
A Second Ornithischian Dinosaur from the Antlers Formation (Lower Cretaceous) of Southeastern Oklahoma

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Introduction

The Lower Cretaceous (Upper Aptian) Antlers Formation of Oklahoma is the terrigenous, non-marine extension of the Trinity Group of Texas. Decades of fossil collecting by the Sam Noble Oklahoma Museum of Natural History ([SN]OMNH) has yielded a relatively diverse vertebrate fauna from this formation, including freshwater sharks, fishes, amphibians, lizards, mammals, crocodylians, and dinosaurs (Cifelli et al. 1997). Although most groups are represented by multiple species, the only ornithischian dinosaur recognized hitherto is the relatively common, large-bodied iguanodontian *Tenontosaurus tilletti*. When compared with other contemporaneous rock units from North America, the ornithischian assemblage of the Antlers Formation is a depauperate anomaly. Most of these formations preserve multiple ornithischian dinosaurs, ranging from the large, armored ankylosaurs to cat-sized basal neoceratopsians (Oreska et al. 2013; Farke et al. 2014). Here, we describe a nearly complete tooth, OMNH 34881, representing only the second ornithischian known from the Antlers Formation of Oklahoma.

The largest and most diverse collection from

the Antlers Formation of Oklahoma comes from a locality in Atoka County (V706; Locality data are on file at OMNH and are available upon request from qualified investigators). This site includes two separate bone-bearing horizons. The stratigraphically higher bed has yielded multiple articulated skeletons of the herbivorous *Tenontosaurus tilletti*, along with associated material from the predatory *Deinonychus antirrhopus* (Theropoda, Dromaeosauridae; Brinkman et al. 1998). Approximately 1.5 m below this unit is a highly fossiliferous microsite that yielded OMNH 34881, together with a wide array of other vertebrate taxa. These deposits are interpreted as representing overbank lags in a fluvial environment with close approximation to the paleo-Gulf of Mexico (Cifelli et al. 1997).

Results and Discussion

OMNH 34881 is a single, relatively complete tooth that is short (total height: 4.05 mm; crown height: 1.25 mm) when contrasted with other dinosaurian teeth from the Antlers Formation. The crown is low, possessing five incomplete marginal denticles. A straight central cusp forms the largest denticle, while the two most lateral denticles are outgrowths of the basal cingulum

(A₁ Fig.1). The other two accessory denticles are small and formed on the same plane as the lateral-most denticles. The root is wide near the crown and gently tapers to a rounded point; a root 'neck' is only moderately developed below the crown base. Enamel is deposited on both sides of the cusp, but may be thinner on the side that bears a large wear facet (A₂ Fig 1).

OMNH 34881 is unlikely to belong to *Tenontosaurus tilletti*, which is by far the most commonly encountered dinosaur in the Antlers Formation. Teeth of *Tenontosaurus*, including juveniles, are thicker, more inflated, and bear a greater number of denticles on the margin of the crown. One of the most striking differences is that the root in *T. tilletti* is angled lingually as compared to OMNH 34881, which is relatively straight. Additionally, affinities with Thyreophora (armored dinosaurs) can be excluded because teeth from this group are often broadly triangular in lateral view bearing a sinusoidal ridge, which is often adorned with more denticles than observed in OMNH 34881 (Oreska et al. 2013). Hence, OMNH 34881 represents a non-*Tenontosaurus* cerapodan, likely either a basal ornithopod or a marginocephalian. Ornithopod maxillary and

dentary teeth are mesiodistally broad and bear multiple denticles on the margins. Although many species have more denticles than OMNH 34881, some species bear as few as five (Norman et al. 2004). In addition, it is not uncommon for posterior dentary or maxillary teeth of basal euornithopods to have a limited number of marginal denticles (Oreska et al. 2013). Ornithopods are known from North America during the late Aptian, including at least one species from the roughly concurrent Trinity Group of Texas (Langston 1974). Specifically, a substantial sample of ornithopod material is known from the Proctor Lake locality in the basal Trinity Group. This ornithopod material awaits comprehensive study, but from what has been described it does not match OMNH 34881. Teeth from this undescribed species are leaf-shaped, bear many marginal denticles, and lack the large central cusp seen in the Oklahoma specimen (Winkler et al. 1988). OMNH 34881 also resembles neoceratopsian teeth; however, this specimen does not compare well with material from contemporaneous deposits in North America. For example, *Aquilops americanus* from the Cloverly Formation of Montana has teeth similar in size and appearance to OMNH 34881, except that placement of the

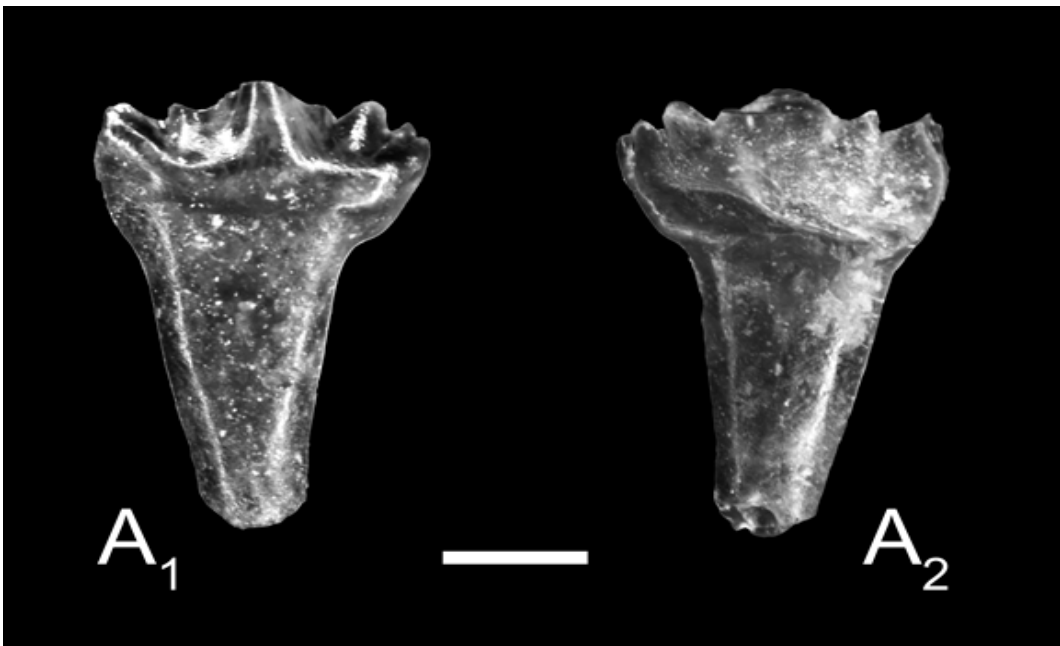


Figure 1. OMNH 34881 in two views (A₁ and A₂). Scale is equal to 1 mm.

central cusp in this species is asymmetric (Farke et al. 2014); a feature commonly observed in basal neoceratopsians (You and Dodson, 2004). A third possibility is that this tooth belongs to an early pachycephalosaur. Pachycephalosaur teeth tend to be small, triangular, transversely compressed, and bear relatively large denticles (Maryńska et al. 2004). The geologically oldest pachycephalosaur previously reported from North America is of earliest Cenomanian age (Cifelli et al. 1999), and hence is slightly younger than OMNH 34881.

Although a definitive identification for OMNH 34881 cannot be made at this time, it is apparent that the specimen represents a previously unrecognized ornithischian from the Antlers Formation of Oklahoma. Additional specimens are needed to determine whether OMNH 34881 is an exemplar for a species with a unique dentition, or an abnormal tooth from a better-known North American species. In either scenario, this discovery significantly adds to the known ornithischian diversity from the Early Cretaceous of Oklahoma.

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