X

PLEISTOCENE FAUNA

By
C. L. COOPER

THE
PLEISTOCENE FAUNA OF KENTUCKY

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INTRODUCTION

The Pleistocene is known as the great period of glaciation in North America. In fact there are five recognized advances with their corresponding retreats of the ice. This great ice sheet radiated from three centers or areas, from which each divisional sheet receives its name. The Labradorean is named from the area east of Hudson Bay. Ice from this sheet radiated to cover the eastern part of the United States and undoubtedly entered Kentucky. The Keewatin sheet emanating from the area just northwest of Hudson Bay covered central United States; and the Cordilleran sheet, located in the western part of the Dominion of Canada, failed to spread out nearly as much as the other two. The five glacial stages, beginning with the oldest are as follows: the Nebraskan, Kansan, Illinoian, Iowan, and Wisconsin. The intervening interval or period which existed between the retreat of one ice sheet and the advance of the next, were of unequal duration. It was during these interglacial epochs that the deposits containing the Pleistocene fossils accumulated. However, most of these deposits in Kentucky are not strictly glacial deposits, but are fluvio-glacial beds formed by the streams flowing from the edges of the melting ice. The first of these interglacial intervals, known as the Aftonian, occurred between the Nebraskan and Kansan invasions. The others in order were the Yarmouth, the Sangamon, and the Peorian. The last is thought to have occupied an interval about equal to the time that has elapsed since the retreat of the last ice sheet, the Wisconsin. The first three intervals probably were of much longer duration.

It is certain that the Illinoian sheet entered Kentucky in a small area in the northern part of the State in the counties bordering the Ohio River from Bracken to Jefferson. (see fig. 36). However, recent finds of pebbles and boulders from Canada and the St. Lawrence Valley brought in by an ice-sheet,

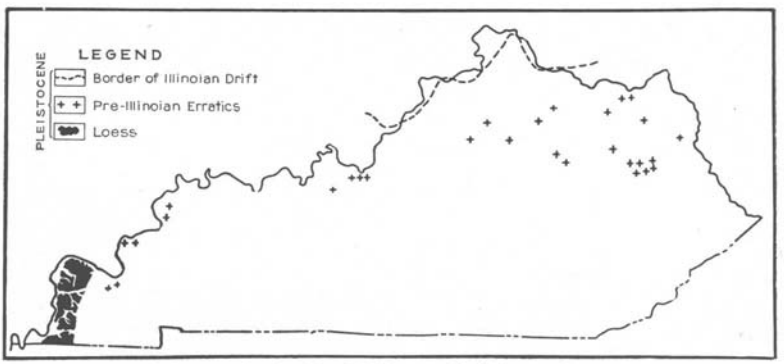


Fig. 33. Map of Kentucky showing Pleistocene glaciation.

floating ice, or an ice-dammed lake may have been deposited as debris from the Nebraskan sheet.[1]

During the time when the ice was most widespread the environments were very unfavorable for the development of life, in fact practically all life retreated before the advance of the ice-sheet, so that the sum total of life on the Continent was greatly reduced during those times. Such rigorous periods caused the complete extinction of certain species of plants and animals, and others developed very rapidly in order to maintain an existence in their rapidly changing habitat. Deposits of the Sangamon stage which immediately followed the retreat of the Illinoian sheet are known from Iowa to New York and as far north as Toronto.[2] The climate varied from cool to warm, being moist for the most part, resulting in a fauna that was most extensive and varied of the interglacial stages. The species of plants and animals in existence at that time are shown in the table following:

Fauna of the Sangamon Interglacial Stage[3]

	Living	Extinct	Total
Plants	65	3	68
Mollusks	132	1	133
Crustacea	2	0	2
Insects	2	83	85
Vertebrates	6	20	26
Total	207	107	314,

[1]Jillson, W. R., Glaciation in Eastern Kentucky: Ky. Geol. Surv., Ser. VI., Vol. 30, p. 134. 1927.
[2]Chamberlain, T. C. and Salisbury, R. D., College Geology, Pt. II, Revised p. 834. 1930.
[3]Chamberlain, T. C., and Salisbury, R. D., op. cit., p. 835.

The most interesting and abundant fossil record from the Pleistocene is found among the vertebrates. Of the few now living species that were then in existence, practically all are to be found in the bone deposits of Kentucky, as are most of the 20 species of animals now extinct. The discovery of the remains of a polar bear in the Breck Smith Cave in the Bluegrass, shows that animals, now native to cold or arctic climates, migrated south with the advance of the ice. Great numbers of herbivorous animals grazed on the grasses and other plants which sprang up after the disappearance of the ice. This abundance of prey attracted many flesh-eating animals, all of which left a record in the form of their teeth, bones, and horns buried in swampy places near springs and salt licks. Our very abundant record of these various kinds of animals is found at such places, known today as Big Bone Lick Springs and other similar localities. The Indians first discovered the "big bones" which were to be found at these places, and in 1739 and 1751 explorers noted the bone deposits in their reports; one collected a mastodon's tooth from Big Bone Lick.

INVERTEBRATE FOSSILS[4]

The collection of fossils listed below were collected at several localities and have been identified by Dr. F. C. Baker.

[4]The list of the invertebrates is taken from a manuscript on the geology of Henderson County, by C. V. Theis.

List of Pleistocene Fossils from Henderson County

SPECIES	LOCALITY														
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Polygyra multilineata wanlessi	x	x	x				x								
P. hirsuta yarmouthensis Baker	x	x				x			x			?			
P. monodon (Rackett)	x										x	x	x	x	
P. monodon cf. peoriensis Baker		x													
P. fraterna (Say)								x				x			
P. sp.										x					
Hendersonia occulta (Say)	x	x			x	x	x		x		x				
Vallonia gracilicosta Reinh.	x		x				x	x							
Gonyodiscus anthoni (Pilsbry)		x	x				x	x	x						
Retinella hammonis (Strom)		x				x			x						
Columnella alticola (Ingersoll)		x	x												
Vertigo modesta (Say)		x	x				x								
V. ventricosa (Morse)		x													
V. loessensis Baker			x				x								
Strobilops virgo (Pilsbry)		x													
Euconulus fulvus (Muller)		x							x		x				
Succinea grosvenori gelida Baker		x	x				x	x				x			
S. ovalis pleistocenica Baker			x	x	x		x			x					
S. retusa fultonensis Baker														x	
S. cf. ovalis											x				
Gastrocopta armifera similis Sterki			x												
G. armifera												x			
Punctum pygaeum (Drap.)			x												
Carychium exile canadensis Clapp			x												
Helicodiscus paralellus (Say)						x									
Anguispira alternata (Say)									x						
Pomatiopsis lapidaria (Say)											x				
P. scalaris (Baker)												x			
Circinnaria concava (Say)									x				x		
Stagnicola caperata (Say)													x	x	x
S. umbrosa (Say)														x	
S. sp.															x
Cincinnatia cincinnatiensis (Anthony)											x				
C. emarginata (Kuster)											x				
Amnicola limosa (Say)											x				
Valvata tricarinata (Say)											x				
Fossaria parva (Lea)														x	
Helisoma trivolvis (Say)														x	
Gyraulus altissimus Baker														x	
Physella gyrina hildrethiana (Lea)														x	
Planorbula n. sp.														x	
Pisidium sp.											x		x	x	
Sphaerium sp.											x				

DESCRIPTION OF LOCALITIES

A-G: About 2 miles northwest of Smith Mills. The hill, in which the road cut exposure shows nothing but loess, excepting as noted below, rises from an elevation of 375 feet A. T. to 440 feet A. T. The lower elevation is the elevation of the probably late Wisconsin terrace, but the loess is probably older than this terrace. At an elevation of 400 feet A. T., a clay band, 2 to 8 inches thick, runs horizontally for the length of the exposure, about 100 feet. No difference in character between the loess above and that below this band was noted. The collections were taken from the following elevations:

A, 380 feet; B, 395 feet; C, 400 feet (fossils from perhaps both above and below the clay band); D, 410 feet; E, 415 feet; F, from 1 foot below the clay band; G, from 1 foot above the clay band.

H: From a mound about ½ mile below Dam 48. The loess occurs in a curving band about 4 feet thick, underlain and overlain by fine sand. The mound apparently represents a dune upon the early Wisconsin terrace.

I: From the base of a loess deposit about 20 feet thick capping a Tertiary gravel deposit about 2 miles north of Spottsville.

J: In river bluff about three miles below Mt. Vernon, on the Indiana side of the river. The material was taken from an 8-foot loess-like band of silt at an elevation of 385 feet, underlying horizontally bedded sand in a hillock rising to about 405 feet A. T. The fossils indicate that it is a true loess.

K: From the material underlying the Early Wisconsin terrace about 5 miles below Henderson. This material ranges here from a heavy, dark blue clay to a coarse sand with pebbles of crystalline rock.

L: From the Early Wisconsin fill in Sellers Ditch 2 miles south of Henderson. The material associated with the fossils is a heavy, dark blue clay.

M: On the Ohio River bank, about 3 miles below Mt. Vernon. The material appears in the field to be a typical loess but lies below the level of the Early Wisconsin terrace.

N: From the bank of a small drain, where crossed by the Uniontown road about 2 miles southwest of Mt. Vernon. in NE. ¼ SW. ¼ sec. 13, T. 7 S., R. 14 W.,) Uniontown quadrangle. The material underlies what appears to be the early Wisconsin terrace although not typically developed here. Dr. Baker is inclined to consider the fauna as of Sangamon or Peorian age.

O: From a loess-like material about two miles below Mt. Vernon. The collection was made from about 10 feet below the level of what is probably the Early Wisconsin terrace.

OCCURRENCE OF VERTEBRATE FOSSILS IN KENTUCKY[5]

Of historical interest is the fact that President Thomas Jefferson first discovered and named *Megalonyx jeffersoni,* a ground sloth very abundant and of wide distribution during the Ice Age. The remains of this animal have been found at Big Bone Lick and near Henderson. *Mylodon harlani,* a smaller sloth, has been found at Big Bone Lick and at Blue Lick. A beaver as large as a black bear, *Castoroides ohioensis,* is known to have inhabited Kentucky streams, as its teeth and bones have been found in the eastern part of the State. Two odd-toed ungulates, the Perissodactyla, are represented by the remains of an ancient tapir and a prehistoric horse. The tapir, *Tapirus sinensis,* has been found at McConnell's Run in Scott County and at Yarnellton Station in Fayette County. These animals are now found in more southern latitudes, and differ little from their Pleistocene ancestors. The horse, *Equus complicatus,* found at Big Bone Lick, was very abundant during this time.

The even-toed ungulates, the Artiodactyla, are represented by a large variety of species from the fossil beds of Kentucky. The peccaries, or American swine have been found at Big Bone Lick and on Crooked Creek in Rockcastle County. *Platygonus*

[5]Webb, W. S. and Funkhouser, W. D., Ancient Life in Kentucky, Ky. Geol. Surv., Ser. VI., Vol. 34, pp. 40-46, 1928.

compressus, the species representing this class of vertebrates, is now extinct. The common Virginia deer (genus *Odocoileus*) was living at that time, as shown by abundant Kentucky records. The "elk," or more properly the wapiti, *Cervus canadensis,* related to the great stag of Europe, is present as fossils at Big Bone Lick and in Wayne County. The caribou, *Rangifer tarandus,* another animal from the Old World, was present in Kentucky during this period. The Indians probably used the fossil caribou horns for ceremonial purposes, as horns that appear to be the same are found in many old Indian graves. The fossils are found at Big Bone Lick. Pleistocene moose have also been found in Kentucky, and are probably the same as the living ,species, *Alces americanus. Cervalces scotti* a very unusual "stag-moose," is quite different from any living species of stag or moose. This form is also found at Big Bone Lick, as is the musk-ox, *Bootherium bombifrons.* This ox, now found only in the far north, apparently had wide distribution in the Pleistocene. The bison came to America from Europe, and two Pleistocene species are found at Big Bone Lick, *Bison antiquus* and *B. latifrons.* The latter was very much larger than the living species, *B. bison,* had horns with a spread of 6 to 8 feet, and is thought to be the parent form of this genus. The presence of fossils of animals now living together with those of the extinct forms at Big Bone Lick shows that this locality was used by salt-eating animals for hundreds of centuries. Only one form of the carnivorous animals is found in the State, in contrast to the great number of herbivorous genera and species. This is a bear, *Ursus americanus,* although a fox *(Urocycon scotti)* now found only in warmer climates, may have lived in Kentucky during the Pleistocene. This form was found in Breck Smith Cave near Lexington.

The most interesting group of Pleistocene animals inhabiting Kentucky are the ancient elephants, which came to America over the old land bridge between Siberia and Alaska. The best known form *Elephas primigenius* roamed throughout the northern hemisphere. It was adapted to cold climates, being protected by a heavy coat of long wooly hair. Big Bone Lick and Blue Lick Spring have yielded perfect skeletons of this form. *Elephas columbi,* a huge beast standing 11 feet high at the

shoulders, has been found at Big Bone Lick. The American mastodon, *Mammut americanum,* is one of the earliest of the ancient elephants, even antedating the early mammoths. In spite of this early ancestry, this form continued long enough to become contemporary with man in North America. Bones of this form have been found in abundance in Kentucky at Big Bone Lick, Blue Lick, in the Green River Valley and well within the Eastern coalfield.[6]

DESCRIPTION OF PLEISTOCENE VERTEBRATES FOUND IN KENTUCKY

ORDER CARNIVORA

FAMILY CANIDAE

UROCYCON CINEREOURGENTEUS SCOTTI

A skull of Scott's gray fox has been found in the Breck Smith cave, about 8 miles west of Lexington. Dr. Hays reports[7] the find indicates that the climate of central Kentucky was much warmer than it is now.

FAMILY URSIDAE

URSUS AMERICANUS

Plate LXXVI, fig. 2.

The only carnivore found in the bone deposits of Kentucky is the black bear, *Ursus americanus.* This is the same species of bear now living and which is all but exclusively northern in distribution. The family is very distinct, and although they live principally upon vegetable food, they have the dentition of the carnivorous animals. The Pleistocene representatives in America include the true bears (*Ursus*) and a large short-faced bear *Arctotherium bonoerense.*

FAMILY CASTOROIDIDAE

CASTOROIDES OHIOENSIS

Plate LXXIV. fig. 3.

This giant beaver attained the size of the black bear, and lived in the late Pleistocene. It came to North America, either from the Old World or South America, and became widely distributed in the eastern and middle states.

[6]Jillson, W. R., Pleistocene Proboscideans Within the Cumberland Plateau in Kentucky: Bull. Geol. S. Am., vol. 40, No.1, p. 253, 1929.

7Hays, _, _., Proc. Biol. Soc. Wash., March 20, 1922.

ORDER EDENTATA

FAMILY MEGALONYCHIDAE

MEGALONYX JEFFERSONI

Plate LXXII, fig. 3.

The ground sloth is common to Pleistocene deposits in North America. The skull resembles that of the tree sloths in that it is short and broad. The lower jaw is short and massive and the chin vertical. The fore limb is shorter and slenderer than the hind, but of nearly the same length. The feet were connected to the limbs so that the animal must have walked on the outside of the foot in much the same manner as the living ant-bear. The very large club-shaped heel-bone formed the back portion of the outer edge of the foot. The teeth are 54 in number, the foremost separated from the others and more or less tusk-like in form. The grinding teeth are without ridges and worn smooth, showing that the animal fed principally on leaves.

Zittel[6] sums up the manner of life of this form as follows:

"The hip-bones, hind legs, and tail are characterized by enormous strength. The entire structure of the extremities proves that the gigantic sloth could move over the ground but slowly and clumsily; on the other hand, the fore limbs served as grasping organs and were presumably employed to bend down and break off twigs and branches and even to uproot whole trees, while the weight of the body was supported upon the hind legs and tail."

MYLODON HARLANI

Plate LXXII, fig. 2.

This form is essentially similar to *Megalonyx,* in fact there is no wide range of variation among the three families of ground-sloths which lived at this time. The main differences are found in size, form and number of teeth, the shape of the skull, and the number of digits.

[6]Zittel, Karl, Handbuch der Paleontologie, Bd. IV, p. 132, 1893.

ORDER ARTIODACTYLA

FAMILY DICOTYLIDAE

PLATYGONUS LEPTORHINUS

Plate LXXVIII, fig. 2.

The predominating peccary of the Pleistocene in North America was the genus *Platygonus,* which was thought to have been more advanced than the existing forms. It failed to survive, however, in spite of the fact that it was better fitted to continue. It was much a larger animal, with longer and heavier legs. The genus first appeared in middle Pliocene.

FAMILY CERVIDAE

CERVUS CANADENSIS

Plate LXXIV, fig. 2.

The Roosevelt elk or wapiti is common to the northern part of North America and is plainly of Old World origin.

RANGIFER (CARIBOU) TARANDUS

Plate LXXV, fig. 2.

This form, the caribou, is also a northern form of Old World origin, and is still existant in North America.

ALCES AMERICANUS

Plate LXXVII, fig. 1.

The moose, *Alces americanus,* is essentially no different from the Old World species, and with the caribou and wapiti, are thought to have originated there.

CERVALCES SCOTTI

Plate LXXV, fig. 1.

This form is different from any now living. It is closely related to the moose and the neck, body, limbs, and feet are almost identical. However the skull and antlers are very much different; the nasal bones are shorter than the moose, indicating a smaller snout. The antlers in general, are like those of the moose, but are less palmate and carry a trumpet-like plate on the lower side of each antler. This form is sometimes called the "stag-moose," and is thought to have migrated from eastern Asia, although no identical forms have been found in the Old World.

ODOCOILEUS VIRGINIANUS
Plate LXXVI, fig. 1.

The Virginia deer is a southern form in contrast to the four previously described forms which are found in the northern part of the continent..

FAMILY BOVIDAE

SYMBOS CAVIFRONS

This form of the musk-ox ranged from Alaska to Arkansas and is one of three extinct genera found in the American Pleistocene. *Symbos* differs from the living form *Ovibos* in its smaller and shorter horns. The skull of *Bootherium bombifrons,* another Pleistocene musk-ox, is shown in Pl. LXXIV, fig. 1.

OVIBOS WARDI
Plate LXXVII, fig. 3.

The remains of the musk-oxen have been found as far south as Oklahoma, but mostly along the terminal moraine formed by the front of the last ice invasion. This form, one of strictly arctic or cold region habitat, shows conclusively the character of the climate during the advance of the ice. The presence of bones of the extinct form, *Symbos,* and the two living forms, *O. moschatatus* and *O. wardi,* with those of the caribou in regions that are now warm or temperate is a good indication of the influence of the ice sheet upon climate.

BISON ANTIQUUS

This form was much larger than the living species, *B. bison* (See Pl. LXXVIII, fig. 1B) and is readily distinguished by the position of the horns at right angles to the axis of the skull. The remains of this species have been found only in California and Kentucky.

BISON LATIFRONS
Plate LXXII, fig. 1; PI. LXXVIII, fig. 1A.

This early Bison was the giant of the race, and is thought to have far exceeded any of its living relatives in size. The largest skull found carries horns that measure 6 feet across from tip to tip or 8 feet 6 inches along the curve. An idea of its size as compared to the living form may be obtained from Pl. LXXVIII, fig. 1A. Its remains have been found as far south as Texas and Mississippi.

ORDER PERISSODACTYLA

FAMILY EQUIDAE

EQUUS COMPLICATUS

Equus complicatus ranged in the western, southern, and middle western states is well known from the Pleistocene deposits of these areas. It is characterized by teeth as large as the living horse, although it was only intermediate in size, about 14 hands high. The species somewhat resembles the ass on account of its short muzzle.

FAMILY TAPIRIDAE

TAPIRUS HAYSII

The fossil record of this class of animals is rather meager, and if the scarcity of specimens is an indication of their numbers in North America they could not have maintained themselves for a long time. It seems that they were most abundant during the Pleistocene, and had, in general, the same habitats as the existing species. *Tapirus haysii* was probably larger and heavier than the living species.

ORDER PROBOSCIDEA

FAMILY ELEPHANTIDAE

MASTODON AMERICANUS

Plate LXXVII, fig. 2.

It has been estimated that the mastodon was as plentiful at one time as the bison. Their known range covers the entire United States northward to Lake Winnepeg and British Columbia, Alaska, and Nova Scotia. The American mastodon is distinguished by its low forehead, its short, massive limbs, very broad pelvis, the height at the shoulders not exceeding 9½ feet. It was probably covered with hair and an undercoating of wool. The tusks attained a length of 10 feet, the average in full-grown specimens being seven to eight feet long.

ELEPHAS PRIMIGENIUS

Plate LXXIII, fig. 2.

The northern or Siberian mammoth, *Elephas primigenius*, came into North America by way of the land bridge across Bearing Sea which connected Alaska with Siberia. It was adapted to a cold climate being covered with a dense coat of

wool with an outer covering of long, coarse hair. In size it is the smallest of the Pleistocene elephants, about nine feet high at the shoulder. Its teeth are of the grinding type, high, cement covered, and composed of many thin plates of enamel, dentine, and cement, very much like those of the Indian elephant living today.

ELEPHAS COLUMBI

Plate LXXIII, fig. 1.

This form is very much like *E. primigenius*, except it is a very much larger form, sometimes attaining a height of 11 feet at the shoulder. The head was very high, with a peaked appearance. The tusks curved inward, sometimes overlapping in old males. The species ranged, in general to the south of the Siberian mammoth, and is found as far south as Florida and the tableland of Mexico. It is thought, since this species is found more to the south, that if the animal was covered with hair, it was not so thick as that found on the northern form.

BIBLIOGRAPHY

Allen, J. A., The American bison, living and extinct: Geol. Survey Kentucky, Mem. I pt. 2, 1876.

----, Mem. American Mus. Nat. Hist., vol. 1, pt. 4, p. 212, 1913.

Antevs, Ernst, Maps of the Pleistocene Glaciations: Bull. Geol. Soc. America, vol. 40, p. 641 fig. 4, 1929.

Bailey, Vernon, Cave life in Kentucky: Kentucky Geol. Survey, Ser. VI, vol. 49, pp--, 1931.

Carr, Lucien, On the prehistoric remains of Kentucky: Geol. Survey Kentucky Mem. I, pt. 4, pp. 1-31, 1876.

Chamberlain, R. C., and Salisbury, R. D., College Geology, Pt. II, revised, pp. 801-820, 832-842, 1930.

Coleman, A. P. The extent and thickness of the Labrador ice-sheet: Bull. Geol. Soc. America, vol. 31, pp. 319-328, 1920.

Cooper, W., Notices of Big Bone Lick: Monthly Am. Jour. Nat. Sci. vol. 1, pp. 158-174, 1831.

Cooper, W., Smith J. A., and DeKay, J. E., Report to the Lyceum of Natural History on a collection of fossil bones disinterred at Big Bone Lick, Kentucky, in September, 1830, and recently brought to New York: Am. Jour. Sci., Vol. XX. pp. 370-372, 183l.

Croghan, , Monthly Jour. Am. Geol., December, 183l.

Filson, John, Discovery, settlement, and present State of Kentucky, 1784.

Funkhouser, W. D., Wild Life in Kentucky: Kentucky Geol. Survey, Ser. VI, vol. 16, 1925.

Hay, Oliver P., The Pleistocene of North America and its vertebrated animals: Carnegie Inst. Washington, Pub. 322, p. 403, 1923.

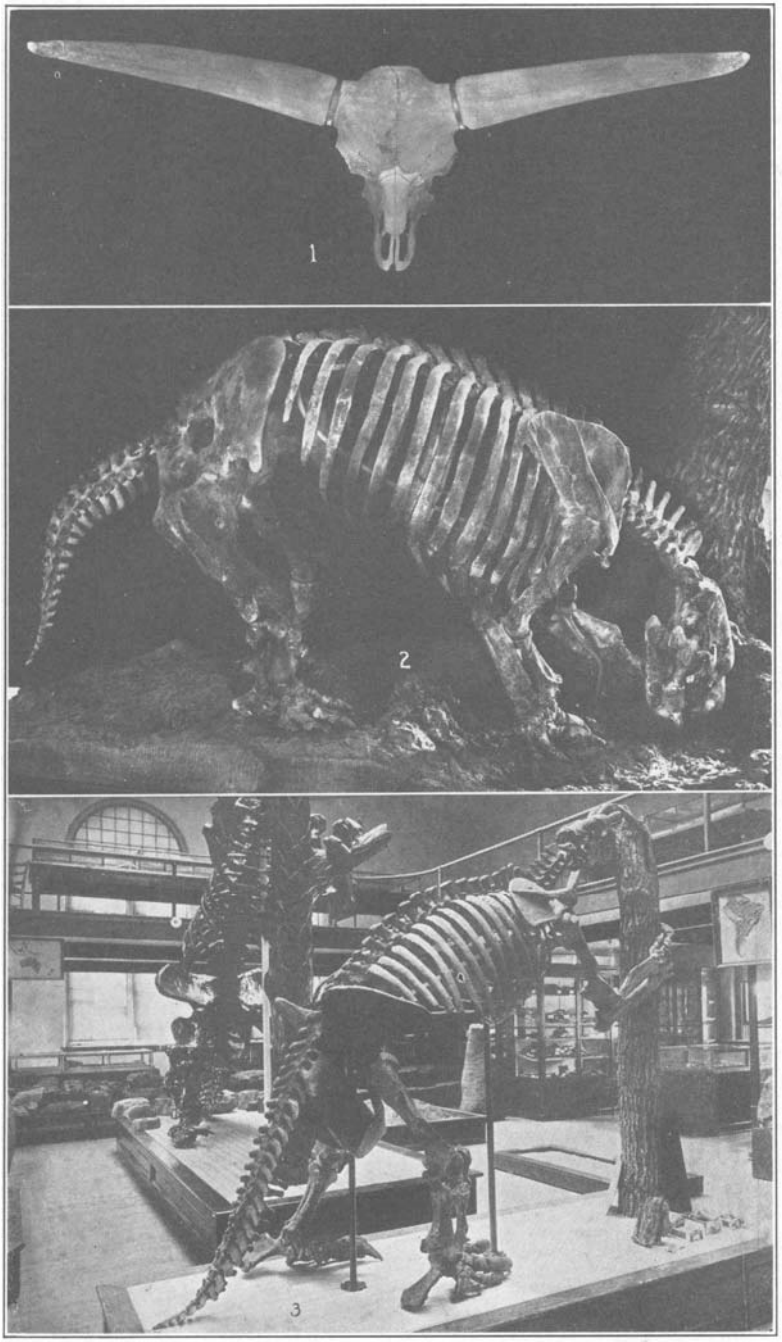
Imlay, G., Western Tertiary of North America: pp. 47-48, 236, London, 1793.
Jillson, W. R., Glacial Pebbles in Eastern Kentucky: Kentucky Geol. Survey, Ser. VI, vol. 30, pp. 123-126, 1921.
-----, Pleistocene of northern Kentucky: Kentucky Geol. Survey, Ser. VI, vol. 31, pp. 1-80, 1929.
-----, Glaciation in Eastern Kentucky: ibid., pp. 127-135 .
-----, Early glaciation in Kentucky, ibid., pp. 137-141.
-----, Geologic map of Kentucky: Kentucky Geol. Survey, Ser. VI, 1929.
Kindle, E. M., The Discovery of Bone Lick: Kentucky Geol. Survey, Ser. VI. vol. 41. pp.-- 1931.
Leverett, Frank and Taylor, F. B., The Pleistocene of Indiana and Michigan and the history of the Great Lakes: U. S. Geol. Survey, Mon. 53, p. 62, 1915.
Lucas, F. A., The fossil Bison of North America: Proc. U. S. Nat. Mus., vol. XXI, No. 1172, pp. 775-771, pl. LXV-LXXXIV, 1899.
Lyell, Sir Charles, On the geological position of *Mastodon giganteum* and associated fossil remains at Big Bone Lick, Kentucky: Am. Jour. Sci., vol. 46, pp. 320-323, 1844; Geol. Soc. London, Proc., vol. 4, no. 92, 1844.
Miller, A. M., The geology of Kentucky: Kentucky Geol. Survey, Ser. V, Bull. 2, 1919.
------, Recent cave explorations in Kentucky for animal and human remains: Kentucky Geol. Survey, Ser. VI, vol. 10, pp. 107-113, 1923.
Osborn, H. F., The Age of Mammals: McMillan, pp. 478-80, 1910.
Osgood, Wilfred H., Smithsonian Mis. Coll., vol. XLVIII, pp. 113-185, pl. 37-42, 1905.
Scott, William B., A history of land animals in the Western Hemisphere: McMillan, 1913.
Shaler, N. S., On the age of the bison in the Ohio Valley: Geol. Survey Kentucky, Mem. I, pp. 232-236, 1876.
------, On the antiquity of caverns and cavern life in the Ohio Valley: ibid., pp. 1-13, 1876.
Silliman, Benj., Am. Jour. Sci., vol. XX., pp. 371-372, 1831.
Webb, William S., and Funkhouser, William D., Ancient Life in Kentucky: Kentucky Geol. Survey, Ser. VI, vol. 34, pp. 40-46, 1928.
Wright, G. F., The glacial boundary in western Pennsylvania, Ohio, Kentucky, Indiana, and Illinois: U. S. Geol. Survey, Bull. 58, 1890.

Explanation of Plate LXXII

Figure

1. *Bison latifrons.* View of top of skull, showing the enormous spread of horns.
2. *Mylodon harlani.* Skeleton mounted in the American Museum of Natural History.
3. *Megalonyx jeffersoni.* Giant sloth described by Thomas Jefferson from a skeleton found at Big Bone Lick.

PLATE LXXII



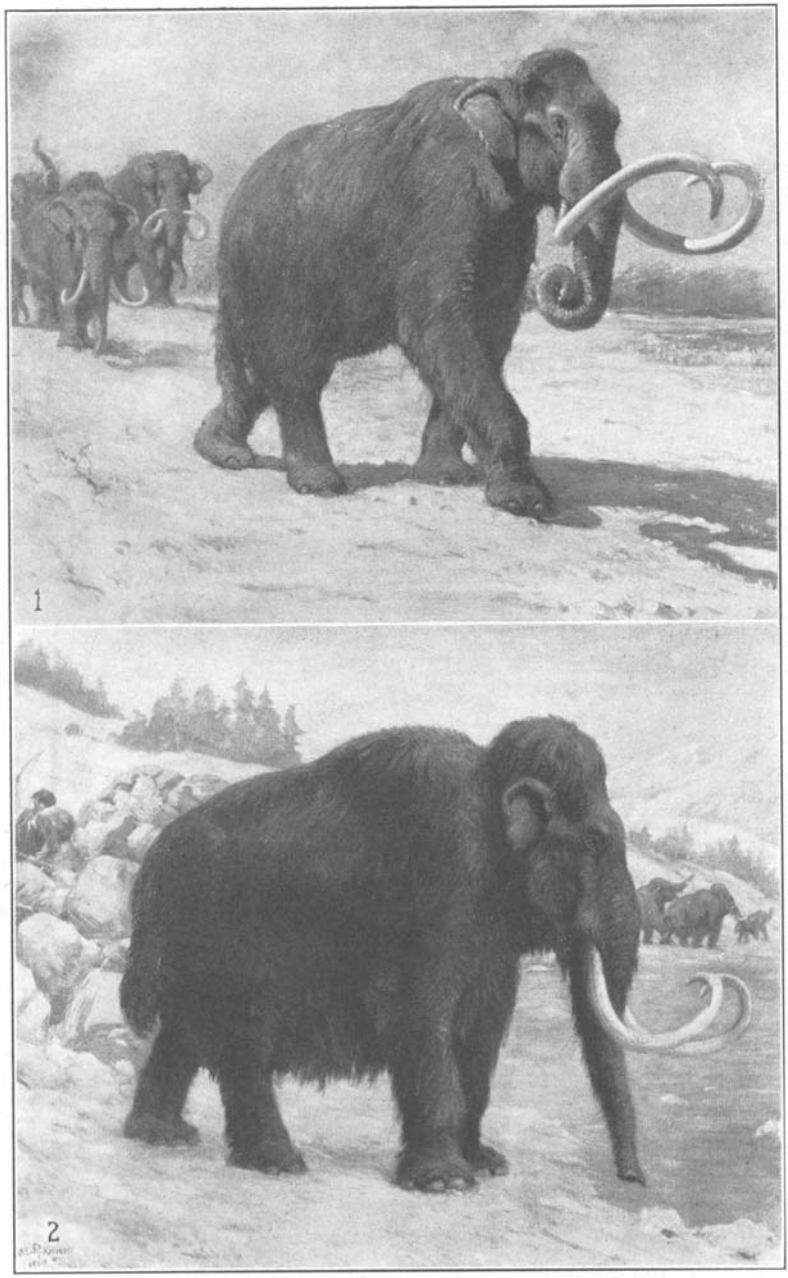
FOSSIL MAMMALS OF THE PLEISTOCENE
Photographs by American Museum of Natural History.

Explanation of Plate LXXIII

Figure

1. *Elephas columbi.* Painting of Columbian elephant by Charles R. Knight.
2. *Elephas primigenius.* Painting by Charles R. Knight.

PLATE LXXIII



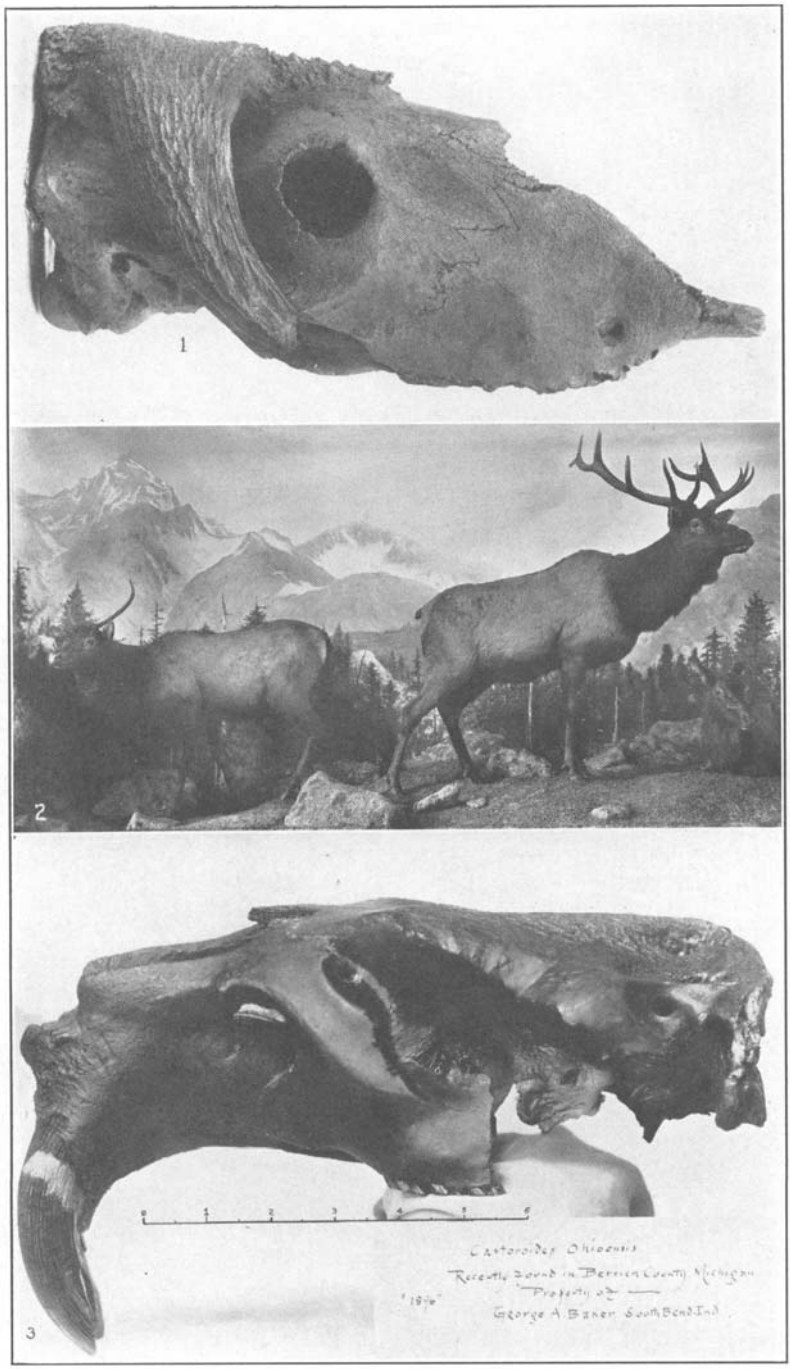
PAINTINGS OF THE PLEISTOCENE MAMMOTH IN AMERICA
Photographs by American Museum of Natural History.

Explanation of Plate LXXIV

Figure

1. *Bootherium bombifrons.* Skull of extinct musk-ox.
2. *Cervus canadensis.* Roosevelt elk, a living species which has been found with Pleistocene animals at Big Bone Lick.
3. *Castoroides ohioensis.* Skul1 of giant beaver, which sometimes grew to the size of the black bear.

PLATE LXXIV



PLEISTOCENE VERTEBRATES
Photographs by American Museum of Natural History.

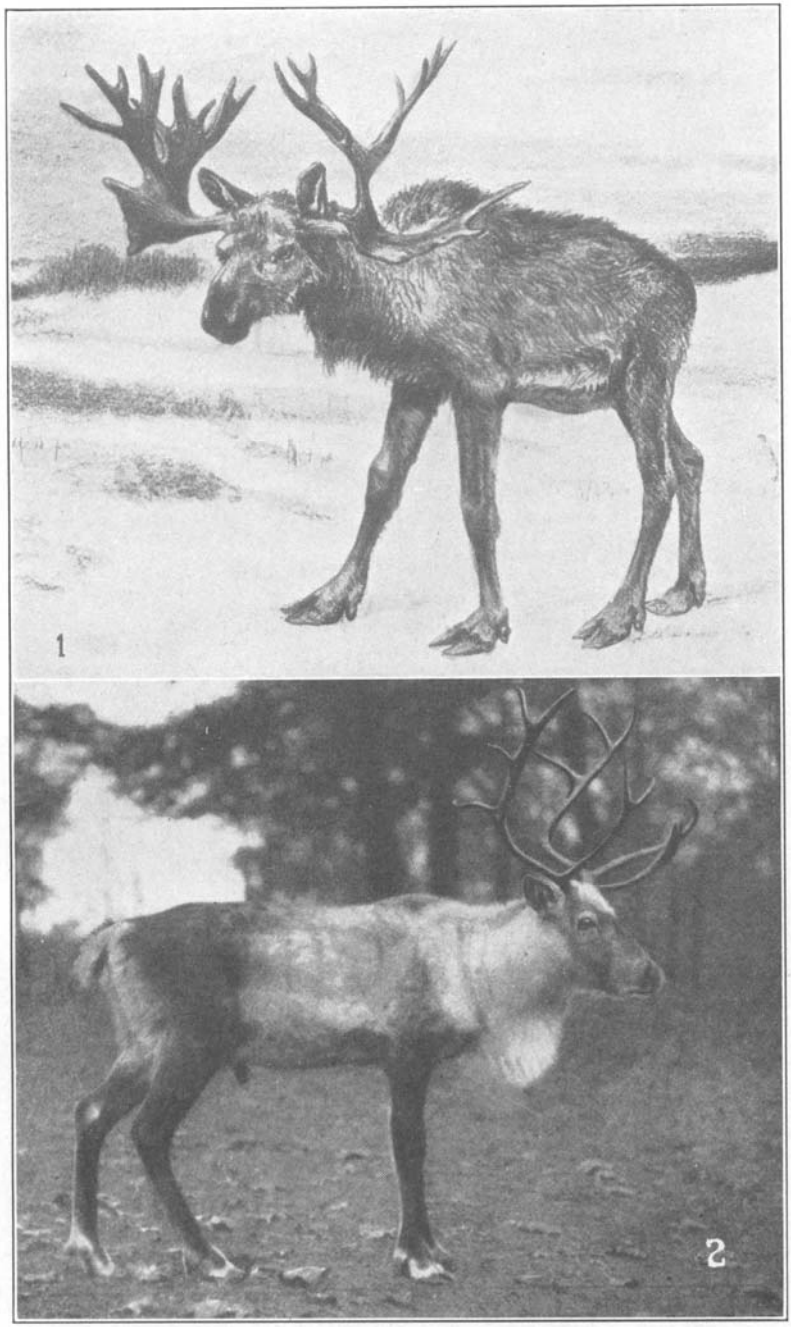
Explanation of Plate LXXV

Figure

1. *Cervalces scotti.* A painting made from the restoration of a skeleton of the "stage-moose" at Princeton University.

2. *Rangifer caribou.* Living species which was existant in the late Pleistocene.

PLATE LXXV



PLEISTOCENE VERTEBRATES
Photography by American Museum of Natural History.

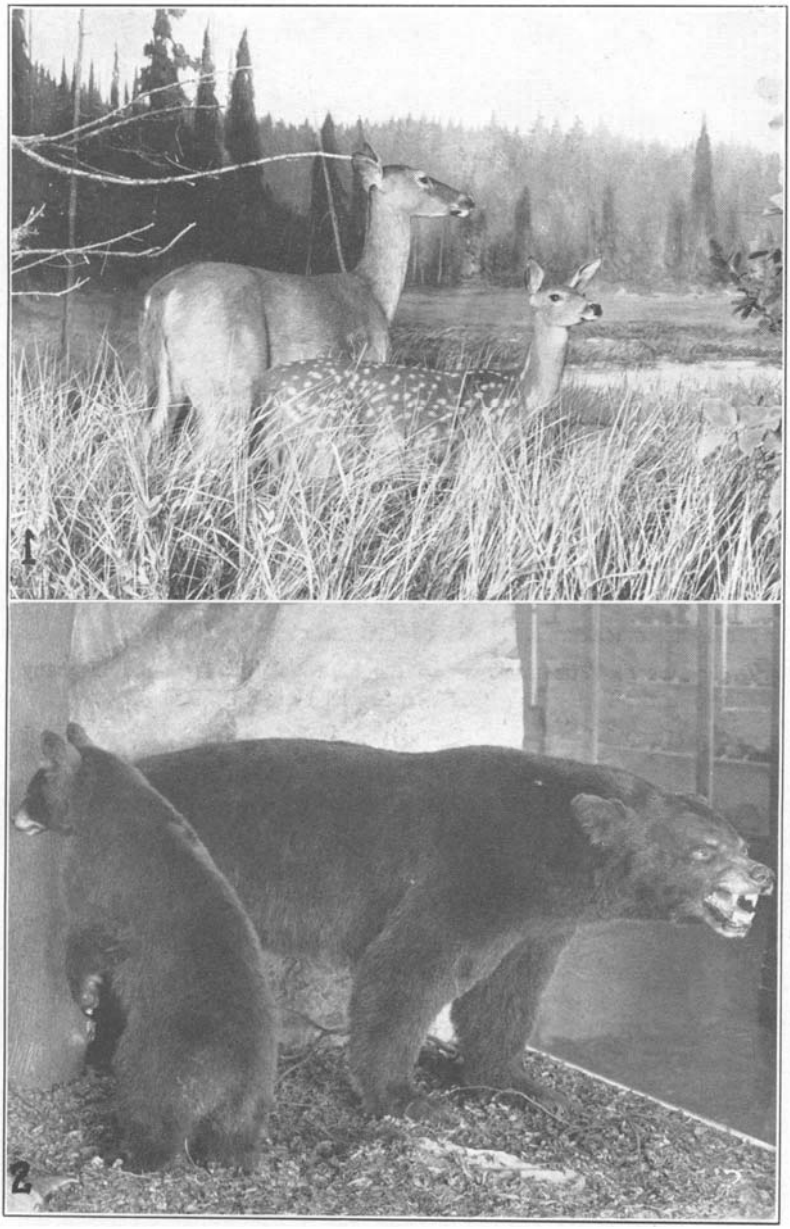
Explanation of Plate LXXVI

Figure

1. *Odocoileus virginianus.* The Virginia deer, also a living form, found in the late Pleistocene bone beds.

2. *Ursus americanus.* The only carnivore found at Big Bone Lick, the living species of black bear.

PLATE LXXVI



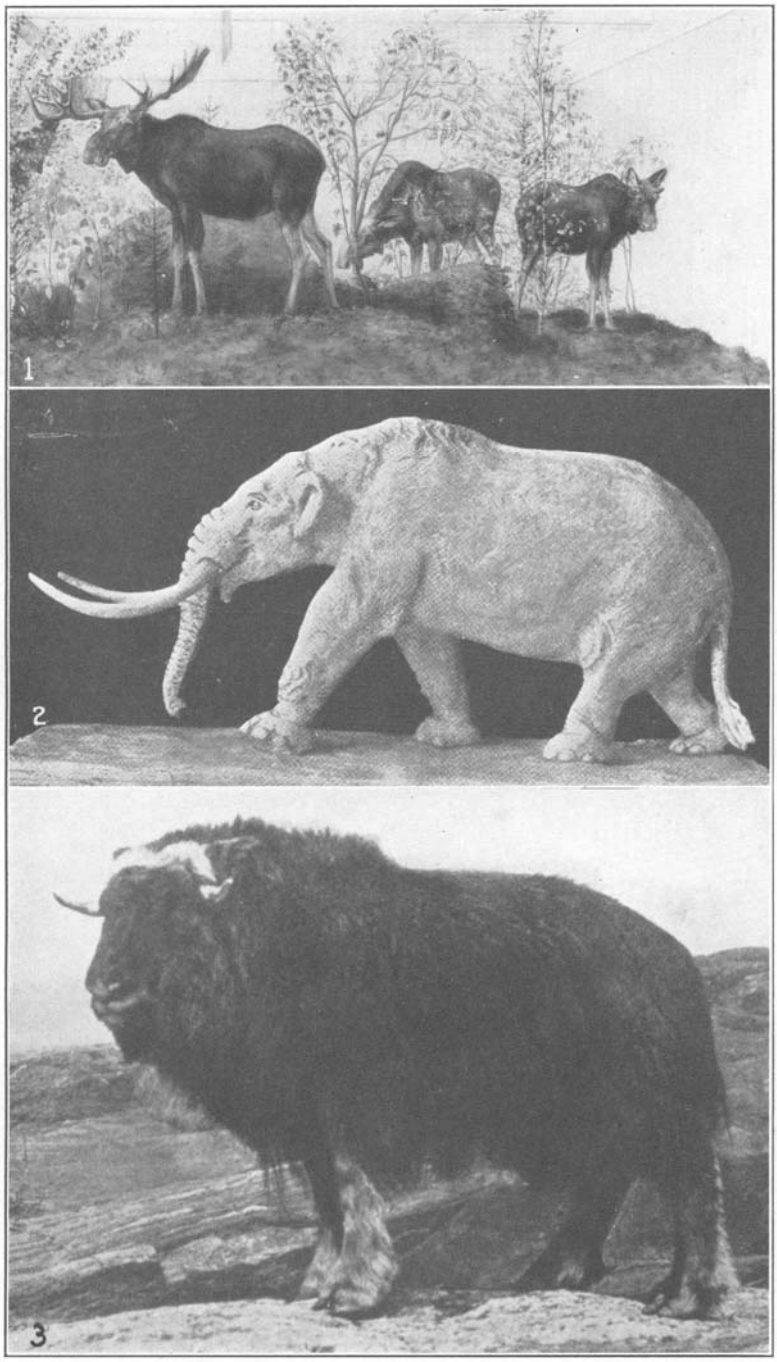
PLEISTOCENE VERTEBRATES
Photographs by American Museum of Natural History.

Explanation of Plate **LXXVII**

Figure

1. *Alces americanus.* Moose group, the living form, from the American Museum of Natural History.
2. *Mastodon americanus.* Model of the American mastodon.
3. *Ovibos wardi.* The musk-ox, of northern habitat, is found in many places in the Pleistocene beds of southern United States.

PLATE LXXVII



PLEISTOCENE VERTEBRATES
(Figures 1 and 2 by the American Museum of Natural History)

Explanation of Plate LXXVIII

Figure

1. A. *Bison latifrons.* Front view of skull showing large spread and curvature of the horns. Compare with Skull of living bison shown in figure IB.

   B. *Bison bison.* Skull of the living buffalo.

2. *Platygonus leptorhinus.* Extinct form of peccary which lived in late Pleistocene.

PLATE LXXVIII