

A REVISION OF THE UPPER TRIASSIC ORNITHISCHIAN DINOSAUR *REVUELTOSAURUS*, WITH A DESCRIPTION OF A NEW SPECIES

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Abstract—Ornithischian dinosaur body fossils are extremely rare in Triassic rocks worldwide, and to date the majority of such fossils consist of isolated teeth. *Revueltosaurus* is the most common Upper Triassic ornithischian dinosaur and is known from Chinle Group strata in New Mexico and Arizona. Historically, all large (>1 cm tall) and many small ornithischian dinosaur teeth from the Chinle have been referred to the type species, *Revueltosaurus callenderi* Hunt. A careful re-examination of the type and referred material of *Revueltosaurus callenderi* reveals that: (1) *R. callenderi* is a valid taxon, in spite of cladistic arguments to the contrary; (2) many teeth previously referred to *R. callenderi*, particularly from the *Placerias* quarry, instead represent other, more basal, ornithischians; and (3) teeth from the vicinity of St. Johns, Arizona, and Lamy, New Mexico previously referred to *R. callenderi* pertain to a new species, named *Revueltosaurus hunti* here. *R. hunti* is more derived than *R. callenderi* and is one of the most derived Triassic ornithischians. However, detailed biostratigraphy indicates that *R. hunti* is older (Adamanian: latest Carnian) than *R. callenderi* (Revueltian: early-mid Norian). Both taxa have great potential as index taxa of their respective faunachrons and support existing biochronologies based on other tetrapods, megafossil plants, palynostratigraphy, and lithostratigraphy.

Keywords: *Revueltosaurus*, Triassic, ornithischian, teeth, Adamanian, Revueltian

INTRODUCTION

Shortly after their origin in the early part of the Late Triassic, dinosaurs, particularly theropods and prosauropods, were diverse, and by mid-Late Triassic (Norian) time, locally abundant. Ornithischian dinosaurs, however, remain absolutely and comparatively rare, with *Pisanosaurus mertii* Casamiquela the only Triassic ornithischian known from postcrania. Consequently, most Late Triassic ornithischians are known only from isolated teeth from the Upper Triassic Chinle Group (Hunt, 1989; Padian, 1990; Hunt and Lucas, 1994; Heckert, 2001) or fissure fills in Europe (Godefroit and Cuny, 1997; Cuny et al., 2000). Although far from satisfactory, these teeth form the majority of fossil specimens available to document the early evolution of the Ornithischia, a group that would eventually become the most diverse clade of dinosaurs (excluding birds). One of the most ubiquitous and, to date, most misunderstood Triassic ornithischians is *Revueltosaurus*.

I re-examined the type and referred material of *Revueltosaurus* identified by Hunt (1989). I also examined specimens identified as *Revueltosaurus* by Padian (1990), Sereno (1991), Hunt and Lucas (1994), Kaye and Padian (1994), Long and Murry (1995) and Heckert and Lucas (1997), as well as undescribed fossils at the University of California Museum of Paleontology and teeth found at "Dinosaur hill" in Petrified Forest National Park that are now repositied there. In the course of this study I identified a second species of *Revueltosaurus*, which I describe here. Because of taxonomic confusion surrounding *Revueltosaurus*, establishing the new species requires a revision of the genus.

Institutional abbreviations: MNA = Museum of Northern Arizona, Flagstaff; NMMNH = New Mexico Museum of Natural History and Science, Albuquerque; PEFO = Petrified Forest National Park, Arizona; and UCMP = University of California Museum of Paleontology, Berkeley.

TAXONOMY

One of the central aims of this paper is to clarify the systematics of Triassic ornithischians, specifically *Revueltosaurus*. Pres-

ently, there are essentially three positions in the paleontological community on the taxonomic utility of dinosaur teeth: (1) dinosaur teeth are almost never diagnostic of low taxonomic levels and should not be used to erect, or even discriminate taxa (e.g., Dodson and Dawson, 1991; Dodson, 1997); (2) taxa based on teeth have some utility but are "form genera" or "metataxa" (Padian, 1990; Sereno, 1991); (3) dinosaur teeth, particularly those of Triassic ornithischians, can be discriminated on the basis of differential diagnoses using synapomorphies and thus are as valid as any other taxon defined by similar criteria (Hunt and Lucas, 1994). These arguments are explored in much greater detail in the cited papers and in Heckert (2001). The following points, however, are the most salient to the taxonomic position of *Revueltosaurus*.

1. There is near-universal consent that dinosaur teeth are diagnostic to family- and higher taxonomic levels. In particular, all modern diagnoses of the clade Ornithischia included multiple characters based on teeth (e.g., Sereno, 1984, 1986, 1991, 1997, 1998, 1999; Benton, 1990, 1997; Sander, 1997).
2. Theropod dinosaurs typically have more plesiomorphic and simple teeth than herbivorous dinosaurs generally and ornithischian dinosaurs in particular.
3. Detailed analysis, description, and illustration of theropod teeth (e.g., Currie et al., 1990; Farlow et al., 1991) has demonstrated that at least several species of Cretaceous theropods (several of them sympatric) can be identified using teeth, in spite of ongoing changes in our understanding of theropod phylogeny (Holtz, 1994, 2000; Sereno, 1997, 1998, 1999; Padian et al., 1999).

Consequently, it is evident that isolated teeth can readily be identified as ornithischians and may, in some cases, be diagnostic to species level. Therefore, isolated teeth of *Revueltosaurus*