

NEW RECORDS OF THE STAG-MOOSE (*Cervalces scotti*) FROM THE LATE PLEISTOCENE OF INDIANA

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ABSTRACT: Three new Indiana localities have produced Late Pleistocene remains of the extinct stag-moose, *Cervalces scotti*. The first specimen, an antler beam, was actually collected in Franklin County prior to 1933 by Amos W. Butler. The record was noted, but the true identity of the specimen remained obscure until now. A second antler beam was recovered in 1990 from a peat deposit in LaPorte County. The third specimen, a partial cranium, was taken in 1988 on the Daviess/Dubois county line from the East Fork of White River, a former glacial sluiceway. *Cervalces* remains are known from nine Indiana localities. All the remains of the stag-moose have been recovered from kettle lake deposits or from riverine deposits associated with former glacial sluiceways.

INTRODUCTION

Several species formerly described under the genera *Cervalces* and *Giraffa* have recently been synonymized under a single species of stag-moose, *Cervalces scotti* (Churcher and Pinsof, 1987; Churcher, 1991). Sixty-five localities were listed, where remains of the stag-moose had been collected. These ranged from New York to Virginia in the north-eastern United States westward to North Dakota and Oklahoma with additional records in southern Ontario, southern Saskatchewan, Alaska, and the Yukon Territory. Remains are most abundant in an east-west band of States that includes Ohio, Indiana, Illinois, Iowa, and Nebraska (Churcher, 1991). This distribution suggests that *Cervalces* inhabited a wide periglacial margin south of the Laurentide ice sheet, moving northward during the Holocene deglaciation (Churcher and Pinsof, 1987). Finds range in age from Illinoian glacial to early postglacial age; most are of Wisconsinan or later age (Kurten and Anderson, 1980). The latest radiocarbon dates for the species are 10,950 \pm 150 years B.P. (New York: Buckley and Willis, 1970), 10,230 \pm 150 years B.P. (Ohio: Mills and Guilday, 1972), and 10,600 \pm 250 years B.P. (Kentucky: Levin, *et al.*, 1965). The last date may not refer directly to *Cervalces*. Most of the finds consist solely of portions of the characteristic antlers (the antlers have long, horizontally-directed beams with anterior and posterior palmations (Scott, 1885)), although a few nearly complete skeletons are known. Non-antler skeletal material is relatively scarce.

The living animal was relatively long-legged, particularly in the metapodials. With withers taller than the rump (as in the modern moose, *Alces alces*), *Cervalces* was thought to have browsed in the muskeg habitat, much like the living moose (Kurten and Anderson, 1980; Scott, 1885).

In Indiana, *Cervalces scotti* has been recorded from Churubusco (Allen Co.), Hazleton (Pike/Gibson Co.), Hudson (DeKalb Co.), Potato Creek (St. Joseph Co.), Shoals (Martin Co.), and, most recently, Kendallville (Noble Co.) (Figure 1, Table 1). The remains consist of antler beams, skull portions, an astragalus, and a possible vertebra. The Kendallville specimen is a spectacular rack of antlers on a partial cranium (Farlow and Sunderman, in



Figure 1. Known *Cervalces scotti* localities in Indiana. "A" indicates the problematical Dearborn County specimen (Warder, 1873).

prep.). Warder (1873) noted that: "Dr. Lutton, of Aurora, has a skull of the large black bear, found in clay at Aurora. He has also a bone that closely resembles that of the Irish Elk." The latter specimen, presumably from Aurora, Dearborn County, may have been of *Cervalces*. However, the whereabouts of this specimen is unknown, and its identity remains obscure. Lutton's locality is indicated in Figure 1 in the hope that one day the specimen may reappear. *Cervalces* was not known from Indiana, when Hay (1912) produced the first major description of Indiana's Pleistocene vertebrates. Three new *Cervalces* specimens from Indiana as well as the previously cited Martin County specimen will be described in this report.

LOCALITY 1

Location. This specimen was recovered in Franklin County from Yellowbank Creek near its confluence with the Whitewater River 4 km west-northwest of Brookville (NE, Sec. 3, T11N, R13E, Brookville Quad.).

Description of the specimen. Only the left antler beam (Figure 2A) was found. The preserved 372 mm of the beam includes only a short portion (111 mm perpendicular to beam axis) of the anterior ascending and none of the posterior descending palmation. The antler appears to have been shed, and its light-colored surface displays the splitting, exfoliation, and rodent gnawings of weathered bone. The antler is relatively heavy, as are the other *Cervalces* antlers examined by the author. Measurements are listed in Table 2.

Provenience. No specific information is available for this specimen. The antler lacks the wear of stream-tumbled specimens. During Wisconsinan times, the Whitewater River served as a glacial sluiceway; valley train sediments blocked many tributaries, resulting in their ponding for a short distance (Thornbury, 1950; Wayne, 1963). Exposures along Yellowbank Creek one km north of the Whitewater confluence expose up to 15 m (composite) of these lacustrine clays (Wayne, 1963). Perhaps, the *Cervalces* antler had been deposited in a ponded environment south of the Wisconsinan ice.

Comments. Amos W. Butler, renowned for his 1898 *Birds of Indiana*, noted the recovery of this specimen (Butler, 1934), which he donated to the Indianapolis Children's Museum (catalog number 7376) on November 11, 1933. Lyon (1936) cited this antler as that of an elk, *Cervus canadensis*. Because the old catalog entry at the Children's Museum identifies it as a "fossil elk antler", it is possible that Amos Butler recognized the specimen's distinctness and hesitated to apply a species name to it.

LOCALITY 2

Location. This specimen was recovered in LaPorte County from a peat deposit 200 m west of Fish Creek and 3.4 km north-northeast of Fish Lake (NE, NE, SW, SW, Sec. 4, T36N, R1W, Stillwell Quad.).

Description of the specimen. Only the left antler beam (Figure 2B) was found. The antler preserves 202 mm (perpendicular to beam axis) of the anterior ascending palmation and 443 mm of the beam and posterior descending palmation (measured along beam axis). The antler appears to have been broken from the cranium. There is some exfoliation of the outer surface of the specimen, but it is otherwise durable and preserved much like the Yellowbank Creek specimen. Measurements are listed in Table 2.

Provenience. This specimen was found on a pile of reed-sedge peat on the Milburn Peat Company property. The peat had already been removed from the deposit, when the

Table 1. Nine known occurrences of *Cervlaces scotti* in Indiana.

County; Locality	Year Collected	Provenience	Materials (Repository)	Published Records
LaPorte; Fish Creek	1990	peat deposit	antler beam (INSM 71.3.87)	This report
St. Joseph; Potato Creek	1936	"marl-like" soil	partial cranium (USNM 15494)	Gazin, 1938; Lyon, 1942; Wetmore, 1945; Churcher and Pinsof, 1987
Noble; Kendallville	1990	marl deposit	partial cranium with partial antlers	Farlow and Sunderman, in prep.; Churcher, 1991
Dekalb; Hudson	?1984	? former lake beach deposit	antler beam	Farlow, McNitt, and Beynon, 1986
Allen; Churubusco	?1983	peat deposit	antler beam, R astragalus; possible vertebra	Farlow, McNitt, and Beynon, 1986
Franklin; Yellowbank Creek	pre-1933	? lacustrine deposit	antler beam (ICM 7376)	Butler, 1934; Lyon, 1936 (as <i>Cervus canadensis</i>); this report
Martin; Shoals	pre-1945	river bed	frontal with partial antler (IUGB 307/2)	Adams, 1946; this report
Daviess/Dubois; Portersville	1988	river bed	partial cranium (INSM 71.3.100)	This report
Pike/Knox/ Gibson; "Hazleton"	1935	river bed	antler beam (FMNH P15143)	Riggs, 1936; Gazin, 1938; Galbreath, 1939; Lyon, 1942; Hibbard, 1958; Churcher and Pinsof, 1987

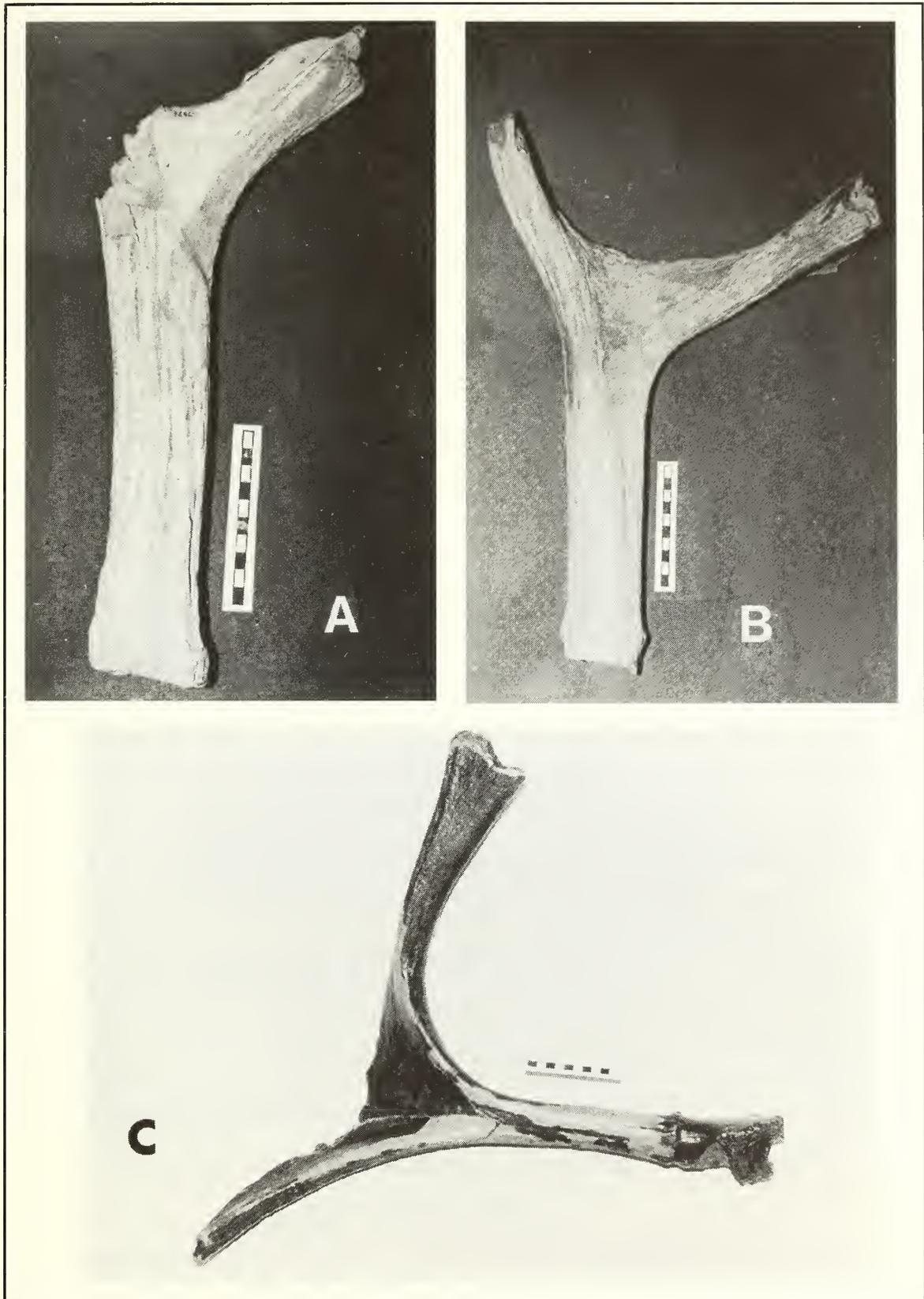


Figure 2. *Cervalces scotti*, left antler beams. A. Yellowbank Creek specimen, Franklin County, Indiana (ICM 7376). B. Fish Creek specimen, LaPorte County, Indiana (INSM 71.3.87). C. Shoals specimen, Martin County, Indiana (IUGB 307/2; cited by Adams, 1946; note attachment to frontal at burr). All three display the long antler beams characteristic of the species. Scale in centimeters.

specimen was found. The fossil locality is underlain by outwash fan deposits associated with the Valparaiso moraine (Gray, 1989). The Valparaiso moraine, one of many looping recessional moraines of Wedron ice (Michigan lobe) in northeastern Indiana (Bleuer and Melhorn, 1989), was formed by the ice advance of approximately 15,500 B.P. (Mickelson, *et al.*, 1983). After its recession, kettle lakes began forming. Quiet-water sediments (e.g., peat and marl) that filled those kettles typically date within the past 13,000 years in northern Indiana (Wayne, 1963). The *Cervalces* antler was likely deposited within this 13,000 to 9,000 year B.P. period, before the species became extinct.

Comments. The antler was recovered in December, 1990. The same peat deposit had, two years earlier, produced the remains of two male elk (*Cervus elaphus*). The stratigraphic relationship between these finds is unknown. Preserved in glyptal driven by acetone, the specimen is catalog number 71.3.87 of the Indiana State Museum.

LOCALITY 3

Location. This specimen was found near the Daviess/Dubois County line under the Portersville bridge on the East Fork of the White River (NE, NW, SW, Sec. 21, T1N, R5W, Alfordsville Quad.).

Description of the specimen. This specimen consists of a skull portion with antler pedicles (Figure 3). The water-worn skull portion contains the left and right frontals, including antler pedicles, and a portion of the sphenoid. Portions of the foramen rotundum, sphenoidal, and optic foramina are preserved, as is much of the anterior braincase. Missing are the occiput, parietals, face, palate, and the portion of the frontals inferior to the postorbital constriction. Identifying features include the shallow depression of the frontals inferior to the antler pedicles (the depression is deeper in the modern moose, *Alces*) and the lack of a sharp knob on the frontal ridge between the pedicles that is present in *Alces* (Scott, 1885). The specimen is the medium brown color typical of other bones locally recovered from the White River and is partially encrusted with a dark brown to black film of calcium carbonate. The specimen is heavy and apparently partially permineralized. Measurements are presented in Table 2.

Provenience. The specimen was dragged up from the White River on a mussel bar. The White River served as a sluiceway during both Illinoian and Wisconsinan glaciations (Thornbury, 1950).

Comments. Recovered in the summer of 1988 by a mussel fisherman, the specimen was transferred to the Property Manager at Williams Dam, who in turn contacted the author. The specimen, catalog number 71.3.100 of the Indiana State Museum, was preserved in butvar driven by ethanol.

LOCALITY 4

Location. This locality was cited previously by Adams (1946). The specimen was found in Martin County in the East Fork of the White River 1.3 km southwest of Shoals (SE, SW, SE, Sec. 25, T3N, R4W, Shoals Quad.).

Description of the specimen. The left frontal with a partial antler (Figure 2C) was found. Though the specimen was previously cited (Adams, 1946), it was neither described nor illustrated. The frontal had detached along the inter-frontal and coronal sutures, and it lacks the frontal inferior to the postorbital constriction. The attached antler preserves 415 mm (perpendicular to beam axis) of the anterior ascending palmation and 519 mm (from

Table 2. Measurements of new Indiana *Cervalces scotti*: antlers and frontals (mm).

Antlers ¹	Locality 1 Yellowbank Creek	Locality 2 Fish Creek	Locality 4 Shoals
Maximum diameter of burr	66.2	69.0	66.7
Minimum diameter of burr	61.7	63.9	57.2
Maximum diameter of beam at 50 mm	55.6	58.0	54.0
Minimum diameter of beam at 50 mm	51.7	52.5	45.1
Maximum diameter of beam at 100 mm	53.1	59.5	51.3
Minimum diameter of beam at 100 mm	51.3	49.6	43.4
Anterior beam length (minimum/maximum)	224/—	181/—	171/293 (\bar{x} = 232)
Anterior beam length (where arc of divergence has a tangent at 45° to beam axis)	303	232	256
Posterior beam length (minimum)	—	221	180
Posterior beam length (burr to center of arc of divergence from beam)	—	263	ca 345
Beam circumference at 50 mm	169	176	158
Slenderness index	179.8	133.7	164.5
Cross-sectional area of beam at 50 mm (mm ²)	2261	2397	1928
Frontals	Locality 3 Portersville	Locality 4 Shoals	
Least frontal breadth (= postorbital constriction)	220	109.6 x 2 = 219.0	
Dorsoventral thickness of pedicle, normal to ventral surface	L = 49; R = 46	44	

¹ Measurements after Churcher and Pinsof (1987).

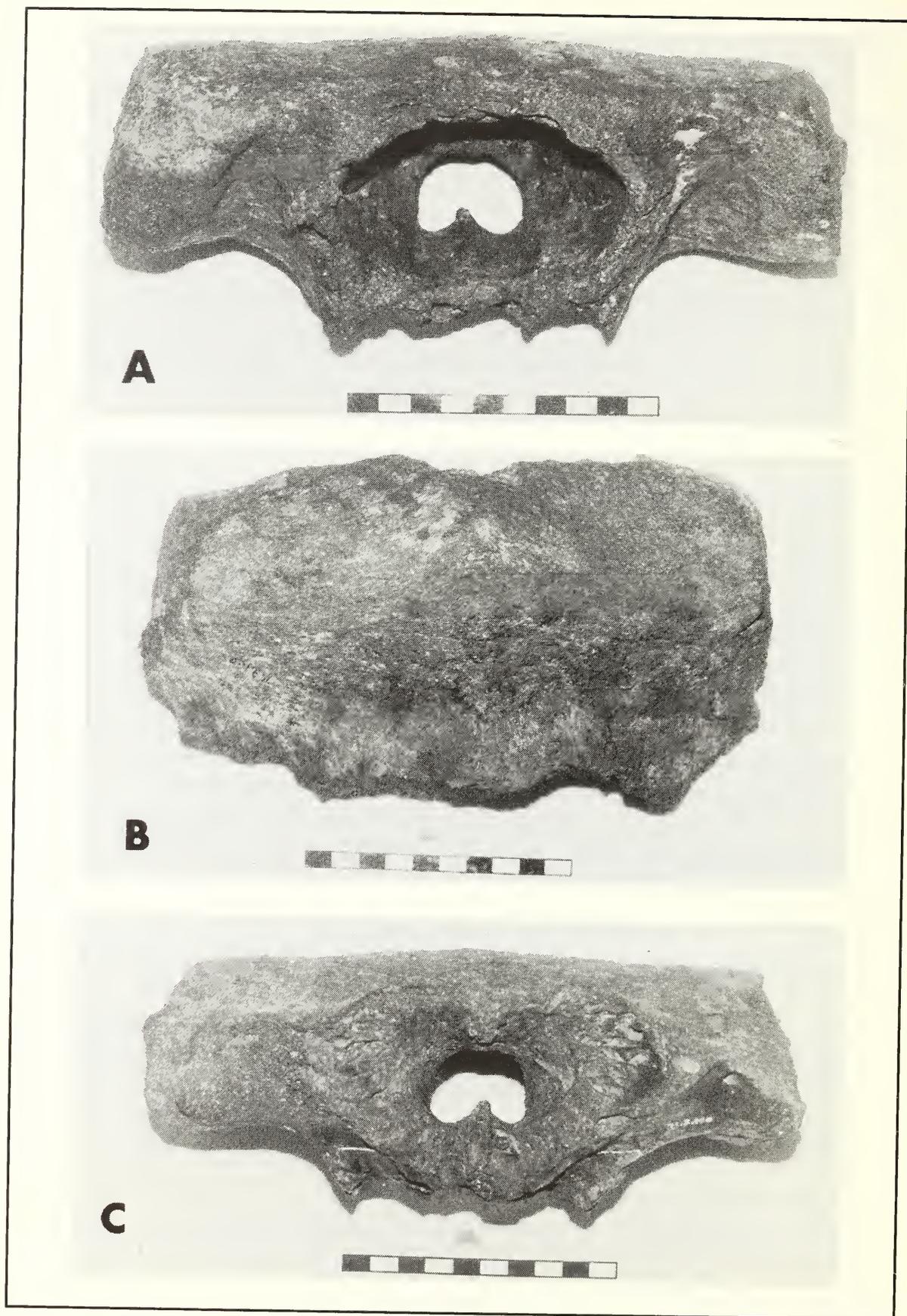


Figure 3. *Cervalces scotti*, skull portion, Portersville, Daviess/Dubois County line, Indiana (INSM 71.3.100). A. Posterior view showing the braincase and horizontally projecting antler pedicles. B. Dorsal view of frontals (snout facing downward). C. Anterior view showing the position of missing cribriform plate (vent in center). Scale in centimeters.

the burr along beam axis) of the beam and posterior descending palmation. The entire circumference of the anterior ascending palmation is preserved from 275 mm through 402 mm from the beam axis. The antler is medium brown in color and is heavy and apparently permineralized. Some of the cortical bone has spalled away. The extremities display some wear. Measurements are presented in Table 2.

Provenience. This specimen was recovered from the bed of the White River. As at the Portersville locality, this specimen was found in an Illinoian/Wisconsinan glacial sluiceway (Thornbury, 1950).

Comments. The specimen was collected by William Melvin of Shoals and donated to the Indiana Historical Society on November 14, 1945. The specimen is now housed in the Glenn A. Black Laboratory of Archaeology, Indiana University (catalog number 307/2). The specimen was preserved and mended with white glue. Also recovered from the stream bed in the immediate vicinity of this specimen were the left dentary of a giant beaver (*Castoroides ohioensis*), a thoracic vertebra of a ground sloth (cf. *Megalonyx jeffersonii*), and the upper right third molar of a mastodont (*Mammot americanum*). All three of these specimens were heavily permineralized and medium to dark brown in color. Next to the Kendallville rack, this is the most complete Indiana specimen.

DISCUSSION

Churcher and Pinsof (1987) show a clinal increase in the size of *Cervalces* antlers from southeastern to northwestern North America. Antlers from east of the Mississippi River have a shorter anterior beam length and a smaller cross-sectional area than those in the northwest. The three antlers described here plot comfortably within the distribution of beam massiveness of the other eastern specimens.

The Indiana finds appear to be primarily of Wisconsinan or early postglacial age, as do most *Cervalces* finds in general. In northern Indiana, *Cervalces* remains (Churubusco, Fish Creek, Hudson, Kendallville, and Potato Creek specimens) have been recovered from kettle lake and bog deposits formed after the recession of Wedron (Michigan Lobe) and Lagro (Huron-Erie Lobe) ice (Bleuer and Melhorn, 1989; Gray, 1989) after approximately 15,500 B.P. (Mickelson, *et al.*, 1983). These remains were recovered from banks of sediments dredged from unknown strata. Pollen analysis and screening for associated microfauna were not undertaken and would have been impractical. In southern Indiana, *Cervalces* remains (Hazleton, Portersville, Shoals, and Yellowbank Creek specimens) were found in river channels (or associated tributaries) that served as glacial sluiceways during Wisconsinan or during both Illinoian and Wisconsinan times. The riverine fossils may have been transported far from their original locus of deposition. Therefore, associated vertebrate remains are not necessarily from the same faunule. The occurrence of *Cervalces* remains in both lake/bog and riverine (sluiceway) situations may attest both to the late arrival of the animal in the State (Wisconsinan/early postglacial) as well as to its association with lowland, marshy, swampy, aquatic habitats.

To date, none of the Indiana finds has been accompanied by associated faunal remains or pollen profiles. Radiocarbon dates have not been obtained. It is interesting to note that there are nine records of *Cervalces* in Indiana, yet no fossils of the living moose (*Alces alces*) have been reported.

The exact source of the "Hazleton" specimen is not clear. A newspaper article (*Indianapolis News*, Friday, 20 March 1936) located the specimen in the White River near Petersburg (Knox/Pike Counties). Galbreath (1938) referred to a Hazleton, Gibson County,

specimen and later noted that it was cataloged as P15143 of the Field Museum of Natural History (Galbreath, 1939). Lyon (1942) lists two specimens, Galbreath's *Cervalces roosevelti* from Hazleton and *Cervalces illinoensis* from the White River about 30 miles from its mouth, which he referred to Daviess County. Lyon had received a letter from Oscar Main (finder of the "Hazleton" specimen), who noted that his specimen had been identified by E.S. Riggs of the Field Museum of Natural History and was deposited as FMNH P15143. Lyon apparently did not realize that these two records were of the same specimen. Hazleton is approximately 18 miles and Petersburg approximately 45 miles (30 airline miles places the find in Daviess County) from the river mouth. It is probably convenient to refer to this as the Hazleton specimen, even though Hazleton is in Gibson County, and Petersburg is in Pike County.

The presence of antlers indicates that all of the Indiana material is from male specimens, suggesting both a preservation and collecting bias for male remains. Each male produced several potential fossils through annual antler shedding. Of Indiana's seven antler specimens, four (Churubusco, Hazleton, Hudson, and Yellowbank Creek) had been shed. Antlers are the predominant fossil material recovered. Little postcranial material has been noted. It is conceivable that unantlered cranial (female) and postcranial material has been largely disregarded as remains of deer or livestock. For example, several other bones and/or wood pieces were found with the Hudson antler, but only the antler was retained by its discoverer (Farlow, McNitt, and Beynon, 1986). Antlers would certainly be more recognizable in river beds than postcranial elements.

Of the 9 Indiana sites, 5 have been located within the past 4 years. It is difficult to understand how antlers of this animal could have been overlooked in the past. Many sites may have gone unreported. Follow up of field reports of skeletal remains may well increase our preservable sample of *Cervalces scotti*.

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