Extinct Woodland Muskox, *Symbos cavifrons,* Cranium from Miami County, North Central Indiana

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Introduction

During a survey of natural history specimens at the Miami County Historical Museum in the spring of 1984 the senior author noted a *Symbos cavifrons* skull among the exhibited materials. The junior author, director of the museum, provided the following information: Catalogue No. 170.56; found in muck on the farm of ex-sheriff Homer Fenters, south of Macy; collected by C.F. Fite; donated by Pearl M. Fite, August 29, 1919. Examination of county plat records indicated that this locality was in the south 1/2 of Section 24 and NE corner of Section 25, T29N, R3E, Allen Township, Macy Quad., Miami County. Our search of the literature failed to locate any description or published record of a *Symbos* skull from Miami County, with the exception of an excellently preserved skull from adjacent Union Township now in the U.S. National Museum (10). Jerry N. McDonald, now actively studying muskoxen, confirmed that two different specimens were involved, and that the Allen Township skull had been previously unrecorded (personal communication, August, 1984). The Union Township skull (USNM 8574), also collected by C.F. Fite in 1916 had been sold for $10.00 and sent to the U.S. National Museum by O.P. Hay, received on February 20, 1917 as Accession No. 60856 (personal communication, August, 1984, Ed Ducco, Dept. of Vertebrate Paleontology, U.S. National Museum).

Description

From dorsal aspect, most of the skull is present, with an excellently preserved exostosis. Ventrally, most of the sphenoid area and much of the palate (except the left alveolar area) is missing including the rostral section of the left maxilla. Also absent are the zygomatic arches, caudal wall of the right orbit, and both premaxillae. Only the roots of the left first and second molars are present; the crowns have broken off at the level of the alveoli. No other teeth are present. Though several sutures are obscured by the exostosis and horn core bases (frontal, fronto-parietal and parieto-occipital sutures), the basioccipital, nasofrontal and caudal nasomaxillary sutures are obliterated, suggesting an adult animal. The parieto-temporal suture is visible and horizontally oriented as in other *S. cavifrons* (12).

Many of the thin extremities of bone (tips of horncores, tips of nasals, rostral maxillaries, orbital rims) appear have been heavily gnawed by rodents. This might indicate exposure for some time before burial. Several other marks on the skull might not have been made by rodents and are under further study. The dark brown skull has peat with minor inclusions of pond weed seeds and sand embedded in many of its foramina and interior cavities. The skull lacks the abrasion that is present on many apparently stream tumbled muskoxen skulls (2, 6, 15). It had been coated with varnish some years ago, though this has not prevented some cortical bone from peeling. The skull is illustrated in Figure 1, with selected measurements presented in Table 1.

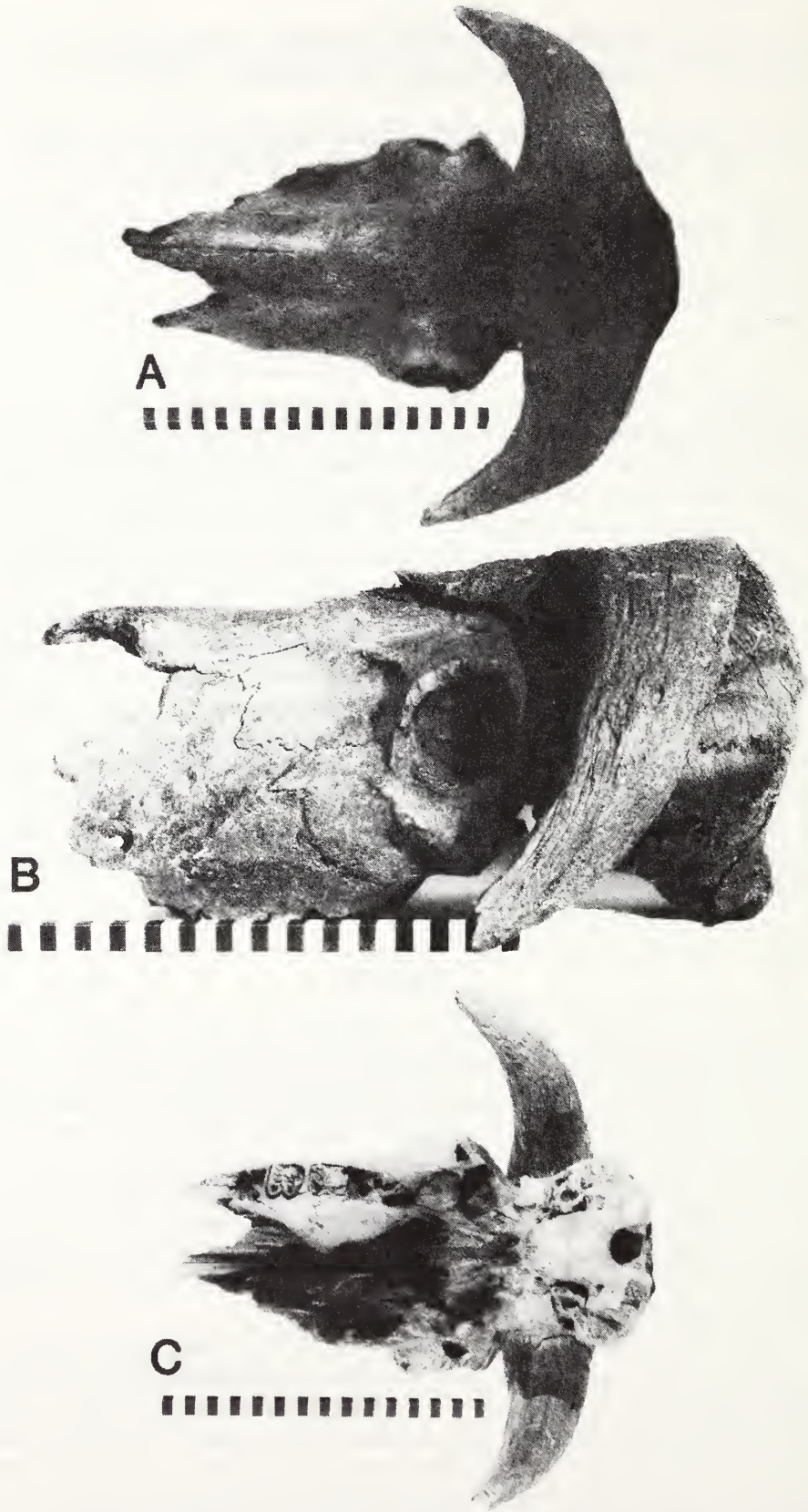

FIGURE 1. Woodland Muskox, *Sumbos cavifrons*, skull from Allen Township, Miami County, Indiana in the collection of the Miami County Historical Museum (Catalogue No. 170.56). A. Dorsal view. B. Left lateral view. C. Palatal view. Scale in centimeters.

TABLE 1. *Symbos cavifrons*, Cranial Measurements (mm.)[1]

	Miami Co., IN.	
Exostosis length:	243	
Exostosis width, anterior to horncores:	117	
Exostosis width, across anteroinferior flanges:	160	
Greatest depth of concavity between horn cores:	25	
Anteroposterior diameter of horncore at base	L = 108**	R = 115**
Dorsoventral diameter of horncore at base:	L = 74	R = 78
Circumference of horn core at base:	L = ca. 298**	R = ca. 277**
Width between horncore tips (as preserved):	494*	
Tip of (preserved) horn core to sagittal plane:	L = 251*	R = 243*
Height from ventral margin of occipital condyle to dorsal surface of cranium:	208	
Greatest height of occipital region: basion-nuchal line:	136	
Height from upper lip of foramen magnum to midline on dorsal surface of cranium:	169	
Height from upper lip of foramen magnum to top of nuchal crest:	110	
Minimum height, occipital: ophisthion-nuchal line:	111	
Minimum height, occipital: opisthion-dorsal edge nuchal ligament insertion:	81	
Height of foramen magnum: basion—opisthion:	37	
Width of foramen magnum (at rim of condyle):	47	
Height of skull above alveolar border to front of exostosis:	204	
Transverse width of cranium at base of horn cores:	136	
Width of cranium at constriction between horncores and orbits:	138	
Greatest breadth of bases of paraoccipital processes	156+*	
Greatest breadth of basioccipital:	69	
Greatest breadth across occipital condyles:	125*	
Mastoid width:	182+*	
Face width between supraorbital foramina:	101	
Zygomatic width (on malars, ventral to orbits):	228	
Angle, foramen magnum plane with occipital plane:	ca. 127°	
Angle, basioccipital plane with foramen magnum plane:	ca. 142°	
Greatest length, front of nasal (gnawed) to rear of skull, measured along dorsal suface:	485+*	
From front of nasals (gnawed) to anterior end of exostosis:	235*	
Greatest diameter of orbit (dorsoventral):	L = ca. 68	R = ca. 67
Width of orbit (anteroposterior):	L = ca. 64	

1. Measurements primarily after McDonald, 1984; Harington, 1975, and Semken, Miller and Stevens, 1964.
*Fragmented or gnawed
**Calipers difficult to position along curving contours of skull

Discussion

Next to remains of the Mastodon (*Mammut americanum*) and Jefferson's Mammoth (*Mammuthus jeffersonii*), remains of muskoxen are among the most commonly recovered of large extinct mammals in Indiana. The most recent descriptive summary of Indiana muskoxen fossils was Lyon (10), though Kitts (6) provided some additonal records. There are now 20 known specimens, comprising 2 or 3 species. One fossil of the living muskox (*Ovibos moschatus*) has been recovered from Wayne Co. (3, 10). One specimen of *Bootherium* is known from a gravel pit in Gibson Co. (USNM 24885; information and casts sent to Indiana State Museum by Robert W. Purdy, Dept. of Paleobiology, U.S. National Museum, March, 1984). Semken, Miller and Stevens (17) suggest that *Bootherium bombifrons* is a distinct genus, and that *B. sargenti* may be a female of *Symbos* (5, 21). An unidentified ovibovine tooth was identified from the Prairie Creek Locality, Daviess County, by John Sparling (specimen in Glenn A. Black Lab. of Archaeology, Indiana University, Bloomington). All other

muskoxen fossils have been referred to *Symbos cavifrons*. These include specimens from: Bartholomew Co. (4); LaGrange Co. (14); LaPorte Co. (9); Miami Co. (10); Montgomery Co. (11); Newton Co. (1, 10); Porter Co. (10); Randolph Co. (10) and St. Joseph Co. (8). There are seven other skulls now under study by Patrick Munson and Russell Graham. These include specimens from Knox (3 individuals), Koscuisko, Marion, Owen and Parke counties.

S. cavifrons skulls are readily identified by the bony, pitted exostosis between the horn cores, and the absence of the median groove (sulcus) normally present in *O. moschatus* (7).

Other characters for the genus are noted in Semken, Miller & Stevens (17), Harington (2) and Kurten & Anderson (7). McDonald (12) has examined additional characters and suggests the possibility that *Symbos* may not be a monotypic genus as it is usually considered. Semken, Miller & Stevens (17) and McDonald and Bartlett (13) give detailed descriptions of the *Symbos* skeleton.

Symbos cavifrons was taller and more slender than the living muskox *Ovibos moschatus* (2). *Symbos* is thought to have inhabited steppe grasslands or parklands (2) as well as woodlands (6, 17), living in more temperate regions than the living muskox which inhabits some tundra regions today (7). *Symbos* is known from late Irvingtonian through Rancholabrean times when the most recent Radiocarbon date available is 10,370± 160 B.P. (7).

The Allen Township and presumably also the Union Township specimens appear to have been recovered from sediments within or above the Packerton Moraine (16). The Packerton Moraine was formed at the maximum advance of the Saginaw lobe during the Cary Substage of the Wisconsinan glaciation (19, 20). Deposition of the remains would have occurred in post-Cary times some 13,000-14,000 years ago (18, 19). The Allen Township specimen appears to have been deposited in the peat layers that would have resulted from the natural infilling of a kettle lake which was left behind the retreating Wisconsinan ice front.

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