A Holocene Mammalian Fauna from Box Elder Creek, Caddo County, Oklahoma

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Received: 1991 May 29; Revised; 1992 Mar 02

A Holocene local fauna from Box Elder Creek near Apache, Caddo County, Oklahoma, included remains of 10 species of mammals and an Indian artifact (Gary point). Mammal remains were recovered from a stratum radiocarbon-dated at 2,440±80 YBP. No definite woodland species were detected but such habitat is suggested by beaver (*Castor canadensis*), white-tailed deer (*Odocoileus virginianus*), Eastern cottontail (*Sylvilagus floridanus*), and possibly woodland vole (*Microtus pinetorum*), remains. Prairie or grassland forms included the 13-lined ground squirrel (*Spermophilus tridecemlineatus*), the black-tailed prairie dog (*Cynomys ludovicianus*), the hispid pocket mouse (*Chaetodipus hispidus*), the plains pocket gopher (*Geomys bursarius*), and the hispid cotton rat (*Sigmodon hispidus*). The Box Elder Creek subfossils indicate that the mammalian fauna present there 2,500 years ago was essentially like that of today.

INTRODUCTION

Box Elder Creek is a tributary that joins East Cache Creek just south of Apache, Caddo County, Oklahoma. At the D.G. Smith Ranch, immediately north of Apache and on the north side of Oklahoma Highway 19, the stream cuts deeply into sandy floodplain deposits which have been quarried. Where the creek flows directly over the Permian bedrock of hard shale and sandstone, shallow riffles have trapped gravel, cobbles, and debris, including bones of animals washed out of the Quaternary river terraces. Remains include those of modern horses and cattle as well as some of late Pleistocene age. The bones mostly are of the modern bison, *Bison bison*, and are Holocene in age. Pleistocene remains include two well-preserved, fossilized metapodials of an extinct horse.

The skull of a bison found in the creek bed contained a poorly constructed projectile point which fell from the cranial cavity during cleaning. Such bones and teeth might range from the late Pleistocene to modern in age. More than 22 feet of alluvium were deposited on the Permian bedrock by a meandering, low-energy stream and traces of seven different terraces can be seen on the western side of the creek. The creek was rejuvenated in the recent past, and it cut through the soft alluvium to form the present channel, becoming entrenched to the level of the bed rock beneath. Permian sandstone was dissected at earlier times, as indicated by varying elevations of exposures. The sandstone is not exposed on the surface but is so at numerous places in the creek-channel walls and stream bed. Box Elder Creek and Cache Creek are fringed with broadleaf woodland species, including pecan (*Carya illinoensis*), burr oak (*Quercus macrocarpa*), netleaf hackberry (*Celtis reticulata*), etc. Some of the pecan and oak trees near the quarry site are more than 50 feet in height and measured more than 12 feet in circumference four feet above ground level. There is a thick understory of bushes and vines, including greenbriar (*Smilax* sp.) and poison ivy (*Rhus toxicodendron*).

Beyond the fringing woodland is open grassland. This probably resulted from modern agricultural practices. The land, where sandy and level as it is on the flood-plain, has been plowed and planted for generations. No records are readily available, but before colonization by Europeans, the woodland probably extended much farther from the creek. Rejuvenation of the creek may have resulted from agriculture and land clearing, allowing swift drainage. Incision of the creek into its present canyon may be a modern event. Uncertainty about the proximity of grasslands to the quarry site makes some faunal interpretations difficult.

A dark silty deposit, presumably the remnants of an old beaver dam, lies directly on yellowish alluvium, 12.5 feet above the present water level of the creek. The top of the bank is 10 feet above the bottom of the lens-shaped dark clay deposit. Clay grades

imperceptibly into yellowish alluvium above, but the vertical height of the bone-bearing deposit is, at its thickest, only about three feet. The deposit extends horizontally for 70 feet. Excavation extended along a front about eight feet long and one foot high.

Since a shell from approximately midway up the creek bank has been dated at ca. 2,500 YBP (years before present), the bottom of the creek bank may be estimated at ca. 5,000 YBP-if the yellowish alluvium were deposited at a fairly constant rate. However, the horse metapodials must be at least 10,000 years old (Dalquest, pers. comm.). Therefore, unless somewhere upstream from the quarry the creek has cut into an older deposit responsible for the horse metapodials, the 5,000 YBP date would be in error. This contradiction cannot now be resolved.

Figure 1. Gary projectile point found at Box Elder Creek with deer vertebrae and lower jaw.

METHODS and MATERIALS

The high, steep banks of Box Elder creek were searched in mid-September, 1990 for almost a mile upstream from Oklahoma Highway 19, in an unsuccessful attempt to find the source of the Pleistocene fossils. At three sites, deposits of dark-gray-to-blackish clay, rich in mollusc shells, were discovered. These closely resembled the "ancient beaver dams" described by Dalquest, et al. (*1*) from New Mexico and the Oklahoma panhandle. One such site appeared especially promising and was chosen for investigation. Approximately one ton of the dark matrix was removed and screen-washed (*2*). Animal remains recovered were termed the Box Elder Creek Subfossil Fauna. The fauna included 11 species of mammals and a few fishes, amphibians and reptiles, but only the mammals will be reported here. Unweathered mollusc shells associated with the vertebrate remains, taken from deep in the deposit, were radiocarbon dated (Beta Analytic, Inc. No. 41698) at 2,440±80 YBP. All measurements, unless otherwise indicated, are in millimeters. Subfossils were compared to known forms in the Midwestern State University (MWSU) Museum of Recent Mammals at Wichita Falls, Texas, and cataloged. The catalog numbers in the species accounts refer to the subfossils collected in this study and placed in the Midwestern State University (MWSU).

Museum of fossil mammals. In late March, 1991 several owl pellets found near Apache, Oklahoma were collected and their contents examined.

RESULTS and DISCUSSION

Species Accounts

Scalopus aquaticus - (MWSU 12586). Over most of Oklahoma, moles occur in areas suitable for extensive burrowing, particularly moist, sandy and loamy soils (*3*). Mole runs in southwest Oklahoma are frequently found in shortgrass and riparian habitats. Moles were represented in the Box Elder Creek Fauna by the anterior portion of a rostrum with incisors being the only teeth remaining.

Homo sapiens - (MWSU 12587). While I was digging around the thoracic vertebrae of a white-tailed deer (*Odocoileus virginianus*), I discovered a projectile point (Fig. 1). The tip was missing, along with part of an edge, but both were later recovered as I screen-washed the matrix. The projectile's measurements were: face, 57; stem, 12; across the shoulder, 25. The fragment of the edge, found later, measured 17. The point was almost flat on one side and convex on the other. It is of whitish-grey flint or chert with splotches of maroon-to-red. This artifact was sent to Dr. David J. Meltzer at Southern Methodist University, who identified it as a Gary point, which suggested an age of 400-4,000 YBP (*4*). The ancient hunter at Box Elder Creek must have embedded the projectile point deep into its white-tailed target, causing the projectile point to be spalled (Meltzer, pers.

TABLE 1. Dimensions[a] (mm) of the occlusal surface from one subfossil *Spermophilus tridecemlineatus* (MWSU 12590), 50 modern *S. tridecemlineatus*, and 10 modern *S. mexicana*.

		Tooth		
		P	m1	M2
S. mexicana	length	0.69–1.08–1.30	1.44–1.66–1.81	1.62–1.76–1.86
(modern)	width	0.65–1.19–1.34	2.04–2.22–2.37	2.51–2.55–2.65
S. tridecem.	length	0.84–0.99–1.16	1.20–1.39–1.58	1.30–1.59–1.77
(modern)	width	0.93–1.09–1.25	1.77–1.92–2.09	1.99–2.27–2.46
S. tridecem.	length	1.02	1.40	1.81
(subfossil)	width	1.67	1.67	2.60

[a] Dimensions given are: low–mean–high except for the subfossil for which there was only one sample.

comm.). The Box Elder Creek area was probably utilized frequently as an Indian campsite throughout the last 2,500 years, for numerous projectile points have been collected locally by land owners Lotsee Patterson and Don Smith (pers. comm.).

Sylvilagus floridanus - (MWSU 12588). The Eastern cottontail has the widest distribution of any lagomorph in Oklahoma and occurs in a variety of habitats. The species is commonly associated with grassy fence rows, forested areas, creeks, and brushy sites in gallery forests. A lower left jaw found at the quarry site was broken anteriorly where the incisor would insert, and posteriorly through the alveolus of the lower third molar. When the jaw was compared to skulls of *S. aquaticus*, *S. floridanus*, and *S. audubonii* in the MWSU collection, the teeth, especially the premolar, matched those of *S. floridanus.*

Cynomys ludovicianus - (MWSU 12589). Most black-tailed prairie dogs are inhabitants of shortgrass prairies. Tyler (*5*) summarized the distributional status of *Cynomys* in Oklahoma. In the 1800s, black-tailed prairie dog towns covered a vast portion of Oklahoma, apparently involving millions of acres (*6*). At present, the closest known prairie dog colony is about 15 miles southeast of Apache, on the east side of the Fort Sill artillery range, 0.5 mile south of Elgin, The teeth could have reached the Box Elder Creek site from some miles away, carried by a predator such as a hawk. The black-tailed prairie dog was clearly a local resident of nearby shortgrass prairie in the past. Teeth found included a lower m1, a lower m3, and an upper M3.

Spermophilus tridecemlineatus - (MWSU 12590). The 13-lined ground squirrel occurs throughout Oklahoma and inhabits the following physiognomic regions as given by Caire, et al. (*3*): Pinon-juniper Mesas, Shortgrass Prairie High Plains, Post Oak-Blackjack Uplands, and the Tall Grass Prairie Rolling Hills. Over most of Oklahoma, it occupies grassy areas. Three teeth were found and identified: an upper premolar, an upper M2, and a lower m1. The measurements were: P, 1.02×1.67; M2, 1.81×2.60; m1, 1.40×1.67. The teeth were larger than those of most specimens of *S. tridecemlineatus* in the MWSU collection, a majority of which were taken in northcentral Texas. A series of fifty 13-lined ground squirrel teeth were measured, together with a series from 10 Mexican ground squirrels. The means of the Mexican ground squirrel teeth were larger than both the fossil and modern *S. tridecemlineatus* (Table 1). The subfossil teeth from Oklahoma were larger in width and length than the average of 50 specimens of *S. tridecemlineatus* from Texas, but measurements were within the size range for the species.

Geomys bursarius - (MWSU 12591). The plains pocket gopher is common in Oklahoma except for the extreme northeast region, the oak-hickory Ozark uplands (*7*). Throughout this range, it prefers to inhabit sandy or moist alluvial soils (*3*). The species was represented at Box Elder Creek by 6 upper molars, 1 incisor, and a few partial teeth (MWSU 12592). Sexual dimorphism is strong in the Geomyidae, and it is thought that the teeth were primarily those of females. A molar measured 1.77 in breadth at the occlusal surface compared to 2.4 for a known Recent male (MWSU 10568).

Castor canadensis - The beaver is common throughout most of Oklahoma today (*3*). For approximately the last 30 years, they were not found in the immediate area of Box Elder Creek. However, in the spring of 1991, a dam was constructed about 50 yards upstream from the excavation site, and burrows were found in the banks of the creek. Although no subfossil remains of beaver were found, evidence for beaver occupation in the recent past was indicated by

a series of lens-shaped dark clay deposits (Dalquest, pers. comm.), that were present along the creek banks at various heights. Sediments of ancient beaver dams may occur throughout the geographic range of the beaver in North America (*1*).

Chaetodipus hispidus - (MWSU 12593). The hispid pocket mouse prefers grassland prairies. Peak populations are reached in mesquite brushland, with soft soils, especially where there are cut banks, ridges, or other irregularities on the surface. Although moist sandy soils are preferred, these mice may dwell in limited numbers in Caddo County on firm clay soils. The species thrives in prairies and brushland, but shows a preference for and environments (*8*). It still inhabits Caddo County today, having been trapped on sandy soil a few miles from the excavation. However, it has not been taken in the immediate quarry area.

Part of an upper right jaw with P4-M2 was found. The jaw was broken through the alveolus of the M3. The incisor was lost owing to a break just in front of the premolar. Length and width of the teeth were: P4, 0.98×1.40; M1, 1.0×1.44; M2, 0.93×1.30. Another upper jaw resembled the first and was also broken through the alveolus of the M3. The teeth measured: P4, 0.84×0.84; M1, 0.84×1.02; and the M2, 0.7×1.12 (MWSU 12593). The occlusal surfaces of the teeth showed some wear, unlike the first jaw described. A third specimen, part of the lower right jaw with only the m2 present, was broken through the diastema anteriorly and throughout the alveolus of the m3. The m2 measured 1.07×1.22. This tooth showed some wear of the occlusal surface (MWSU 12594). Two upper incisors, broken off at the proximal end, were found and compared with the incisors of *C. hispidus* in the MWSU collection. Both matched those of *C. hispidus* in size and curvature. The breadth of the incisors measured 0.79 in both subfossil and modern specimens.

Peromyscus leucopus or *maniculatus* - (MWSU 12595). The white-footed mouse is found from central Arizona to southern Canada and from the east base of the Rocky Mountains eastward toward the Atlantic (*8*). Although *P. maniculatus* may appear more generalized in habitat requirements, in north-central Texas it seems to avoid dense thickets and woodlands. The deer mouse is most often trapped in mesquite brushland, rocks, broken land, sandy areas, and sparse grasslands (*8*).

Peromyscus was represented at Box Elder Creek by a lower jaw with only the incisor present. It was compared to lower jaws of *P. leucopus, P. maniculatus,* and *Onychomys leucogaster.*

Both the white-footed mouse and the deer mouse have been trapped at the D.G. Smith Ranch along Box Elder Creek (specimens deposited in the MWSU collection). The habitat of 2,500 years ago, when these *Peromyscus* lived at Box Elder Creek, could have been similar to that of today. The vegetation on the floodplain probably varied with changes in precipitation and the meandering of the creek before it cut the deep channel it follows today.

Sigmodon hispidus - (MWSU 12596). At present, cotton rats occur in every terrestrial habitat in Oklahoma, limited only by absence of cover for their runways. The species is abundant in the Box Elder Creek area today. It is probably most abundant in tall grassy areas, especially along roadsides where johnsongrass (*Sorghum halepense*), big bluestem (*Andropogon* sp.), ragweed (*Ambrosia* sp.), and sunflowers (*Helianthus* sp.) occur. Runways are usually prominent and easily seen where they wind through the heavy cover.

Two *Sigmodon* teeth were found at the Box Elder site, an upper M3 and a lower m3. The upper M3 measured 1.49×1.91. Some wear was apparent. This tooth possessed three roots. The single lingual root was larger than the two labial roots. The anterior of the labial roots was broken near the crown. The m3 measured 2.0×1.72. All of the roots have been broken off of this tooth, and the occlusal surface showed some wear, especially on the posterior portion.

Microtus ochrogaster or *pinetorum* - (MWSU 12597-12599). The woodland vole ranges eastward from Oklahoma, Texas, and the Great Lakes to the Atlantic coast. *M. pinetorum is* taken frequently in upland grassy areas associated with blackjack and post oak that occur in the eastern limits of its range (*9*). *M. ochrogaster* occurs within central North American prairies. Discovered in the early 1980s on the East Firing Range

at Fort Sill, Oklahoma, a relict population of these voles extended the southern limit of the known geographic range (*10*). In Oklahoma, *M. ochrogaster* has been taken primarily in grassy communities. The habitat present along Box Elder Creek today would be suitable for either of these two species. The riparian habitat, with burr oak, pecan, some elm (*Ulmus* sp.) and cottonwood (*Populus deltoides*), and greenbriar thickets, occurs on both sides of the creek. This woodland extends outward on either side of the creek for 10-20 yards. The edge of the tree line is the beginning of the grassland, which at one time was in cultivation. The west side of the creek was returned to grasses such as bluestem and lovegrass (*Eragrostis* sp.), but the east side remains in cultivation. Trapping failed to take either *M. ochrogaster* or *M. pinetorum.* The change in habitat, from open prairie to cultivated land, could have caused the local demise of *M. ochrogaster*. However, *M. ochrogaster* is found at Fort Sill, approximately 20 miles to the south of the Box Elder site (*10, 11*). The absence of *M. pinetorum* at Box Elder Creek is puzzling.

Thirty-one *Microtus* teeth were found at the Box Elder site. Identification to species of these two voles from their teeth is not possible. Habitat suitable for both could have occurred at the time of deposition in the Box Elder Creek subfossil fauna. The teeth included; 4 upper M1's; 4 upper M2's; 8 upper M3's (MWSU 12597); 6 lower m1's; 1 lower m2 (MWSU 12598); and 8 tooth fragments; 4 lower jaws; and 2 maxillary fragments (MWSU 12599).

Odocoileus virginianus - (MWSU 12600). In woodlands, deer frequent edges and clearings, where they find the greatest variety of their preferred food plants. In most of central Oklahoma, post oak-blackjack forest interspersed with open woodlands make up the optimal habitat. Woodland is restricted to bottomlands in western Oklahoma, limiting the available deer habitat (*3*). White-tailed deer are seen in the Apache area from time to time, and apparently are more abundant now than in past decades. They are sometimes seen crossing U.S. Highway 281 south of Apache, near Lake Ellsworth, where the late Dr. Joe Kelsey saw one swimming across the lake. Several trunk vertebrae, ribs, and a lower jaw of this species were found at the excavation site, as described in the account of *Homo sapiens.*

The lower jaw with p2-m3 was measured using a dial caliper. Length was measured along the ligual side of the jaw. The width was determined on the anterior loph of each tooth. Measurements were: p2, 8.9×4.9; p3, 10.9×6.5; p4, 11.6×8.2; m1, 11.8×9.5; m2, 14.6×10.8; m3, 21.3×11.3. The wear on the occlusal surface of the m1 indicated the age of the deer at about three to four years old at time of death.

Several regurgitated food pellets of the Great Horned Owl, *Bubo virginianus,* found under a burr oak tree near Box Elder Creek in late March, 1991, showed that the species of small rodents taken by this raptor are similar to those preserved in the subfossil fauna. Six of the nine small mammals in the subfossil fauna had been taken by the owls; these included Eastern cottontail, gopher, hispid pocket mouse, deer mouse, hispid cotton rat, and prairie vole.

CONCLUSIONS

All of the uncovered subfossil taxa occur at or near the Box Elder Creek site today. Although the riparian area of Box Elder Creek now contains chiefly broadleaved trees, no species with definite woodland affinities was detected among the subfossils. Some forms, such as beaver, deer, and cottontail, suggest a forested habitat. If the vole sample included *Microtus pinetorum,* this, too, would indicate a woodland. In contrast, the ground squirrel, prairie dog, pocket mouse, gopher, and cotton rat indicate prairie or dry grassland near the quarry site. Therefore, the mammalian fauna at Box Elder Creek today is probably similar to that of ca. 2,500 years ago.

ACKNOWLEDGEMENTS

I am indebted to Dr. Walter W. Dalquest, Dr. Frederick B. Stangl, Jr., and Dr. John V. Grimes for their helpful suggestions and critical review of the manuscript. Thanks are extended to Jane Lindsey and Elsa Galbraith for technical assistance with the manuscript. A special thanks goes to Dr. John Kocurko for aid in interpretation of the geology of Box Elder Creek. I extend special gratitude to my

parents, Dr. Lotsee F. Patterson and Don G. Smith, for moral and financial support. An earlier version of the paper was submitted as part of a thesis to Midwestern State University in partial fulfillment of the requirements for the Master of Science degree.

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