotherium arizonae Gidley, 1926

Glyptodon fossils collected earlier from the Seymour Formation were reported by Melton (1964) and included a skull, lower jaws, an almost complete tail with armour and vertebrae, two articulated feet, many isolated bones, pieces of carapace, and isolated scutes. Additional bones, sections of carapace, and isolated scutes since have been found. An isolated supraoccipital (3241, length, 65.9; greatest breadth, 55.7), probably from an immature animal, is so unusual that it is figured here (Fig. 1A). In the mature animal, the skull bones are solidly fused. The bulk of glyptodon remains were found south of Gilliland, but bones and scutes were taken virtually throughout the Seymour Formation in the collecting area.

Gillette (1973) and Gillette and Ray (1981) placed the glyptodons of the United States into three species of the genus *Glyptotherium*: the small *G. texanum* of Blancan age, the large *G. arizonae* of Irvingtonian age, and *G. floridanum* of Rancholabrean age, and referred the glyptodon fossils of the Gilliland local fauna to *G. arizonae*.

Nothriotheriops shastensis (Sinclair 1917)

A fragmentary lower jaw with two posterior teeth, the posterior part of a cranium, isolated teeth, foot elements, an atlas, a thoracic vertebra, and a complete scapula (1582) have been

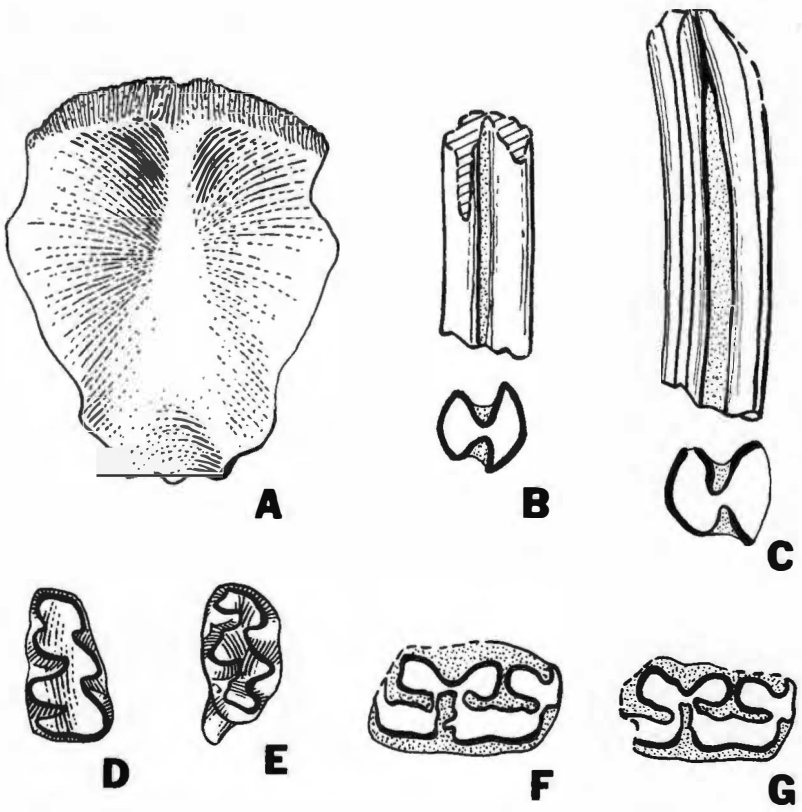

FIG. 1.—Fossils from the Gilliland local fauna. A, dorsal view of isolated supraoccipital of young *Glyptodon arizonae* (3241). B and C, lateral and occlusal views of upper fourth premolars of *Geomys tobinensis* (12216). D, occlusal view of lower first molar of *Peromyscus cragini* (12228). E, occlusal view of upper first molar of *Onychomys pedroensis* (12230). F and G, dorsal views of lower first or second molars of zebrine *Equus*, sectioned 10 below the occlusal surface (12248, 1821). See text for measurements.

recovered. Only the lower jaw fragment is diagnostic (Hibbard and Dalquest, 1966:fig. 5A). The ramus under the posterior molariform teeth is almost level rather than swiftly increasing in depth anteriorly, as in *Megalonyx*. The other fossils only indicate a small ground sloth.

Nothriotheriops appears to be much less common in the Gilliland local fauna than *Glossotherium*, because the relatively few specimens (nine) are greatly outnumbered by remains of the latter. Parts of skeletons of ground sloths are so unusual in

appearance that even fragmentary bones that catch the eye are apt to be saved.

Glossotherium harlani (Owen, 1840)

Earlier collected materials include parts of skulls, lower jaws, isolated teeth, parts of an associated skeleton, many limb and foot bones, and so forth; for a complete listing, see Hibbard and Dalquest (1966). More recently recovered are fragments of two skulls, much of a pelvic girdle, limb bones, and vertebrae. Specimens were found virtually throughout the Seymour Formation.

Edward Roth and Robert Westmoreland, university students, discovered what might have been a complete *Glossotherium* skeleton on the Patterson Ranch. Because it was late in the day and they were some distance from a highway, they collected only the skull (largely an internal cast; many of the external bones eroded away) and some limb bones, all encased in hard sandstone. In spite of repeated efforts to rediscover the site, they have been unable to locate the specimen.

Lepus sp.

A p3 (12213), cleanly broken across the axis of the tooth, was washed from matrix at the Burnett Quarry. Anteroposterior diameter of the tooth is 3.16; transverse diameter 2.54. The enamel pattern is typical of *Lepus* and *Sylvilagus*.

Sylvilagus cf. ***floridanus*** (J. A. Allen, 1890)

Articulated lower jaws reported by Hibbard and Dalquest (1966), were found in such context as to convince the authors that they were fossils of the Gilliland local fauna. An isolated M3 (12215) was recovered at the Burnett Quarry. All of the specimens are the size of the living eastern cottontail.

The common cottontail of the area today is *Sylvilagus floridanus*, but previous to 1900 only *S. audubonii*, the desert cottontail, was present. The desert cottontail now is rare in the Gilliland area.

Cynomys cf. ***ludovicianus*** (Ord, 1815)

A worn upper molar (12222), part of another (12223), and much of a lower molar (12225) belong to prairie dogs of the black-tailed group. Six molars and an astragalus (12227) were screen-washed from a bed of gray clay north of Red Springs, Baylor County. This site is low in the Seymour Formation, well below the level of the Pearlette volcanic ash, although no ash

occurs nearby. The teeth and astragalus are from a single half-grown prairie dog with teeth that were just beginning to show wear. They also are of the black-tailed group.

Prairie dog remains, often quite complete and well preserved, were found almost throughout the Seymour Formation. Some were in the compact beds of sand or sand and gravel several meters beneath the prairie soil and associated with remains of extinct Pleistocene mammals. All of these bones were heated to incandescence. Most burned, smoked, and gave off a strong odor of burned collagen. These were definitely bones of Recent animals that had burrowed into the Pleistocene layers. It is surprising how deep these mammals can burrow and what hard matrix they can penetrate.

Some of the bones were true fossils and remained unchanged when heated. It is possible that some are of late Pleistocene age and not of the age of the Gilliland local fauna. All of the specimens, both fossil and Recent, are *Cynomys ludovicianus*. We have not included these in the list of Gilliland mammals.

However, teeth from the two sites listed above were found in such context that they almost certainly are not intrusive from younger faunas. The teeth are not diagnostic enough to determine with certainty if the species is *C. ludovicianus* or another, but they are not of the white-tailed group, *Leucocrossuromys*. For methods of separating lower teeth of the two subgenera of prairie dogs see Dalquest (1988*a*).

Spermophilus sp., small

One isolated m3 (12226) and a damaged upper molar (12224) were recovered from the Burnett Quarry. The lower tooth is too worn to see details but is close to the m3 of *Spermophilus spilosoma* in size. The teeth are not sufficient for species identification but show the presence of a small species of ground squirrel in the fauna.

Hibbard and Dalquest (1966) reported 10 teeth the size of those of the living *Spermophilus franklinii* (Sabine) from the Vera local fauna. No teeth of this size were found in the Burnett Quarry.

Castor canadensis Kuhl, 1820

A calcaneum of a young beaver (9717) has the epiphyseal suture still visible. The specimen matches calcanea of young of the living beaver from Texas. Greatest length of the bone is 45 millimeters, but slight abrasion at the posterior end may have shortened it.

Geomys tobinensis (Hibbard, 1944)

Fossils from the Burnett Quarry include the following isolated teeth of a small species of pocket gopher—one p4 (12288), two P4's (12216), two incisor fragments (12214), four upper molars (12218), and four lower molars (12219). The lower premolar measures: length, 1.92; breadth of talonid, 1.20; breadth of trigonid, 1.60. Measurements of the two upper premolars are: length, 1.68, 1.44; breadth of anterior loph, 1.76, 1.68; breadth of posterior loph, 1.68, 1.36.

The premolars (Fig. 2B, 2C) show the character remarked by Hibbard (1944) in the original description of the species: reentrant angles acute, converging inward, rather than narrow with almost parallel sides. Lower premolars of typical *Geomys*, when worn to just beneath the top of the crown, also have V-shaped reentrants, but the valleys become U-shaped with slight additional wear. The fossil teeth do not appear to be from young gophers. Were it not that the holotype is a lower jaw with molars possessing enamel plates on the posterior faces only, the specimen might be mistaken for *Thomomys*. The premolars from the Burnett Quarry also resemble those of *Thomomys*.

Geomys sp.

One p4 and a damaged P4 (12217) were recovered at the Burnett Quarry. These are of another, larger species of pocket gopher with the narrow, U-shaped valleys typical of *Geomys*. The complete premolar measures: length, 2.40; breadth of trigonid, 2.24; talonid, 1.44.

An edentulous lower jaw (11907) and a few fragments of a rostrum with an upper incisor and a molar (12195) are also from a species of *Geomys* larger than *G. tobinensis*. These specimens were found in strata of sand in such context as to suggest that they are of Seymour age, and are the size of the premolars (12217) mentioned above. In view of the burrowing ability of pocket gophers, we hesitate to refer these two fossils to the Seymour local fauna, because they are from sediments that gophers readily could penetrate.

Perognathus sp.

The terminal seven millimeters of an upper incisor of a pocket mouse (12287) the size of the living *Perognathus hispidus* was found in the Burnett Quarry. Although somewhat abraided, the curvature, size, cross-sectional shape, and nature of the sulcus matches *Perognathus*, not *Dipodomys* or *Reithrodontomys*.

Dipodomys pattersoni Dalquest and Carpenter, 1986

The type locality of this species is the Burnett Quarry. *Dipodomys pattersoni* was a large kangaroo rat, smaller than the living *D. spectabilis* but slightly larger than *D. elator*. It is known only from an isolated P4 and an m1. The presence of kangaroo rats in a deposit in which voles and cotton rats are the common rodents suggests that open areas occurred near the meadows or grasslands that supported the bulk of the rodent population at the fossil site.

Peromyscus cragini Hibbard, 1944

This is the common deer mouse at the Burnett Quarry. A lower jaw (12228) contains a moderately worn m1 (Fig. 1D, length, 1.43; breadth, .87), the labial arch of the anterior cingulum partly obliterated by wear. Another lower jaw (12224) also contains the m1 but is too worn to show details. Number 12231, an isolated lightly worn m1, possesses a small accessory root. Two other isolated m1's (12235, 12236) are but lightly worn.

The lower first molars all resemble the m1 of the holotype jaw of *Peromyscus cragini* from the Cudahy local fauna of Kansas. They are small, the size of the smallest races of the living *P. maniculatus*, and lack accessory stylids or lophids in the major valleys. Measurements vary, in lightly worn teeth, from 1.43 to 1.55 by 0.87 to 0.98. Mean measurements of 10 specimens of the small *P. maniculatus pallescens* Allen, with teeth in a similar stage of wear, are 1.52 by 0.98. The m1 of the holotype has a slightly notched anteroconid, as do Seymour teeth that are only slightly worn. In *Peromyscus maniculatus*, the m1 often is slightly notched or grooved but the groove is small and visible only in lightly worn teeth.

Hibbard (1944) noted that the major valleys of the holotype teeth of *Peromyscus cragini* were shallow. This is not true of the specimens from Texas but the depth of the valleys is individually variable in *Peromyscus maniculatus* and probably was in *P. cragini* also.

Hibbard and Dalquest (1966:44) included *Peromyscus cragini* in their table of species of the Vera local fauna. This was an error and the species is not listed in their accounts.

Onychomys pedroensis Gidley, 1922

An upper first molar (12230, Fig. 1E) is from a relatively enormous grasshopper mouse. As compared with the living *Onychomys leucogaster*, the reentrants seem slightly narrower and the tooth appears more *Peromyscus*-like.

Hibbard (1941) described *Onychomys fossilis* from the late Blancan Borchers local fauna of Kansas. Carleton and Eschelman (1979) placed *O. fossilis* in the synonyomy of *O. pedroensis*; holotype from the Curtis Ranch local fauna of Arizona. The authors expressed some reservations about this treatment but found the lower molars of all late Blancan to late Pleistocene (Jinglebob local fauna) *Onychomys* to average larger than molars of *O. leucogaster*.

Hibbard and Dalquest (1966) noted that an m1 from the Vera local fauna was smaller than m1's of *Onychomys fossilis*, measuring only 1.75 by 1.25 in diameter. Greatest length of m1 of *O. pedroensis* (Curtis Ranch, Arizona) listed by Carleton and Eschelman (1979) is 2.00 and the greatest breadth is 1.14. Measurements of M1's are not given by Carleton and Eschelman. The M1 (12230) from the Burnett Quarry measures 1.91 by 1.40.

Three *Onychomys* lower molars were found in a Vera local fauna equivalent immediately beneath a bed of Pearlette Type O ash less than five kilometers from the Burnett Quarry. An m1 measures 1.89 by 1.13; two m2's measure 1.89 by 1.40 and 1.73 by 1.43. The longest m2 listed by Carleton and Eschelman (1979) is 1.58; the greatest breadth is 1.31. The m1 from beneath the ash bed near the Burnett Quarry is within the range of measurements of *Onychomys fossilis* and exceeds all but the largest measurements of m1's for *O. leucogaster* given by Carleton and Eschelman (1979). The two m2's exceed all listed measurements for that tooth.

We wonder if two species of *Onychomys* might be included in the deposits of the Seymour Formation. The small m1 from the Vera local fauna (Hibbard and Dalquest, 1966) might belong to the *O. torridus* group and perhaps represent *O. hollisteri* Carleton and Eschelman, whereas the large teeth might be from *O. pedroensis*. Their large size suggests that *O. fossils* may be a valid species, a large grasshopper mouse intermediate in time between the late Blancan *O. pedroensis* and the late Pleistocene to modern *O. leucogaster*.

Sigmodon cf. *curtisi* Gidley, 1923

Seven isolated teeth of a small species of *Sigmodon* were recovered from the Burnett Quarry. Cotton rat teeth are outnumbered in the quarry collection only by teeth of the vole, *Pitymys*. Sympatric occurrence of microtines and cotton rats is almost unknown in modern faunas (Baker, 1969) but was certainly the case at the Burnett Quarry.

Specimens include an m3 (12241), two M3's (12242, 12243), and three m1's (12237, 12238, 12239). Crown length and breadth of the m1's are 2.19 by 1.54, 2.12 by 1.38, and 2.00 by 1.73. Robert A. Martin has examined these teeth and found them referable to the widespread group of cotton rats generally referred to *Sigmodon curtisi.*

Neotoma sp.

One m2 (12244) and a fragment of another (12245) from the Burnett Quarry are from a species of woodrat of moderate size. The complete tooth measures: length, 2.96; breadth across middle loph, 2.08. An m1 is needed for identification to species.

Pitymys llanensis (Hibbard, 1944)

Remains of *Pitymys llanensis* are the most common mammalian fossils found at the Burnett Quarry. Specimens include a fragmentary lower jaw with incisor and alveolus of m1 plus complete m2 (12278); a fragment of lower jaw with m1 (12279); five isolated m1's (12280-12284), and many partial and complete isolated teeth (12277). The first molars were examined by C. A. Repenning and considered to belong to this species. The teeth are large for *P. llanensis* (length, 3.0 to 3.7; mean 3.3).

The understanding of the evolution and history of microtine rodents with rootless teeth has increased greatly in recent years (Martin, 1974; van der Meulen, 1978; Repenning, 1983) but the use of generic names has been confusing. Zakrzewski (1985) clarified the situation by pointing out that the American rootless-toothed "*Microtus*" all belong to two valid genera—*Pitymys* McMurtrie, 1831, with three closed triangles in the lower first molar, and *Microtus* Schrank, 1798, with four or more closed triangles on the lower first molar. We have followed Zakrzewski in placing *llanensis* in the genus *Pitymys.*

Microtus paroperarius Hibbard, 1944

Two m1's (12285, 12286), one lacking most of the posterior loop and one with the anterior loop broken away, were found in the Burnett Quarry. Both show four closed triangles. The complete anteroconid of the most complete specimen is like that of *Microtus paroperarius.*

Two teeth of *Microtus paroperarius* were reported by Hibbard and Dalquest (1966) from the Vera local fauna, among many teeth of *Pitymys llanensis.* At the Burnett Quarry, *Microtus paroperarius* is also outnumbered by specimens of *Pitymys llanensis,* suggesting a difference in ecological preferences for these two voles.

Proneofiber guildayi Hibbard and Dalquest, 1973

The partial skeleton (with part of the skull, lower jaws, and teeth) that is the holotype of this species remains unique. The specimen comes from lower in the sediments than the level of the Burnett Quarry, from reddish brown, silty clay. The clay, when dry, becomes hard and tends to fracture in rectangular pieces. The skeleton was originally thought to be that of a muskrat, *Ondatra annectens* (Brown), and only later was recognized as belonging to a new genus and species of vole.

Canis armbrusteri Gidley, 1913

Remains of a large wolf were found scattered throughout the sand, gravel, and silt beds of the Seymour Formation. Specimens include the anterior end of a skull (UMMP 46483) with right and left upper and lower incisors, canines, and first and second premolars (except that the right p2 is lost). A right parietal (UMMP 46460), an edentulous lower jaw ramus (9698), an edentulous maxillary fragment (12187), and left metacarpal three lacking distal tip (7438) also were found.

None of these specimens is diagnostic at the species level. They are much too large to belong to a coyote or coyotelike dog and occurred too early to belong to *Canis lupus* or *Canis dirus*, neither of which is known from deposits earlier than Rancholabrean age (Nowak, 1979; Kurtén and Anderson, 1980). The only large wolf known from the Irvingtonian of North America is *C. armbrusteri*. The lower jaw listed above was identified by Nowak (personal communication) as *C. armbrusteri*.

Canis latrans Say, 1823

Remains of the coyote are rare in the Seymour Formation. Hibbard and Dalquest (1966) reported a metacarpal (UMMP 46464). More recently taken are a left second metatarsal (12189) and an axis (11920).

The specimens show the presence of a dog the size of the modern coyote, and are almost identical to equivalent bones of the coyote in morphology. *Canis lepophagus* Johnston is not known from the Pleistocene and *Canis priscolatrans* Cope is too large for the Seymour fossils.

Procyon sp.

The distal end of the humerus of a large raccoon, similar to the living *Procyon lotor* (UMMP 46473), was reported by Hibbard and Dalquest (1966). No other remains of raccoons have been found in the Seymour Formation.

Spilogale putorius (Linnaeus, 1758)

A partial left lower jaw (12192), missing the ramus anterior to ml but with ml and m2 as well as most of the ascending ramus present, was found on the Burnett Ranch.

The ascending ramus of the lower jaw of *Spilogale* is readily separated from other small mustelids by the deep masseteric fossa with dorsal and anterior margins outlined by a thin, almost bladelike flange of bone. This character was found in the lower jaws of 25 specimens of *Spilogale putorius* and three *S. gracilis*. Specimens of *Mustela* (several species), *Martes*, *Mephitis*, and *Conepatus* have the rim of the masseteric fossa lower and rounded, not a bladelike flange.

Taxidea taxus (Schreber, 1778)

A left maxillary (12193) from the Burnett Ranch is definitely a fossil, found deep in a gravel bank. The teeth are well preserved but the bone is represented only by small fragments. The teeth are comparatively small but can be matched in size and morphology by selected specimens of the modern badger.

Acinonyx (Miracinonyx) studeri (Savage, 1960)

Kurtén and Anderson (1980) listed "Gilliland" (Gilliland local fauna) as a locality for this cheetah. The only specimen then available that might represent the cheetah is UMMP 46371, a left femur. This specimen was described by Hibbard and Dalquest (1966) as similar to the femur of the mountain lion, *Felis concolor*, but (1) the shaft is slightly curved, (2) the lesser trochanter is better developed, and (3) the area bounded by the lesser trochanter and the posterior intertrochanteric line is broader. The length of the femur is 302.

A partial innominate (3003) is hesitantly referred to this species. The bone is the size of a large *Felis concolor* but differs in numerous details, mostly features that cannot be measured easily. Ernest Lundelius (personal communication) examined the specimen and commented: "ridge on outside of ischium is sharper than in *F. concolor*: notch at posterior end of acetabulum much narrower than in *F. concolor*; ischium dorsal to obturator is narrower than in *F. concolor*." The ilium is relatively stouter than in *F. concolor*. In a mountain lion that was collected in western Texas and is approximately the same size as the fossil (MWSU Recent Mammal Collection no. 1339), the ischium dorsal to the obturator foramen measures 21.7 wide as opposed to 23.4 in the fossil, a difference of 1.7; but the ilium of the mountain

lion measures 35.8 high at the sacral scar and 31.3 just ahead of the scar, whereas the ilium of the fossil measures 39.7 and 36.6, respectively, differences of 1.9 and 5.3.

Adams (1979) placed *Acinonyx studeri* and *Acinonyx trumani* (Orr) in a new subgenus, *Miracinonyx*. The holotype skull of *A. studeri* is from a Blancan site at Cita Canyon, Texas. The holotype skull of *Acinonyx trumani* is from a late Pleistocene local fauna (Pershing County, Nevada, dated at 19,750 years old). Kurtén and Anderson (1980) noted records of *A. studeri* from Irvingtonian local faunas, but records of *A. trumani* are from Rancholabrean local faunas. We follow Kurtén and Anderson (1980) in referring the Seymour specimens to *A. studeri.*

Homotherium cf. ***serum*** (Cope, 1893)

Fragmentary fossils of this sabertooth cat were found scattered through the Seymour sands and gravels. The specimens were far apart, and doubtless every fossil represents a different individual. Specimens suggest that *Homotherium* was the most common large carnivore in the Gilliland local fauna.

Remains include: upper right canine (3240); tip of a deciduous right upper canine (2027); base of an upper canine (11918); atlas lacking alar processes (12185); proximal end of an ulna (11919); calcaneum (9716); proximal phalanx (6860); and partial humerus (12253).

Kurtén and Anderson (1980) include all the Gilliland material under *Homotherium serum.* However, Churcher (1966) suggested that the scimitar-toothed cat of the Irvington may belong to a species different from the late Pleistocene *H. serum.* Unfortunately, the type locality of *Dinobastis serus* is "western Oklahoma" and might be Irvington or later in age. If there are two species it might be difficult to determine whether the name *H. serum* belongs to the Irvingtonian or Rancholabrean taxon.

Cuvieronius sp.

No new material of this mastodon has been found since Hibbard and Dalquest (1966) reported a fragmentary lower molar and a 12-inch long tip of a flattened tusk.

Stegomastodon barbouri (Osborn, 1921)

Part of a left lower jaw with much of the third molar and large parts of three other molars (UMMP 46632, 46631; 33532) are referable to this short-jawed mastodon. Small fragments of *Stegomastodon* teeth are rare but widely scattered through the Seymour sands and gravels. Apparently the teeth of *Stegomas-*

todon are especially subject to destruction by weathering, but even a relatively small part of the thick, complicated enamel is enough for identification. The presence of these bits is sufficient to assure us that the sediments where they were found are of the age of the Gilliland local fauna.

When Dalquest first began collecting fossils in the Seymour Formation in 1956, postcranial elements of proboscidians were common almost everywhere vertebrate fossils were concentrated. Few of these were saved. Rockhounds and other collectors now have so scoured the area that none of these remain. Even the isolated plates from weathered mammoth teeth have been carried away. The proboscidian postcranial fossils that were saved in past years have not been studied for this report. Most probably belong to the mammoth but some may be mastodon.

Savage (1951) suggested that all but the most ancient records of *Stegomastodon* should be referred to *S. mirificus* (Leidy), the type species of the genus. Dalquest (1977)) believed that the *Stegomastodon* remains from Irvingtonian sites, such as Seymour and Holloman, Oklahoma, belong to a species different from the Blancan *S. mirificus*. Cary Madden, who has studied this genus, concurs (personal communication, 1985).

Mammuthus imperator (Leidy, 1858)

Remains of mammoth are found virtually throughout the sands and gravels of the Seymour Formation in the area studied. This results in part from the ease of identification of even a small fragment of tooth enamel, and also from the large amount of identifiable enamel fragments resulting from the disintegration of the teeth of a single mammoth. However, mammoths must have been abundant in the fauna.

Specimens recovered include a partial skull (originally complete), with one tusk and associated fibula (UMMP 46641), partial lower jaws (UMMP 34353, 46629), and partial and complete isolated teeth (UMMP 33525, 46625, 46626, 46627, 46628, 33769). We have followed Cary Madden (personal communication) in use of *Mammuthus imperator* for the mammoth of the Gilliland local fauna rather than *M. meridionalis* (Maglio, 1973; Kurtén and Anderson, 1980).

Platygonus vetus Leidy, 1883

Fossils of this large peccary are scattered through the deposits of the Seymour Formation and, although not common, some are comparatively complete and well preserved. Hibbard and Dal-

quest (1962) listed and briefly described four lower jaws (one figured), and an additional jaw was mentioned (Hibbard and Dalquest, 1966). A partial skull (2444), a lower jaw (3505), a lower tusk (1181), an astragalus (3037), and a calcaneum (3513) since have been recovered. We follow Kurtén and Anderson (1980) in placing *Platygonus cumberlandensis* in the synonomy of *P. vetus*.

The skull is incomplete, crushed, and distorted, and no meaningful measurements can be obtained from it. P3 and the molars are present on the right side. Measurements are: P3, 11.6 by 13.0; M1, 13.6 by 14.5; M2, 18.1 by 17.7; M3. 20.6 by 18.8. The greatest diameter of the best preserved tusk is 23.3, the transverse diameter at the same point, 14.9. The large size of the skull, heavy zygomatic arches, and large teeth suggest that the specimen was a male. Males of *Platygonus vetus* are large peccaries but are not as large as males of *P. bicalcaratus* Cope from the Blanco local fauna.

A lower jaw (3505) consists of a left ramus with symphysis. The right tusk is missing, the left is broken off just above the alveolus. The alveolus of p2 is present, p3-m2 present and well preserved, but m3 lacks the posterior half. The ramus is broken across at m3 in such a way that the alveolar length of p2-m3 cannot be measured. Measurements of the other teeth are: p3, 12.2 by 8.8; p4, 12.9 by 11.2; m1, 12.0 by 12.5; m2, 17.7 by 14.5. Because the lower jaw is comparatively small, this individual probably was a female.

Odocoileus virginianus (Zimmermann, 1780)

A deer similar to small specimens of the modern white-tailed deer was fairly common in the Seymour Formation. Fossils come from various localities but were most common south of Gilliland. Fossils include four antler fragments (UMMP 37908, 37909, 37911, and MWSU 3002); two partial lower jaws (UMMP 37910, MWSU 9707); distal end of a metapodial (UMMP 39362); distal end of a humerus (UMMP 37912); and a proximal phalanx (MWSU 2920).

The specimens are consistently small, matching the smallest races of the modern white-tailed deer in size. Both jaws have the teeth moderately worn and, by comparison with modern deer of known age, came from animals that were more than 18 months old when they died. The antler fragments are similar to those of spike-horned or fork-horned bucks of approximately 18 months of age—small and slender in cross section. Specimen number 3002

has the base rounded just above the burr, diameter measuring 20.2 by 15.9. The browtine is represented by a rounded spur. The total stright-line length of the antler fragment is about 95. Approximately 30 past the browtine, the beam is somewhat flattened, the flattening extending to the broken end of the beam. The flattening suggests that the remainder of the antler might have been palmate, but some young of the modern white-tailed deer have similar antlers, flattened at the base of the first main tine but with the beam rounded thereafter.

Tetrameryx knoxensis Hibbard and Dalquest, 1960

The holotype horn-cores came from the area south of Gilliland, but most of the specimens representing this species come from the Burnett Ranch, including: base of a posterior horn-core broken off just above the fork (2464), measuring (just above fork) 49.2 by 29.7; part of a posterior horn-core broken off at fork (6859), not part of 2464, measuring 37.8 by 23.4 just above the fork; associated right M2 and slightly damaged M3 (9088); medial phalanx with greatest length of 44.5 (11908); and two lower molars (UMMP 38102, 39360). The newly discovered horn-core fragments resemble the holotype in size and shape.

Capromeryx sp.

A diminutive antilocaprid is represented by a lower jaw fragment with m1-m3 (UMMP 38103), a first phalanx (UMMP 38105), distal end of a metapodial and two phalanges (UMMP 39361), two isolated molars (UMMP 38104, 39363), and the proximal end of a metapodial (9710).

Specific identification of antilocarpids requires horn-cores, and no horn-cores of *Capromeryx* have been found in the Seymour Formation.

Tapirus haysii Leidy, 1859

Two fragmentary lower jaws, one (UMMP 33523) with the bases of the crowns of p4-m3 present and another (UMMP 46484) with p2, p3, and the anterior part of p4, were reported as ***Tapirus copei*** by Hibbard and Dalquest (1966).

A recently collected complete metapodial (3242) measures: greatest length, 109.8; proximal breadth, 25.8; midshaft breadth, 18.5; distal breadth across facets, 24.0. The jaws and metapodial come from widely separated sites in the Seymour Formation and represent different individuals. The species was widespread but rare in the Gilliland local fauna.

Family Equidae

Most of the large collection of fossil horse material from the Seymour Formation is deposited at the University of Michigan. Included are fossils of a species of zebrine *Equus*, a species of hemione *Asinus*, and four kinds (one hesitantly and two tentatively identified) of horses that may be caballine *Equus* (see Dalquest, 1988*b*).

Approximately 90 percent of the horse remains collected belong to the large, stocky-limbed *Equus scotti*. Because even scraps of horse fossils of medium to small size or unusual appearance were saved, whereas equivalent specimens of the common *Equus scotti* were discarded, actual proportions of *E. scotti* in the living fauna must have been even greater than 90 percent.

By the later Irvingtonian age, when the Seymour deposits were forming, most of the radiation of Pleistocene equids probably had taken place. If the Gilliland local fauna is typical of the Great Plains in the late Irvingtonian (the similarities of the faunas of Rock Creek, Holloman, and Gilliland indicate that this is true), zebrine horses were nearing extinction in America and caballines already dominated the fauna. The large hemione, *Asinus calobatus*, was present but rare, and medium-sized and small caballines that cannot confidently be identified to species were equally rare.

Equus sp.

Hibbard and Dalquest (1966:37, fig. 7A, table 3) described a lower jaw with p2-m2 (UMMP 39383), the best specimen of this species collected up to that date in the Seymour Formation, and noted that it resembled a horse rather than an ass. At that time, the distinguishing character (deep ectoflexid penetrating into the molar isthmus, separating the isthmus into antroisthmus and postisthmus) was not appreciated. The specimen has been reexamined through the kindness of P. D. Gingerich, University of Michigan Museum of Paleontology, and found to agree in detail with the original figure (Hibbard and Dalquest, 1966). The ectoflexids of m1 and m2 are deep and broad, penetrating the isthmus much deeper than the shallow penetration found in caballine *Equus* and *Asinus*, where the tip of the ectoflexid is usually narrow and rarely reaches a line connecting the internal walls of preflexid and postflexid.

Two lower molars (12248, 1821—Fig. 1F, G) have been found on the Burnett Ranch. Both were associated with typical species of the Gilliland local fauna. Both are thought to be m1's,

although it is possible that one or both are m2's. The occlusal surface of 12248 was worn flat and the animal was young when it died. The tooth is almost complete. Crown height is more than 100. The basal portion of 1821 is broken away and the enamel of the occlusal surface somewhat fractured and damaged. It also was quite young when it died. Both teeth were sectioned 10 millimeters beneath the occlusal surface and deep, broad, almost square-ended ectoflexids are even more prominent at that level.

The linguaflexids of the Seymour zebrine horse are broadly to sharply U-shaped, not sharply V-shaped as is usual in zebras. This suggests the condition seen in dentitions of *Equus caballus*, as figured by Forstén (1986), characteristic of caballine horses. The linguaflexids of the molars are not sharply V-shaped like those of *Equus parastylidens* Mooser, and lack the parastylids of that species.

Lower molars of the Seymour zebrine horse are distinguishable from those of *Equus scotti* by size alone. *Equus scotti* is a large species; the Seymour *Equus* was of medium size. We are not aware of any characters that will separate upper teeth of *Equus* from those of *Asinus*. The Seymour zebrine horse is readily distinguished from the Blancan *Equus simplicidens* by smaller-sized lower teeth, thinner enamel on the molars, and lack of sharply V-shaped linguaflexids.

Measurements of horse teeth were taken as follows: greatest length, with the calipers perpendicular to the anteroposterior axis of the tooth, not with the jaws parallel to the anterior and posterior surfaces of the tooth; transverse breadth measured with the caliper jaws touching the outer edges of the enamel of both protoconid and hypoconid and measuring to the innermost contact with the metaconid or metastylid. Measurements of number 12248 are 30.3 by 14.8, number 1821, 30.8 by 13.2.

Equus scotti (Gidley, 1900)

The Seymour deposits have yielded three skulls, several maxillaries, numerous lower jaws, and innumerable complete to fragmentary teeth, as well as postcranial bones of this horse. The species is well known from several complete skeletons and other fossils from the type locality—Rock Creek, Briscoe County, Texas. This site is equivalent in age to the Seymour Formation and approximately 250 kilometers distant.

Equus scotti was a large horse, the size of a large domestic horse, but different in body proportions (see Gidley, 1900). The limbs were short and stocky, the skull large, and the incisors

massive. The cheekteeth are large and comparatively simple. Plications of the upper teeth are usually simple but occasionally are moderately complicated: a simple pli caballin usually is present; the protocones of the upper molars are flattened and moderately elongated. In the lower teeth, plications of the enamel other than of the simplest kind are uncommon; pli caballinids are usually absent; ectoflexids of the premolars are comparatively short to moderately long (longer in p3 than p4); ectoflexids are short in the molars, barely entering the molar isthmus in worn m2's; linguaflexids are broad, usually U-shaped but sometimes with a narrowed "V" near the center of the "U."

Equus scotti must have been abundant in the living Seymour fauna for its remains are the most common fossils of large mammals in the formation. This seems to have been true in the Rock Creek and Holloman local faunas also. Both are equivalent in age to the Seymour Formation.

The skeleton of *E. scotti* was figured by Gidley (1900) and another is on display in the Panhandle Plains Historical Museum in Canyon, Texas. Dentitions have been figured by Gidley (1900), Dalquest (1964), Hibbard and Dalquest (1966), and elsewhere; *E. scotti* is one of the better known Pleistocene horses.

Equus (?) *giganteus* (Gidley, 1901)

Reference of this species of *Equus* is tentative. The holotype is an isolated upper tooth from "southwestern Texas," which Gidley (1901) thought was an M2. Inasmuch as the M2 is often the smallest tooth in the upper jaw, if the tooth is M2, other teeth from the same specimen would have been even larger than the enormous holotype (40 by 39 measured about 75 above the base—Gidley, 1901). The type is probably a P3 or P4, and other teeth would have been smaller.

Other than large size the only characters of the holotype tooth that may be of taxonomic value are the moderately complicated lakes and short, broad protocone. Complications of the lakes are highly variable in Pleistocene horses and the protocones of premolars may be short and broad, even when the protocones of the molars of the same individual are elongated and slender. As average characters, plications of lakes and shapes of protocones may be helpful in identifying species but are not reliable when applied to individual specimens. Nevertheless, the largest upper cheekteeth from the Seymour Formation resemble the holotype tooth of *E. giganteus* in having moderately complicated lakes and short, broad protocones. This is true also of teeth from the

TABLE 2.—*Horse metatarsals.*

	Greatest length	Proximal breadth	Midshaft breadth	Distal breadth
E. ? giganteus				
1256	310.0	56.4	41.5	56.4
780		60.7		
6844		60.3		
12246			40.2	60.0
E. scotti (largest metatarsal)				
UMMP	292.0	53.5		52.0
E. scotti				
(Holloman local fauna, Oklahoma)	295.0	52.7	36.7	51.2

Holloman local fauna of Oklahoma (Dalquest, 1977). The two teeth most like the holotype tooth are UMMP 46584 and 46585, the former figured by Hibbard and Dalquest (1966: fig. 5B).

A p2 was questionably referred to *E. giganteus* by Hibbard and Dalquest (1966: fig. 4G). This tooth has an occlusal length of 44 and an extremely complicated enamel pattern. The specimen is from the Atwater Member of the Crooked Creek Formation of Kansas, as explained in the text; not the Gilliland local fauna as indicated in the legend of the figure. No other lower teeth have been referred to *E. giganteus* and none of the 200 or more lower teeth from the Seymour Formation is large enough or distinctive enough to refer to the species.

Premaxillaries with incisors (11785) were referred to *"Asinus" giganteus* by Dalquest (1980). Preservation of the specimen is poor. The incisors are larger than those referred to *E. scotti* by Gidley (1901), and we believe that the incisors described by Gidley and those described by Dalquest belong to the same species. An isolated I2 from the Seymour Formation is even larger than those described by either Gidley or Dalquest. The greatest diameter is 23.5 (not measured across the obliquely worn occlusal surface, which would be greater); diameter at right angles to greatest diameter, 13.1; height from broken tip of root to highest point on crown, 85.2.

An extremely large metatarsal from the Gilliland site was mentioned by Hibbard and Dalquest (1966). Three fragmentary metapodials from the Seymour Formation are as large as, or larger than, the complete specimen (Table 2).

The longest proximal phalanx in the Seymour collection stands out from phalanges referred to *Equus scotti* by its slender proportions (Table 3). Certainly it is too large to represent the

TABLE 3.—*Horse proximal phalanges.*

	Greatest length	Proximal breadth	Midshaft breadth	Distal breadth
E. ? giganteus				
1858	96.0	52.2	31.5	42.0
*E. scotti**				
2437	94.4	62.8	41.3	51.3
6852	95.0	64.9	39.1	50.2
7986	94.0	68.8	39.7	51.7

*Comparisons with three largest *E. scotti* proximal phalanges.

stilt-legged horse, *Asinus calobatus*, and is questionably referred to *E. giganteus*.

The largest medial phalanx from the Seymour Formation (2295) measures: greatest length, 54.7; proximal breadth, 58.7; greatest distal breadth, 47.8. A specimen from the Holloman local fauna of Oklahoma (9236) measures: 52.6, 62.1, 56.4, respectively. When these bones are placed in contact with a large proximal phalanx (1858) they do not articulate well. The facets of the medial phalanx are so broad that they project laterally past the proximal phalanx.

All, some, or none of the specimens hesitantly referred to *E. giganteus* may belong to that species. The amount of sexual variation in *Equus scotti* is not known. The large fossils could be of large males of *E. scotti*. Whether *E. giganteus* is represented in the Gilliland local fauna or even if the species is valid remains to be determined.

Equus sp., size of *Equus excelsus* Leidy, 1858

A medium-sized species of horse is represented by two metatarsals lacking their distal ends (381, 12247), distal end of a metapodial, proximal and medial phalanges found in articulation (12173), and upper and lower teeth.

Both of the partial metatarsals are complete up to the flattened, smooth area usually present near the anteroventral face of the end of the diaphysis, and are slightly expanded at the broken terminations, permitting close approximation of the original lengths of the bones. Number 381 measures: length as preserved, 251; estimated original length, *ca.* 275; proximal breadth, 52.7; midshaft breadth, 37.2. Number 12247 measures: length as preserved, 212; estimated original length, *ca.* 250; proximal breadth, 51.5; midshaft breadth, 34.5. Three associated lower teeth (9076) measure: p4, 31.0 by 18.2; m1, 27.0 by 17.4; m2, 25.0 by

15.9. Although the materials are unsatisfactory, they do show that a horse of medium size lived in association with the Gilliland local fauna but was rare compared to the large *Equus scotti*.

Equus sp., size of ***Equus conversidens*** Owen, 1869

Hibbard and Dalquest (1966) mentioned four teeth and two proximal phalanges of a species of small horse found in the Seymour Formation. We can add to this list a lower premolar (1824), a lower ml or m2 (7994), a proximal phalanx (7987), and a medial phalanx (2296). The teeth are the size of teeth of *Equus conversidens*. The proximal phalanx is small but is not slender and elongated like the proximal phalanx of *Asinus francisci* Hay. It measures: greatest length, 76.1; proximal breadth, 40.9; midshaft breadth, 29.8; distal breadth (across facets), 35.9. The medial pahalanx is short, broad, and blocky. It measures: greatest length, 44.3; proximal breadth, 43.5; distal breadth, 42.4. Its proportions are like those of other phalanges from Texas and elsewhere referred to *E. conversidens*.

Asinus calobatus (Troxell, 1915)

This species was based on limb bones, including metacarpals, metatarsals, a proximal phalanx, and vertebrae from Rock Creek, Texas. The limb and foot bones were exceptionally long and slender. Many workers have considered the name to be a synonym of *Equus semiplicatus* Cope (1893), a name based on one complete and one partial upper tooth from Rock Creek (Cope gave "Tule Canyon" in the description but "Rock Creek" in the caption of the figure of the specimens) and two upper teeth from San Diego in "southwestern Texas." The type locality is Rock Creek, Briscoe County, Texas. The type teeth of *Asinus semiplicatus* are not diagnostic; the metapodials of *Asinus calobatus* are. The name "*Equus*" *calobatus* has been associated with dentitions and skulls by various authors but no dentitions ever seem to have been found in unmistakable association with limb bones of the *A. calobatus* type.

Long, slender, metapodials agreeing with the measurements of the type material from Rock Creek, have been reported from a number of sites, as far apart as Nebraska (Skinner, 1972) and central México (Mooser and Dalquest, 1975). Quinn (1957) described a metapodial from the Holloman local fauna of Oklahoma, and a recently discovered metacarpal from the Gilliland site (3031) that indicates the species occurred in the Gilliland local fauna. Thus the stilt-legged horse, whatever the

eventual disposition of the name *Equus (Asinus) calobatus*, occurred at Rock Creek, Holloman, and Gilliland, all local faunas thought to be of approximately the same age.

The metacarpal from Gilliland lacks the distal end. From the proximal end to the broken termination the specimen measures 260. Direct comparison with a metacarpal from the Cedazo local fauna of Aguascalientes, México, indicates that the bone was at least 25 longer when complete; the estimated length was 285 or more. Proximal breadth is 49.6; midshaft breadth, 32.6.

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