MORPHOLOGICAL COMPARISON OF MANDIBLES OF THE TOOTHED BIRD HESPERORNIS AND MOSASAURS

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ABSTRACT

Some mandibles of juvenile mosasaurs have previously been mistaken for mandibles of Hesperornis. Mandibles of mosasaurs are characterized by: 1) dentaries with 12 to 24 pleurodont teeth, 2) no predentary bone, 3) prearticular process extending anteriorly between the splenial and dentary, 4) dentary deepening posteriorly with no overlap with the surangular, 5) presence of a coronoid, 6) tooth replacement from posterior and medial relative to the functional tooth, 7) the glenoid for the ventral surface of the quadrate is a simple sulcus, and 8) glenoid composed of the articular and surangular. In contrast, mandibles of Hesperornis are characterized by: 1) dentaries with 33 thecodont teeth, 2) presence of a predentary bone, 3) surangular with a process that extends medial to the dentary, almost to the dentary's anterior end, 4) surangular and dentary overlap, with the dentary tapering posteriorly, 5) absence of a coronoid, 6) tooth replacement from directly below the functional tooth, 7) glenoid for the ventral surface of the quadrate is a complex of ridges and sulci, and 8) glenoid confined to the articular. Convergence between immature mosasaurs and Hesperornis was postulated in the past because of size similarity. The morphology and movement of articulations, is also similar, although not homologous. Some confusion arose previously because juvenile mosasaurs were often mistaken for species of Hesperornis.

INTRODUCTION

Early paleontologists were fascinated by late Cretaceous toothed birds which included Hesperornis (Marsh, 1880; Thompson, 1890; Williston, 1898; Wetmore, 1929; Edinger, 1951; Gregory, 1951, 1952). Marsh (1880) described the extinct toothed birds of North America. Gregory (1951) commented that apparently Marsh (1880) was so intrigued with the presence of teeth in Hesperornis that he may have neglected some of the other unusual features of its jaws. Gregory proceeded to investigate the functional morphology of the lower jaws of Hesperornis and mosasaurs. He proposed that both these taxa used the same bones to perform similar functions and suggested convergence to explain structural similarities (Gregory, 1951). One of the most complete specimens discussed by Gregory (UKVP 2287) has now been reassigned to Parahesperornis (Martin, 1987) and is therefore beyond the scope of this study. Additionally, Gregory's assessment could not include a recently recovered, well preserved specimen of Hesperornis (UKVP 71012) which has a relatively complete skull and postcranial skeleton. The skull of this specimen includes a previously unknown predentary bone that firmly articulates with the anterior lower jaw, forming a rigid symphysis. Its preservation allows for examination of mandibular elements so that articulation can be better understood.

Furthermore, at the time of Gregory's analysis, juvenile mosasaurs were generally unrecognized. Documentation of the mosasaur Clidastes ontogenetic traits is now available (Bell and Sheldon, 1986; Sheldon, 1987, 1989) and criteria for recognizing juvenile mosasaurs of other taxa is being developed. Now that juvenile mosasaurs can be recognized, it is clear that numerous immature specimens were assigned to inappropriate taxa, including Hesperornis (Bell and Sheldon, 1986; Sheldon, 1987, 1989).

Of particular interest to this analysis is a specimen identified as Hesperornis (UNSM 5471), which was on display at the University of Nebraska State Museum. Swinton (1965) figured this specimen, suggesting that it was one of the best known specimens of Hesperornis (Figure 1). Swinton (1965) also assigned UKVP 1028 to Hesperornis. In his discussion, Swinton stated that the teeth of these two specimens were not like those figured by Marsh (1880), but instead closely resembled those of the mosasaur Clidastes. Nevertheless, Swinton interpreted these specimens as toothed birds. He suggested a new genus of Cretaceous bird be erected because these specimens exhibited such distinctive characters. This analysis, however, finds that both UNSM 5471 and UKVP 1028 are very immature mosasaurs of the genus Clidastes.

New specimens of Hesperornis and increased understanding of mosasaur ontogeny argue for a review of comparative morphological and biomechanical analyses of mosasaurs and Hesperornis mandibles.