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H. Gregory McDonald
National Park Service

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Harlan's Ground Sloth (*Paramylodon harlani*) (Xenarthra: Mylodontidae) from the Late Pleistocene (Rancholabrean) of Iowa

H. GREGORY MCDONALD

Park Museum Management Program, National Park Service, 1201 Oakridge Drive, Fort Collins, Colorado 80525,
email: Greg_McDonald@nps.gov

Harlan's ground sloth, *Paramylodon harlani*, is documented for the first time from Iowa. The record is based on a fifth metacarpal recovered from a gravel bar within West Tarkio Creek, Page County. While the specimen was not found *in situ*, and could not be radiocarbon dated, the local geology suggests that it was probably derived from sediments that post-date Peorian loess deposition and is late Wisconsinan in age. This specimen extends the range of *Paramylodon* 350 km to the northeast of the closest previously known locality. Its size is slightly larger than average for other late Pleistocene (Rancholabrean) individuals of *Paramylodon harlani*.

INDEX DESCRIPTORS: *Paramylodon*, Harlan's Ground sloth, Pleistocene, Rancholabrean.

INTRODUCTION

Giant ground sloths were first reported from Iowa in 1862 from remains recovered from a crevice in the Galena Limestone near Dubuque (Hall and Whitney 1862). Additional remains have been subsequently collected from 12 localities state wide (McDonald and Anderson 1983). All previous records of ground sloth in Iowa represent *Megalonyx jeffersonii*, so the discovery of a bone clearly identifiable as *Paramylodon harlani*, adds significantly to our understanding of the diversity of the Pleistocene fauna of Iowa and expands our knowledge of the distribution of this species. This single Iowa record is in sharp contrast to the multiple records of *Megalonyx* in the state, and to the west on the Great Plains where *Paramylodon* is the more common of the two genera. Given the inferred differences in habitat preference between the two genera, *Megalonyx* as a browser utilizing more forested habitat, and *Paramylodon* as a grazer, preferring more open grassland environments, the difference in relative abundance may simply reflect differences in availability of local habitat and the transition from a more forested environment in the east to the grassland habitat westward. This paper examines the Iowa record within the context of *Paramylodon* distribution in North America, focusing on records from the nearby Great Plains and surrounding region.

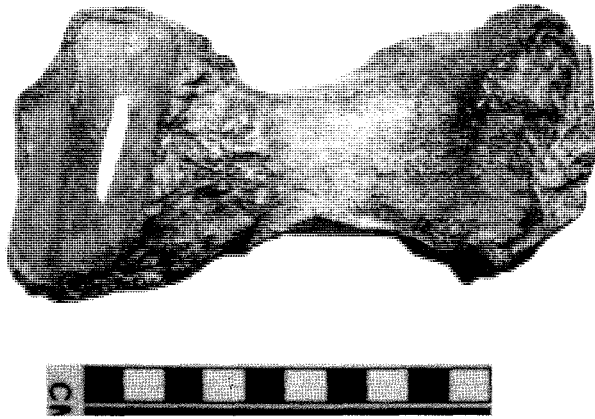
LOCATION AND GEOLOGY

Unfortunately the specimen was not recovered *in situ* but was found as float on a gravel bar in West Tarkio Creek, Page County, Iowa, 6 mi southwest of Northboro; NE1/4, NE1/4 NW1/4, NE1/4 section 31, T67N, R39W, Westboro Quadrangle Missouri-Iowa; 95° 21' 29.85 W, 40° 34' 54.06 N, elevation 290 meters. The specimen was collected by Bob Athen during recovery of bones related to the West Tarkio Valley sloth site where the remains of three individuals of *Megalonyx jeffersonii*, one adult and two juveniles, were excavated through the combined efforts of the staff of the University of Iowa Museum of Natural History; Department of Geoscience, University of Iowa; Office of the Iowa State Archaeologist and numerous volunteers. Mr. Athen generously donated the specimen to the Paleontological

Repository, Department of Geoscience, University of Iowa and it is cataloged as SUI 116925. The skeleton of the adult *Megalonyx*, the discovery specimen, had been exposed in the bed of West Tarkio Creek and some bones of this animal were dislodged and transported downstream. However, there is no evidence to indicate the *Paramylodon* bone eroded from the *Megalonyx* excavation area and no bones of *Paramylodon* were recovered from the *Megalonyx* excavation, which covered approximately 400 square meters.

The drainage area of West Tarkio Creek watershed covers 106,000 acres; 71,000 acres of which are located in Page and Montgomery Counties in southwest Iowa (Van Klaveren 2005) and the *Paramylodon* bone could have been derived from any number of other upstream exposures on West Tarkio Creek. The quality of bone preservation and preserved details of its external morphology indicate that transport distance is minimal as the specimen shows little wear or damage. An ongoing survey of exposures along the creek may locate additional specimens in place and permit a more detailed understanding of the depositional environment and perhaps habitat in which the *Paramylodon* was preserved.

West Tarkio Creek cuts through Pleistocene deposits located on the Southern Iowa Drift Plain east of the Loess Hills that parallel the Missouri River. Down cutting by the creek has exposed sediments of the Holocene DeForest Formation. Although there is no composite stratigraphic section for the West Tarkio Creek locality, in 2004 11 drill holes were made for an archaeological study about 5 miles east of Shenandoah. All were in either floodplain or fan positions in the West Tarkio Valley. Four of the holes reached a depth of 3 meters and seven others were 5-6 meters deep. Most of the deeper holes penetrated into pre-DeForest Formation deposits. This alluvium, assumed to be Wisconsinan in age, consists of a loess-derived silt loam or silty clay loam, but with a much stiffer consistency than the Gunder, the basal member of the DeForest alluvium. The top of this older alluvium was at depths ranging from 4-5 meters below the floodplain and could easily be the source sediment for the sloth. One drill hole on an alluvial fan penetrated 3 meters of fan deposits (Camp Creek and Corrington Members) and then 2+ meters into what was almost certainly Loveland Loess (silty clay



A.



B.

Fig. 1. *Paramylodon harlani*, right fifth metacarpal (SUI 116925)
A. medial B. lateral view.

loam or silty clay). The Loveland Loess has been identified in western Adams County, so there is every reason to believe it is present in western Page County as well (Kathleen Woida pers. comm. 2009).

Based on both thermoluminescence ageing (Norton, and Bradford 1985) and radiocarbon dates from vertebrate remains in Nebraska, the Peorian loess appears to have been deposited between 13,150 to 24,130 rcyBP (Woodfordian substage of the Wisconsinan glaciation) with initial deposition starting around 21,000–20,000 rcyBP and ending approximately 12,000 rcyBP (May and Holen 1993; Mandel 2002). In western Iowa Peoria Loess deposition may have begun between 27,000 – 24,000 rcyBP with deposition possibly ending as early as 14,000 rcyBP, but certainly before 11,000 rcyBP (Muhs and Bettis 2000). OSL ages from northeastern Nebraska and northwestern Iowa bracket

Table 1. Comparison of measurements of the Tarkio Valley *Paramylodon harlani* fifth metacarpal with fifth metacarpals of the species from Rancho La Brea, California.

Measurement	Tarkio Valley SUI 116925	Rancho La Brea (average of 34 specimens) Stock, 925
Length	117.7	107.8
Width of proximal end	54.3	48.8
Greatest depth of proximal end, measured across unciform facet	58.8	51
Least width of shaft	40.6	32.5
Least depth of shaft	29.5	26.7
Width of distal end	50.8	40.6
Depth of distal end	59.7	54.4

the accumulation of most of the Peoria Loess between about 25 ka and 16 ka and the accumulation of loess of the underlying Gilman Canyon/Pisgah Formation between about 60 and 26 ka (Bettis et al. 2007). Based on these ages, the possible source sediments in the area where the *Paramylodon* bone was found constrain the maximum age as latest Pleistocene, and most likely Wisconsinan.

Attempts to radiocarbon date the specimen by Thomas W. Stafford were unsuccessful as the bone did not contain a sufficient amount of its original organic content. Humic acids in sediments removed from the marrow cavity of the bone were also dated but produced an age of $4,600 \pm 15$ rcyBP (CIAMS – 80376) which is considered to be too young to accurately reflect the true age of the specimen.

DESCRIPTION OF SPECIMEN

The specimen, SUI 116925, is a complete right fifth metacarpal of *Paramylodon harlani* (Fig. 1). The morphology agrees with that described by Stock (1925) based on specimens from Rancho La Brea, California. The bone is massive for its length with the proximal and distal ends of roughly similar dimensions and only a slight constriction of the shaft. The shaft is wider mediolaterally than dorsoventrally. There is a slight crest on the palmar-ventral margin extending from the distal end. The proximal end consists of three facets which form a continuous surface although each is offset at an angle with the proximal and distal facets sloping away from the intermediate facet. The smallest articular surface located at the lateral margin contacts the ulnare, the intermediate articular facet contacts the unciform and the most distal facet contacts the fourth metacarpal. The lateral margins of the facets for the unciform and fourth metacarpal form a prominent crest that extends above the shaft. The lateral margin of the proximal end distal to the facet for the ulnare is raised, thickened and rugose and extends distally about a third of the length of the bone. This process serves as the insertion for the extensor carpi ulnaris and an interosseus ligament from the unciform. This process and the lateral margin of the distal end may have also supported a fleshy callous of skin as suggested by the tracks of *Paramylodon* recovered from at the Carson City Prison, Nevada (Stock 1925, plates 46, 47). The distal end is bulbous and rugose. Stock (1925) described a flattened facet on the inner margin for the rudimentary fifth

Table 2. Localities on the Great Plains with *Paramylodon* and *Megalonyx*.

Locality (states listed from north to south)	<i>Paramylodon barlani</i>	<i>Megalonyx jeffersonii</i>
Alberta		
Edmonton gravel pits		X
Saskatchewan		
Pike Lake, Sutherland		X
Montana		
Doedon, Custer Co.	X	X
North Dakota		
Haven Site, Emmons Co.		X
South Dakota		X
Phillip, Haakon Co.		X
Nebraska		
Box Butte, Sheridan Co.		X
Mullen II, Hooker and Cherry Cos.	X	
Red Willow, Red Willow Co.	X	X
Smith Falls, Cherry Co.		X
Westpoint, Cuming Co.		X
Kansas		
Butler Spring, Meade Co.	X	X
Cimarron, Gray Co.	X	
Delphos, Ottawa Co.	X	
Fall River, Wilson Co.	X	
Harper Township, McPherson Co.		X
Kansas River, Johnson Co.		X
Oatville Sand and Gravel, Sedgwick Co.	X	
Superior Sand and Gravel, Sedgwick Co.		X
Wellington, Sumner Co.		
Colorado (only localities on the Great Plains)		
Bijou Creek, Adams Co.	X	
Crook, Logan Co.	X	
Dutton, Yuma Co.	X	
Lamb Spring, Douglas Co.	X	
La Salle, Weld Co.	X	
Selby, Yuma Co.	X	
Walsenberg, Huerfano Co.	X	
Widefield, El Paso Co.		
Oklahoma		
Chickasha fauna (Bob Bowles Gravel Pit), Grady Co.	X	X
Clinton, Custer Co.	X	
Concho Gravel Pit, Woodward Co.	X	
Deer Creek, Grant Co.		X
Freedom, Woods Co.	X	
Gould, Harmon Co.	X	X
Hardesty, Texas Co.	X	
Jefferson, Grant Co.	X	
Lawton, Comanche Co.		X
Nash, Grant Co.	X	
Tegarden, Woods Co.	X	
New Mexico (only localities on the Great Plains)		
Badlands Ranch, Quay Co.	X	
Blackwater Draw, Roosevelt Co.	X	
Hall and Stewart Ranch, Roosevelt Co.	X	
east of Barranca Creek, Quay Co.	X	
Jal, Lea Co.	X	
Roswell Fauna, Chaves Co.	X	
Texas		
Aubrey, Denton Co.	X	
Avenue fauna, Travis Co.	X	
Big Wichita River fauna, Wichita Co.	X	

Table 2. Continued.

Locality (states listed from north to south)	<i>Paramylodon harlani</i>	<i>Megalonyx jeffersonii</i>
Kickapoo, Archer Co.	X	
Kincaid Rockshelter, Uvalde Co.	X	
Laubach Cave, Williamson Co.		X
Old Glory, Stonewall Co.	X	
Quitaque, Motley Co.		X
Salt Fork Brazos River, Stonewall Co.	X	
Settlement Creek, Coryell Co.	X	
Thigpen, Falls Co.		X
Total	39	21

digit. This facet is present in the Iowa specimen but as a roughened area and not a distinct smooth facet. Stock (1925) noted that occasionally there is a small facet for a sesamoid below this facet and this appears to be represented in the Iowa specimen by two facets separated by a vestigial carina. The lateral margin of the distal end is triangular with the apex of the

triangle proximal and expanding distally. Stock (1925, Table 84) provided the average of measurements for 34 fifth metacarpals from Rancho La Brea, these are provided in Table 1 along with those of the Iowa specimen. The Iowa specimen represents a large individual but not outside the size range expected for the species.

DISCUSSION

While a specimen identified as a mylodont sloth (an ungual, SUI 162, from the Cox gravel pit at Missouri Valley, Harrison County) has been previously reported from Iowa (Calvin 1909) reexamination of this specimen indicates it is *Megalonyx* (McDonald and Anderson 1983). Another record reported as *Paramylodon cf. harlani* by Rhodes and Semken (1986) cited specimens in an unpublished manuscript by Frankforter (n.d.) on the Turin fauna, Monona County. Chris Widga (pers. comm., 2012) has reexamined the two specimens and concluded that one is a vertebral centrum, which may be proboscidean, and the other a fragmentary innominate(?), neither of which is sufficiently diagnostic to permit assignment to *Paramylodon*. Thus, the West Tarkio Creek specimen is the first valid record of *Paramylodon* from Iowa. The new site for the species is 519 km east of the Red Willow local fauna, Nebraska, (Corner 1977); 726 km north of Boney Springs, Missouri (Saunders 1977) and 350 km northeast from the Oatville Sand Pit, Kansas (Rogers and Martin 1985), the three closest localities with *Paramylodon*. All previous discoveries of sloths in Iowa are *Megalonyx* and all, except for one, have been recovered from gravel pits or other deposits of fluvial origin. This has been interpreted as indicative of *Megalonyx* in Iowa and elsewhere as being closely associated with gallery forests along river systems reflecting its preference for wooded habitat (McDonald and Anderson 1983; Hoganson and McDonald 2007). In contrast the numerous records on the Great Plains and elsewhere in the United States indicate *Paramylodon* was closely associated with grass lands or prairie parkland. It has been interpreted as a grazer (Stock 1925; McDonald and Pelikan 2006) or possibly a mixed feeder (Naples 1989). Stable isotope analysis of the teeth of *Paramylodon* suggests a mixed diet dominated by grass (Ruez 2005). *Paramylodon harlani* is commonly recovered with other grazers and species indicative of open habitat such as mammoth, horse and bison in Pleistocene faunas (McDonald and Pelikan 2006).

Based on the nearby Farmdalian Craigmile and Woodfordian Waubonsie faunas, Rhodes (1984) interpreted the late Pleistocene environment of southwestern Iowa as boreal grassland with boreal coniferous and deciduous trees dispersed to form patches of

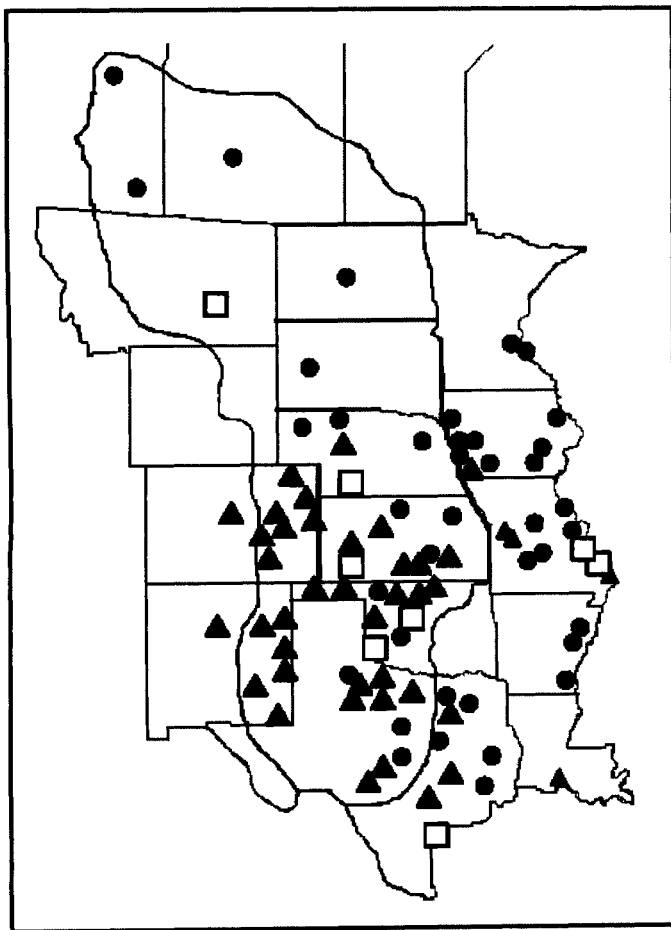


Fig. 2. Map of distribution of Late Pleistocene (Rancholabrean) *Paramylodon* and *Megalonyx* from the midcontinent of the United States. Triangles are *Paramylodon*, circles are *Megalonyx*, and open squares are faunas that contain both taxa. Outlined area is the physiographic boundary of the Great Plains.

“boreal parkland” with closed forests in sheltered locations. While these faunas did not contain tundra-specific taxa they do contain taxa indicative of strong, cold steppe habitat with few temperate/mesic elements. This parkland had cooler summers and winters and overall cooler average annual temperatures so climatically would have been analogous to that found along the prairie-forest border in southern Manitoba and Saskatchewan today (Rhodes and Semken 1986). Deciduous forest cover in the region, the type of habitat preferred by *Megalonyx* only became more common towards the end of the Wisconsinan. It might therefore be inferred that the *Paramylodon* was present in the area much earlier than *Megalonyx* and disappeared from the region with the expansion of forested habitat.

While both *Megalonyx* and *Paramylodon* remains were found in the West Tarkio Creek drainage, they have not been found in association. Both taxa are present in some faunas outside of Iowa, such as Rancho La Brea, California; American Falls Reservoir, Idaho and Big Bone Lick, Kentucky but these sites are exceptions and not common (McDonald 1996), reflecting differences in the preferred habitats of the two genera. There are 39 (Table 2) Rancholabrean localities with *Paramylodon* on the Great Plains (McDonald and Pelikan 2006) and 21 for *Megalonyx* (Hoganson and McDonald 2007) and while there is broad overlap in the distribution of the two taxa in the region (Fig. 2), they only co-occur in five faunas: Doedon, Montana; Red Willow, Nebraska; Butler Spring, Kansas; Bob Bowles Gravel Pit, Oklahoma and Gould, Oklahoma. Applying the Index of Association $100 C / N_1 + N_2 - C$, used by McDonald (1996), where C is the number of faunas in which the two taxa co-occur, N_1 = the number of faunas with *Paramylodon* and N_2 = the number of faunas with *Megalonyx* the value is 9.3, a value only slightly higher than the 7.1% calculated for the association of the two taxa from California, Nevada and Arizona (McDonald 1996). When the two taxa are found together, there is often a difference in their relative abundance, with one taxon more common than the other, depending on predominant habitat type.

SUMMARY

The presence of Harlan's ground sloth in southwestern Iowa increases the known late Pleistocene (Rancholabrean) distribution of the species substantially to the northeast from all previously known late Pleistocene (Rancholabrean) records of the species, in the adjacent states of Nebraska, Missouri and Kansas (Fig. 2). Fossil evidence from other sites in the region suggests the species probably inhabited cool boreal parkland. Although the metacarpal was not recovered *in situ*, the local geology suggests it was probably late Wisconsinan in age. Given the differences in habitat preferences, *Paramylodon* may have pre-dated *Megalonyx* in the region and became locally extirpated when the open parkland was replaced by denser forest habitat. The size of the individual is slightly larger than other Rancholabrean specimens of *Paramylodon harlani* but not outside the size range expected for the species.

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