

## THE OCCURRENCE OF *HESPERORNIS* IN THE LATE CRETACEOUS NIOBRARA FORMATION OF SOUTH DAKOTA

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### ABSTRACT

The fossil vertebrate paleofauna from the Niobrara Formation has long been renowned. Most of the known specimens were derived from the Niobrara chalk in Kansas. Surprisingly, relatively few specimens have been found from the same formation in South Dakota. Of the vertebrates, only fish and reptiles have been reported from the marine formation; whereas in Kansas, a number of genera of birds are also known. Last summer, as part of a survey to assess fossiliferous units on the Buffalo Gap National Grasslands, the first bird from the Niobrara Formation of South Dakota was found. The individual is represented by a partial hind leg of the diving bird, *Hesperornis regalis*. The occurrence extends the range of this taxon into western South Dakota and aids in the correlation of the upper portion of the Niobrara Formation in South Dakota with that in Kansas.

### INTRODUCTION

Recently, an attempt was undertaken by personnel of the Museum of Geology, SD School of Mines and Technology, and the New Jersey State Museum to assess the fossil vertebrates from the Niobrara Formation in South Dakota. Because many vertebrates have been collected and described from equivalent chalk beds in Kansas, we expected numerous and varied specimens from the Niobrara chalk of South Dakota. However, our research (Martin, Parris, and Grandstaff, in press) indicated relatively few known specimens. Most known specimens represented those of fish and marine reptiles (turtles, mosasaurs, and plesiosaurs). Only a single specimen of flying reptile was encountered, and no birds were found. The lack of birds was surprising, as diving birds such as *Hesperornis* are well represented in the upper Niobrara Formation of Kansas and in the overlying Pierre Shale of South Dakota.

Last summer, in a cooperative venture between the Museum and the Nebraska National Forest to survey the Buffalo Gap National Grasslands and to salvage encountered fossils, the first bird from the Niobrara Formation of South Dakota was found by Mr. Patrick Ward.

## SYSTEMATIC PALEONTOLOGY

Hesperornithiformes

Hesperornithidae

*Hesperornis regalis*

Referred specimen.--SDSM 25005, associated left femur, tibiotarsus, and fibula from the Honadel Ranch (SDSM locality V919).

Occurrence.--upper Niobrara Formation, Campanian; individual consists of an associated rear leg with the tibiotarsus and fibula oriented North 33 degrees East. All elements are slightly crushed, and the tibiotarsus was broken into six pieces. All measurements except the proximal end of the fibula are affected by preservation.

The associated elements are identical to those of *Hesperornis regalis* described originally from the Niobrara Formation of Kansas (see Marsh, 1880, for a review). The femur and fibula have the distal ends broken away; the tibiotarsus is complete and measures 31.5 cm, only .5 cm shorter than the type specimen, Yale Peabody Museum no. 1200, (Marsh, 1880, p. 92). The femur is 5.18 cm across the maximum dimension of the proximal end; the same measurement of the fibula is 2.12 cm. Diameter of the femoral head is 1.8 cm.

The femur is extremely short and robust in comparison to the tibiotarsus and exhibits a large greater trochanter that is widely expanded laterally. The tibiotarsus is long and delicate in comparison to the femur. The element exhibits a prominent cnemial process, divided proximal articular surfaces and a large inner distal condyle. Like the tibiotarsus, the fibula is relatively straight and becomes a slender element distally. Proximally the fibula possesses two articular surfaces, a larger surface for articulation with the femur and a small surface for articulation with the tibia. No features of these bones are unlike those described for *Hesperornis regalis*. Therefore, similar size and nearly identical morphology indicate assignment of these elements to *Hesperornis regalis*.

## DISCUSSION

The occurrence of these elements of *Hesperornis* in the upper Niobrara Formation indicates close correlation of these rocks with those in Kansas. Stewart (1990) proposed a vertebrate paleontological zonation of the Niobrara Formation in Kansas. His uppermost zone was that of *Hesperornis*. The occurrence of this taxon in western South Dakota suggests deposition of the upper Niobrara Formation, and incidentally the lower Pierre Shale, during this interval.

## ACKNOWLEDGEMENTS

Members of the Nebraska National Forest, and in particular, Mr. Robert Storch and Ms. Terri Liestman, are to be commended for their vision in the protection, preservation and survey of fossil resources on public lands. The survey during which this bird was found is the first of its kind in South Dakota, and represents a new era in cooperation between governmental agencies and in preservation of these non-renewable resources. We wish to thank Allen Kihm, Patrick Ward, Bill Schurmann, Barbara Beasley, and Walter Dennison, among others, for aid in the field. The fossils were expertly prepared by Ms. Janet Whitmore of the Museum staff, and the figure was rendered by the second author. Dr. E. M. White, South Dakota State University, reviewed the manuscript and made valuable comments. Finally, Lloyd and Helen Honadel graciously allowed us access to and across their land.

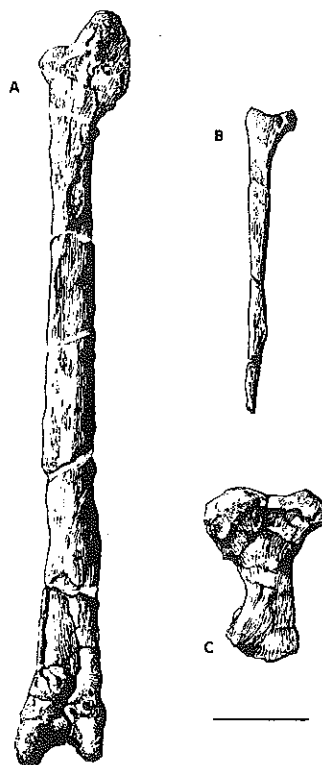


Figure 1. SDSM 25005, associated partial left rear leg, *Hesperornis regalis*: A, left tibiotarsus; B, left fibula; and C, left proximal portion of femur. Scale equals 4 cm.

## REFERENCES

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