FOSSIL MUSK OXEN OF ILLINOIS

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ABSTRACT. — The first definitely identifiable specimens of *Ovibos* from Illinois are reported from Henderson and Fulton Counties. Eleven other locality records, six previously unpublished, for musk oxen in Illinois, are reviewed, representing *Symbos*, ovibovines of uncertain generic identity, or possibly non-ovibovine bovids.

The purpose of the present communication is to place on record the first definitely identifiable specimens of the living musk ox genus *Ovibos* known to us from Illinois, and to review present knowledge of fossil ovibovines in the Pleistocene of Illinois. Following is an annotated list of all specimens known to us. The numbers (1-13) preceding the account of each specimen or specimens from a given locality correspond to the numbers by which localities are designated on the distribution map (Figure 1). All specimens have been examined by one of us (Ray), excepting those from localities 9 and 13.

ANNOTATED LIST

1. *Ovibos* (?)*moschatus. Oquawka, 5.5 miles east southeast of, Henderson County.* The locality is in the bed of the south branch of Smith Creek (Jinks Hollow on U.S. Geological Survey topographic map, 15′ ser., Oquawka quadrangle), SW¼, Sec. 33, T. 11 N., R. 4 W. The location can not be ascertained more precisely owing to the death of the collector, Mr. Wilford Peterson.

This record is based upon a partial skull collected by Mr. Peterson in 1965 and turned over to the Department of Geology, Monmouth College. The specimen was forwarded to the U. S. National Museum for further study and permanent deposit, where it has received the number U.S.N.M. 23456 in the Division of Vertebrate Paleontology. Casts have been placed in the collections of Monmouth College, the Field Museum of Natural History (PM 14680), and the National Museum of Canada.

The specimen consists of the braincase and the interorbital region of the frontals. The free, projecting portion of each horn core has been lost, and the entire specimen has been abraded, apparently by stream-tumbling (Figures 2 and 3). The specimen compares well with crania of adult bulls of modern *Ovibos moschatus*, except in its unusually great postorbital breadth of 171.5 mm. (least width posterior to orbits and anterior to horn cores), as compared to postcornual breadth of 140.5 mm. (least width immediately posterior to horn cores). These may be contrasted to similar measurements of 139.6 mm. and 132.0 mm. in a modern adult bull of *O. moschatus* (U.S.N.M. 288025, Division of Mammals). The specimen from Fulton County (locality 3) is too abraded and broken to permit accurate measurement. The maximum postorbital breadth among 85 skulls of Recent adult male *Ovibos moschatus* measured by Tener (1965, Table 44) is 156.0 mm. The fossil from Henderson County may be referred with confidence to *Ovibos*, but only with question to *O. moschatus*.

Illinoian till, Peorian loess and Recent alluvium are the only surface materials in the Jinks Hollow drainage basin, i.e., the collecting locality. Classification of the glacial materials is based on lithologic correlation with Horberg's section 9a (1956, p. 32), located 14 miles north-

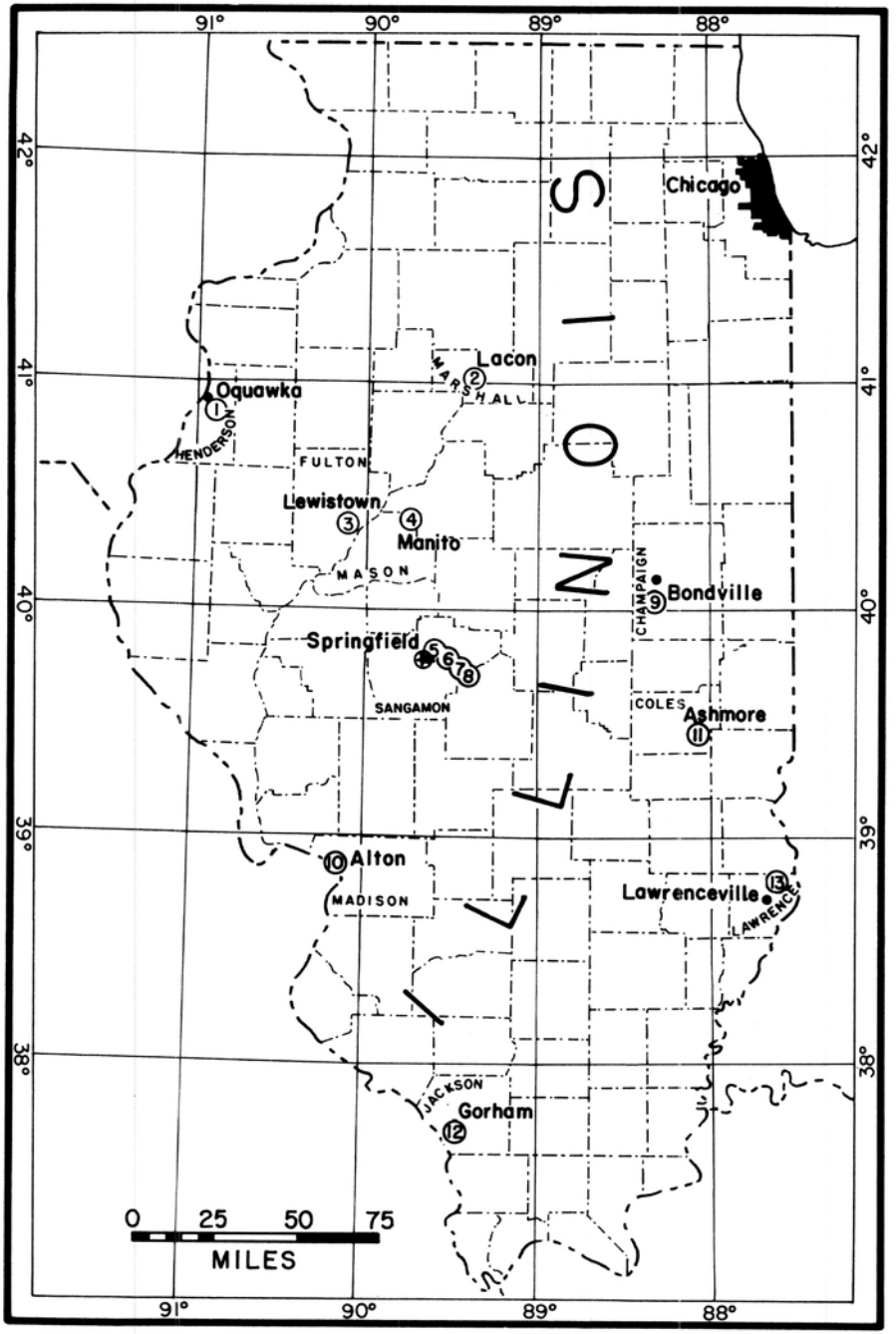

FIGURE 1.—Distribution of fossil musk oxen in Illinois. Encircled numbers (1-13) designate localities and correspond to numbered paragraphs in the ANNOTATED LIST.

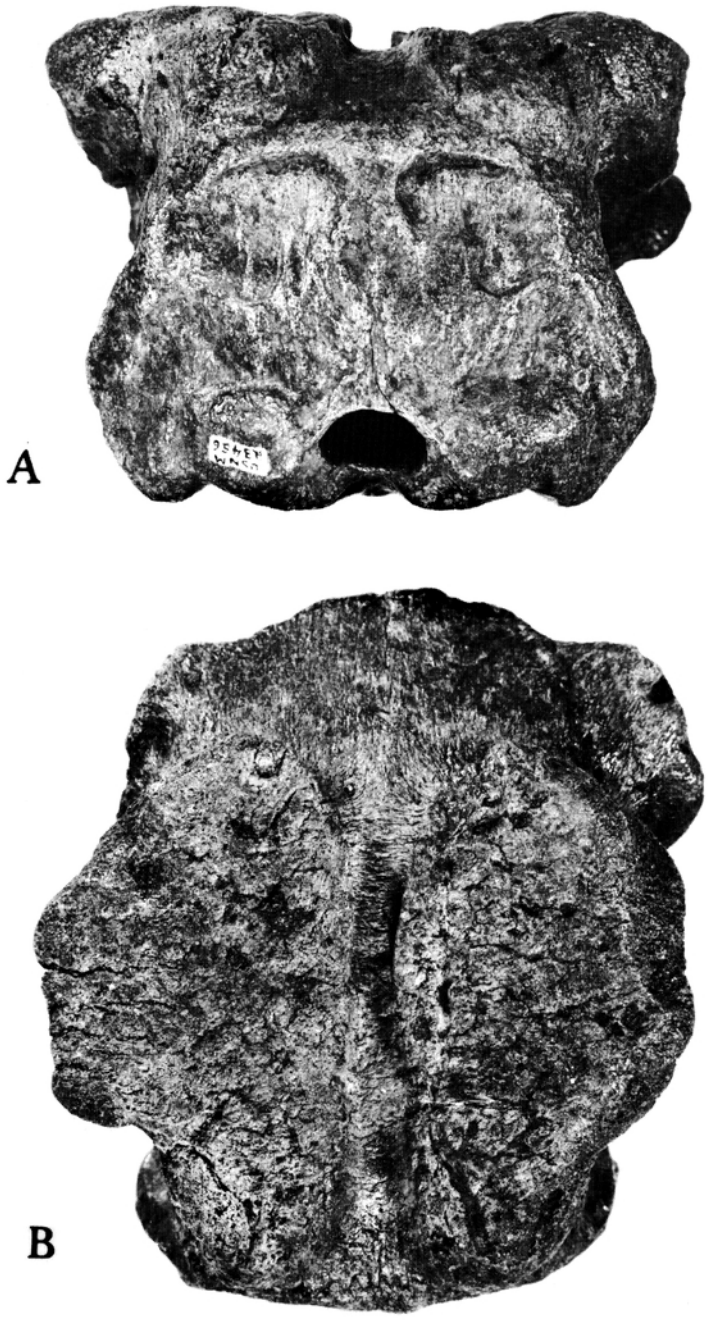

FIGURE 2.—Cranium of *Ovibos* (?) moschatus, U.S.N.M. 23456, from Henderson County, Illinois, in posterior (A) and dorsal (B) aspects. Approximately X ⅜.

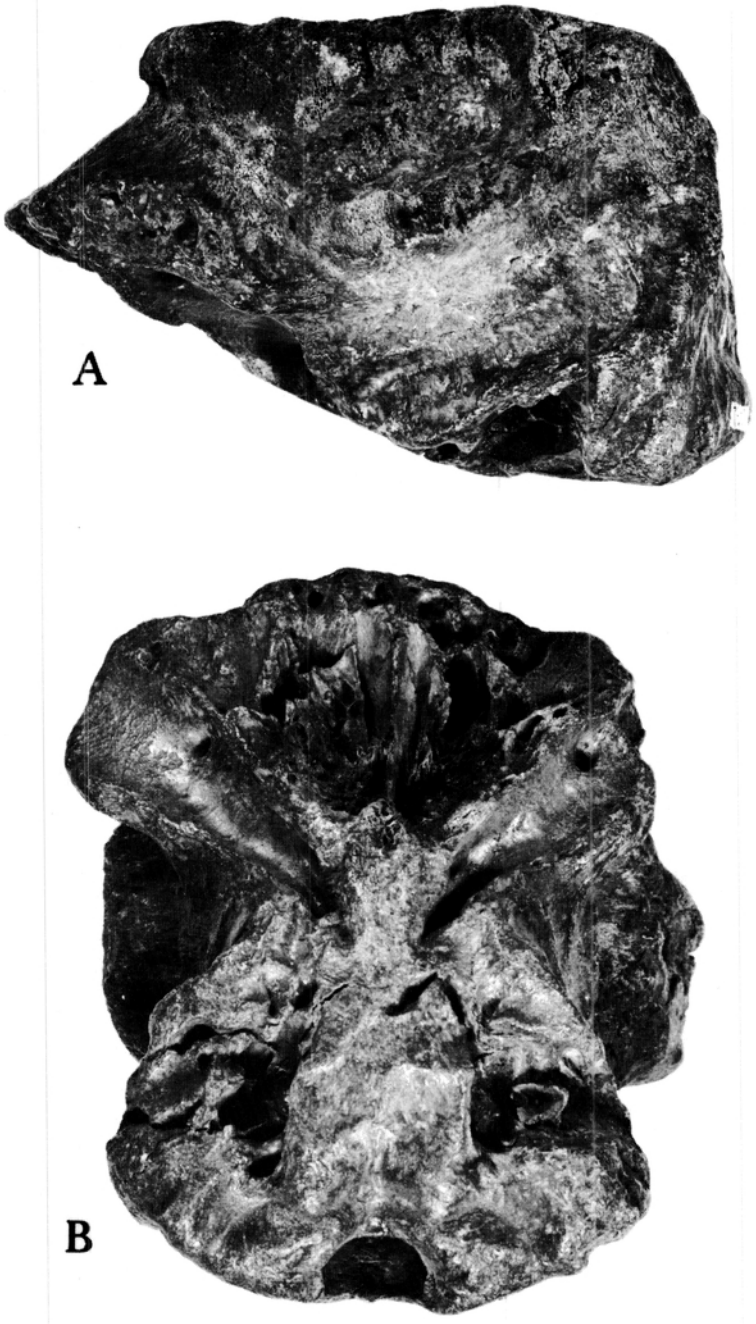

FIGURE 3.—Cranium of *Ovibos* (?) *moschatus*. U.S.N.M. 23456, from Henderson County, Illinois, in left lateral (A) and ventral (B) aspects. Approximately X ⅜.

east of Jinks Hollow. The till is yellowish-brown, clayey, sandy, silty, and locally gravelly or pebbly. Up to 40 feet of till is exposed in the valley wall. The upper surface of the till is locally oxidized, suggesting that late Illinoian or early Wisconsian erosion partially removed the weathering profile. Yellow-brown clayey loess overlies the till.

The permineralized character of the braincase would seem to preclude the possibility that the musk ox was buried initially in the Recent alluvium. Material resembling till was scraped from depressions in the skull. The clay matrix was separated from the coarser fraction and x-ray diffraction analysis of the clay was made in an attempt to correlate the relative amounts of illite, montmorillonite, kaolinite and chlorite with those in local tills. Although no conclusive results were obtained, the nature of the material adhering to the skull suggests that it was derived from Illinoian till. Thus, it seems possible that the *Ovibos* specimen could be of Illinoian age.

2. *Ovibovini, gen. et. sp. indet. Lacon, Marshall County.* No further data are available regarding locality.

This record is based on the centrum of a posterior cervical vertebra (probably the seventh) of an undetermined ovibovine in the collections of the Field Museum of Natural History (PM 15227). The specimen was collected by Mr. Magoon Barnes and was given to the museum in 1936.

3. *Ovibos moschatus. Lewistown, 3.8 miles southeast of, Fulton County.* This locality is immediately west of the Morton School on a ridge known locally as "Hill Top," bordered on the east by the west bluff of the Illinois River and on the west by the valley of Coal Creek. It is near the midpoint, and perhaps 100 feet south of the northern boundary of the NW¼, NE¼, Sec. 6, T. 4 N., R. 4 E. (U.S.G.S. topographic map, 15′ ser., Havana quadrangle). The site has been located precisely by Cole and Deuel (1937, Figure 16 and Plate VIA.).

This specimen consists of a much abraded and fragmented braincase with the bases of the horn cores of a presumably young adult male with occipital sutures open (Figures 4 and 5). It was reported as *Symbos cavifrons* by Cole and Deuel (1937, pp. 73, 268), based upon field identification by Professor Alfred Romer, but its characters clearly are those of *Ovibos*, rather than of *Symbos*. The narrow, dorsal, mid-sagittal groove separating the left and right horn cores and the wide, basin-shaped dorsal depression of the horn cores lacking a pronounced anterior interorbital extension (Figure 4), immediately indicate *Ovibos*. There is nothing in the preserved portion of the skull to separate it from *O. moschatus*.

The specimen was until recently housed in the collections at the Dickson Mounds, Museum of the Illinois Indian, near Lewistown, Fulton County, but has now been presented by Mr. Marion Dickson to the Illinois State Museum where it has received the catalog number I.S.M. 416118.

It was found beneath mound F^0 10 in the Morton Group of Cole and Deuel, 1.5 feet down in the undisturbed loess which mantles the "Hill Top" ridge. The loess here is undoubtedly the Peoria Loess of late Wisconsinan age (Frye, Willman, and Black, 1965, p. 56).

4. *Symbos cavifrons. Manito, Mason County.* According to Hay (1923, p. 253), "the exact location of the skull was in section 22, township 23 north, range 6 east [actually west] . . . ." (U.S.G.S. topographic map, 15′ ser., Manito quadrangle).

The specimen (U.S.N.M. 7800) is a well preserved braincase, with the horn cores and much of the interorbital and circumorbital regions, of *Symbos cavifrons* collected from a peat deposit of presumed Wisconsinan age. It has been reported upon previously by Hay (1923, pp. 253-254), who suggested that it might represent a female individual. On the basis of analogy with sexual dimorphism in *Ovibos moschatus*, it seems much more likely that it represents a young adult male.

5. *Ovibovini* (?), *gen. et sp. indet. Springfield, 6.5 miles east northeast of, Sangamon County.* The locality is the workings of the Clear Lake Sand and Gravel Company along the north shore of Clear Lake, SW¼, Sec. 22, T. 16 N., R. 4 W. (U.S.G.S. topographic map, 7½′ ser., Springfield East quadrangle), from which Holman (1966) has reported remains of fossil turtles.

In the collections of the Illinois State Museum (uncatalogued) is the well preserved crown of a left M_3 lacking most of the roots. The tooth is almost certainly ovibovine, but not further identifiable in the present state of knowledge. It is somewhat atypical of ovibovine molars in the presence of a well devel-

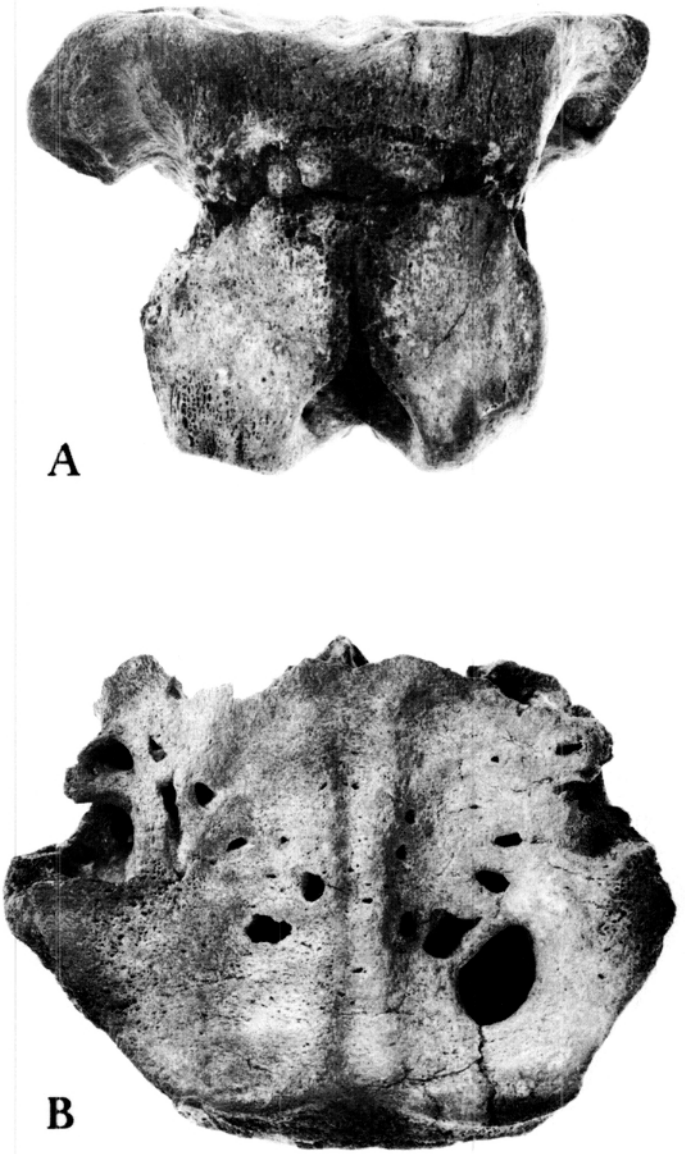

FIGURE 4.—Cranium of *Ovibos moschatus*, I.S.M. 416118, from Fulton County, Illinois, in posterior (A) and dorsal (B) aspects. Approximately X ⅜.

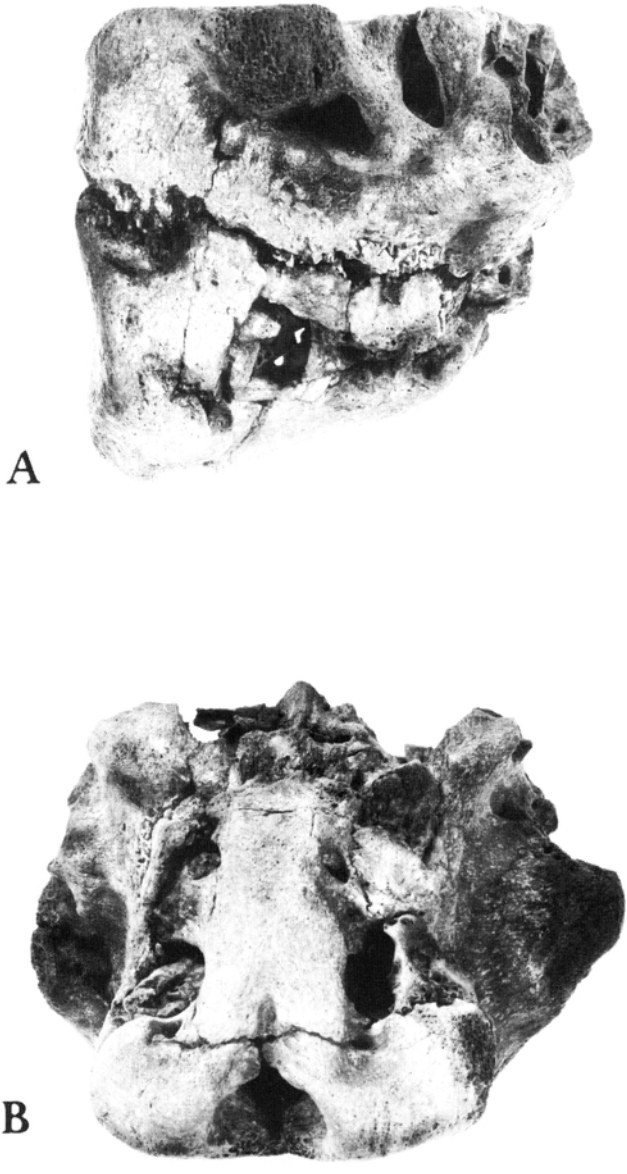

FIGURE 5.—Cranium of *Ovibos moschatus*, I.S.M. 416118, from Fulton County, Illinois, in right lateral (A) and ventral (B) aspects. Approximately X ⅜.

oped labial stylid. The occlusal length of the tooth is approximately 51 mm., the greatest length of the crown parallel to the occusal surface approximately 56 mm., and the greatest breadth of the crown 25.2 mm.

The collections of the Field Museum of Natural History contain a cast (P 27139, referred to *Euceratherium*) of a left M^2 from the Clear Lake Gravel Pit. The original specimen is in the Illinois State Museum according to the records of the Field Museum, but is not now to be found there. The cast represents a large tooth (maximum occlusal length 38.0 mm., maximum crown breadth 33.9 mm.) which compares closely to the left M^2 in referred specimens of *Symbos cavifrons*.

6. *Symbos*(?), *sp. indet. Springfield, 4-5 miles east of, Sangamon County.* The locality is described in the records of the Field Museum of Natural History as a late Pleistocene gravel pit along the Mechanicsburg Road. Dr. Paul W. Parmalee (pers. comm.) feels that this locality is probably the pit of the Springfield Sand and Gravel Company in the bed of the Sangamon River, Sec. 36, T. 16 N., R. 4 W. (U.S.G.S. topographic map, 15′ ser., Mechanicsburg quadrangle) eight and one half miles east of Springfield, from which he (1967) has recorded *Cervalces*.

The specimen is a water worn fragment of the occipito-parietal region of the skull, tentatively referred to *Symbos*. It was collected in 1954 by Dr. Carlton Condit, then Head Curator of Geology at the Illinois State Museum, and in 1956 was sent as a gift to the Field Museum of Natural History where it has been catalogued as no. PM 1418.

7. *Symbos cavifrons. Springfield, 8.5 miles east of, Sangamon County.* The locality is a pit of the Sangamon Valley Sand and Gravel Company, about one fourth mile south of the Springfield Sand and Gravel Company pit (locality 6). The locality lies in the southwest corner of Sec. 36, T. 16 N., R. 4 W. (U.S.G.S. topographic map, 7½′ ser., Springfield East quadrangle).

The specimen consists of the posterior end of the braincase of an adult individual with much of the skull roof sheared away, apparently by excavating machinery, but retaining the proximal portion of the right horn core. It was found on August 20, 1967, by Mr. Robert D. Broughton, of Springfield "in a large gravel pool at an approximate depth of 65 feet [below ground level] and surrounded by a yellowish clay." The specimen was submitted to Dr. Paul W. Parmalee who forwarded it to one of us (Ray) for study. It has been returned to the finder.

8. *Ovibovini* (?), *gen. et sp. indet. Buckhart, Sangamon County.* The locality is the pit of the Buckhart Sand and Gravel Company, NW¼, Sec. 16, T. 15 N., R. 3 W. (U.S.G.S. topographic map, 15′ ser., Mechanicsburg quadrangle).

In the collections of the Illinois State Museum and of the Field Museum of Natural History (P 27138, referred to *Euceratherium*) are casts of an isolated crown of a right upper molar, either the M^1 or the M^2, measuring 34.4 mm. in maximum occlusal length and 26.3 mm. in maximum crown breadth. The casts compare favorably to the corresponding teeth of various ovibovines, including those from the Frankstown Cave, Pennsylvania, referred to *Bootherium bombifrons*, those of uncertain identity from Alton (locality 10 below), the M^1 of referred specimens of *Symbos cavifrons*, and the M^2 of the type specimen of *Euceratherium*(?) *americanum*, U.S.-N.M. 7622, the affinities of which remain uncertain.

9. *Symbos cavifrons. Bondville, approximately 4 miles south southeast of, Champaign County.* Hay (1923, p. 253) indicates that the locality is on the farm of John Busey, in Sec. 31, T. 19 N., R. 8 E. (U.S.G.S. topographic map, 7½′ ser., Bondville quadrangle).

According to Hay (1923, p. 253) the specimen is "the rear portion of the skull with the horn-cores of . . . *Symbos cavifrons*." It is number P6857 in the collections of the University of Illinois, where it is at present on display (Bader, pers. comm.).

10. *Symbos*(?), *sp. indet. Alton, Madison County.* Exact location unknown, but from a quarry in the vicinity of Alton.

William McAdams, of Alton, assembled a collection of Pleistocene mammals occurring in concretions within the loess near Alton (McAdams, 1884). This collection ultimately reached the U. S. National Museum where it was studied and reported upon by Hay (1920, pp. 109-117). Hay later (1923, pp. 254, 338-340, etc.) repeated the faunal list, with notes on certain species, and discussed further the geology and probable age of the source deposits.

Among some 12 bovid cheek teeth

from Alton other than those of *Bison*, Hay (1920, p. 115) tentatively referred one, a left M^2?, U.S.N.M. 9011, to his *Symbos promptus*, described in the same paper (p. 125) on the basis of a single left M^3 (U.S.N.M. 9120) and several fragmentary vertebrae from Afton, Oklahoma. The impropriety of referring a deeply worn, damaged lower molar to a species known only from an upper molar, not to mention the futility of erecting a new species of *Symbos* on the basis of an isolated tooth, is obvious. The tooth from Alton may be referred with question to the genus *Symbos*.

The remaining non-*Bison* bovid teeth discussed by Hay (1920, pp. 113-115; 11 teeth by his count, but 12 according to his text and to existing specimens, U.S.N.M. 9007-9009) were referred to *Taurotragus americanus* described by Gidley from Cumberland Cave, Maryland. Gazin (Gazin, 1933; Gidley and Gazin, 1938, pp. 86-90) tentatively transferred this species to the genus *Euceratherium* and suggested (1933) that the material from Alton might also be referable to *Euceratherium*(?) *americanum*. In the opinion of one of us (Ray) the material from Alton originally referred by Hay to *Taurotragus americanus*, together with poorly preserved, associated, right M_1-M_3(U.S.N.M. 9136), should be referred with question to *Symbos*. The occurrence of *Euceratherium* in the eastern United States has not as yet been established, and will remain doubtful until cranial material, preferably including horn cores, is discovered.

11. *Ovibovini, gen. et sp. indet. Ashmore, one mile south of, Coles County.* Gravel pits along Polecat Creek in the northern half of Sec. 6, T. 12 N., R. 11 E. (U.S.G.S. topographic map, 15′ ser., Oakland quadrangle).

Among fossils from a post-glacial alluvial gravel in these pits, Galbreath (1938, p. 308) identified as Ovibovinae, gen. et sp. indet., an anterior dorsal vertebra deposited in the Field Museum of Natural History (P 15273).

There is also an apparently ovibovine left innominate bone in the collections of the Field Museum of Natural History (PM 531). Data with the specimen indicate that it was collected from a gravel pit three miles south of Ashmore, and was received in 1936 as a gift from E. C. Galbreath (field no. ECG 3115). According to Galbreath (pers. comm.) this specimen comes from the same pit as the vertebra, does not represent a separate locality, and was in fact collected during 1941.

12. *Ovibovini, gen. et sp. indet. Gorham, Jackson County.*

This record is based on a partial cervical vertebra of an undetermined ovibovine collected near Gorham by a farmer in 1956 or 1957. The specimen was returned to the finder, but casts were retained in the collections of the Field Museum of Natural History (PM 2377) and the Illinois State Museum (I.S.M. 416117).

13. *Symbos cavifrons. Lawrenceville, 4 miles northeast of, Lawrence County.* The locality is a gravel pit in the NW¼, Sec. 27, T. 4 N., R. 11 W. (U.S.G.S. topographic map, 7½′ ser., Birds quadrangle), on the western border of the Lawrenceville-Vincennes Municipal Airport (formerly George Field).

The specimen is an axis, no. P 200 in the vertebrate paleontological collection of the Department of Zoology at Southern lllinois University, reported by Galbreath (1962) and identified as *Symbos cavifrons*. The age of the glacially derived source beds was determined as "much later in time than the Shelbyville glacier," which is to say that they are latest Wisconsinan in age.

Discussion

The 13 recorded finds of fossil musk oxen in Illinois include two of *Ovibos* (localities 1 and 3); four, more or less certainly identified, of *Symbos cavifrons* (localities 4, 7, 9, and 13); two questionably referred to *Symbos* (localities 6 and 10); and five of Ovibovini or Ovibovini (?), gen. et sp. indet. (localities 2, 5, 8, 11, and 12).

Although Adams (1923, p. 143) states "two musk ox are recorded from the state . . . , Symbos cavifrons and the modern Ovibos moschatus . . . ," and Bader and Techter (1959, p. 3) list *Ovibos* sp. among the fossil mammals of Illinois, we have been unable to find the basis for these statements, and assume therefore that the present records are the first

for Illinois. Additional finds of *Ovibos* and *Symbos* are to be expected, as are finds of *Bootherium*, thus far not recorded for Illinois, but known from nearby states (Michigan, Indiana, Kentucky, Missouri, and Nebraska).

Satisfactory field data are available only for the specimens from localities 3, 11, and 13 and the specimens from the last two of these localities are not very informative morphologically or taxonomically. There is as yet no basis other than the cranium with horn cores by which *Symbos* and *Bootherium* may be distinguished with certainty. Although dental material has been referred customarily to *Symbos*, or occasionally to *Euceratherium*, and dissociated postcranial material to *Symbos*, there has been no basis for excluding *Bootherium*. If authors have implicitly accepted the repeatedly suggested, but undemonstrated, congeneric status of *Symbos* and *Bootherium*, then *Bootherium* is the name with clear priority.

Thus the partial skull of *Ovibos moschatus* from Fulton County is the only specimen of fossil musk ox from Illinois that is both closely identifiable and accompanied by adequate field data. Further advances in knowledge of fossil musk oxen in Illinois and in general will depend on the discovery of well preserved material, circumspect identification, and the recording of adequate geographic and stratigraphic data.

Acknowledgments

We wish to express our thanks to Drs. R. S. Bader (University of Illinois), E. C. Galbreath (University of Southern Illinois), P. W. Parmalee (Illinois State Museum), and W. D. Turnbull (Field Museum of Natural History) for critically reviewing the manuscript and for providing helpful information. Drs. Parmalee and Turnbull also made available for study specimens in their care. Drs. M. S. Peterson (American University, Washington, D.C.) and F. C. Whitmore, Jr. (U. S. Geological Survey) aided in the initiation of this study. Dr. D. M. Moore (Knox College) carried out the X-ray analysis of the matrix associated with the *Ovibos* cranium from Henderson County. Figure 1 was prepared by Mr. Lawrence B. Isham, scientific illustrator for the Department of Paleobiology, U. S. National Museum.

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