

The Late Triassic pseudosuchian *Revueltosaurus callenderi* and its implications for the diversity of early ornithischian dinosaurs

William G. Parker^{1,*}, Randall B. Irmis^{1,2}, Sterling J. Nesbitt³,
Jeffrey W. Martz⁴ and Lori S. Browne⁵

¹Division of Resource Management, Petrified Forest National Park, PO Box 2217, Petrified Forest, AZ 86028, USA

²University of California Museum of Paleontology, 1101 Valley Life Sciences Building, Berkeley, CA 94720-4780, USA

³Lamont-Doherty Earth Observatory, Columbia University, 61 Route 9W, Palisades, NY 10964, USA

⁴Department of Geosciences, Texas Tech University, Lubbock, TX 79409, USA

⁵Museum of Geology, South Dakota School of Mines and Technology,
501 East Saint Joseph Street, Rapid City, SD 57701, USA

A new discovery of skeletons of *Revueltosaurus callenderi* from the Upper Triassic Chinle Formation of Petrified Forest National Park, Arizona clearly shows that *Revueltosaurus* is not an ornithischian dinosaur as previously supposed. Features such as the presence of a postfrontal, crocodile-normal ankle and paramedian osteoderms with anterior bars place *R. callenderi* within the Pseudosuchia, closer to crocodylomorphs than to dinosaurs. Therefore, dental characters previously used to place *Revueltosaurus* within the Ornithischia evolved convergently among other archosaur taxa, and cannot be used to diagnose ornithischian dinosaur teeth. As a result, all other putative North American Late Triassic ornithischians, which are all based exclusively on teeth, are cast into doubt. The only reasonably well-confirmed Late Triassic ornithischians worldwide are *Pisanosaurus mertii* and an unnamed heterodontosaurid from Argentina. This considerably changes the understanding of early dinosaur diversity, distribution and evolution in the Late Triassic.

Keywords: *Revueltosaurus*; Ornithischia; Pseudosuchia; Late Triassic; Petrified Forest National Park

1. INTRODUCTION

The record of Triassic ornithischian dinosaurs is poor; only a single taxon, *Pisanosaurus*, is known from cranial and postcranial material (Casimiquela 1967; Bonaparte 1976). Other proposed Triassic ornithischians (*Galtonia*, *Tecovasaurus*, *Lucianosaurus*, *Pekinosaurus*, *Technosaurus* and *Revueltosaurus*) are known from isolated jaw fragments or teeth (Chatterjee 1984; Hunt & Lucas 1994; Heckert 2002).

Hunt & Lucas (1994) and Heckert (2002) have argued that ornithischian teeth are capable of being diagnosed using autapomorphies, and therefore can be used to designate valid taxa. Hunt (1989) described *Revueltosaurus callenderi* as a probable ornithischian dinosaur from the Bull Canyon Formation of New Mexico on the basis of several isolated teeth, and later authors have followed this assignment (e.g. Padian 1990a; Long & Murry 1995; Heckert 2002). Sereno (1991a,b) argued that the characteristics and associations that Hunt (1989) provided were ambiguous and, therefore, *Revueltosaurus* represented a *nomen dubium*, but he did not dispute its ornithischian affinities. All known specimens of *Revueltosaurus* are isolated teeth except for an undescribed skull fragment collected by Hunt (Heckert 2002). Heckert (2002) reanalysed the genus and erected a second species, *Revueltosaurus hunti*, again based upon isolated teeth.

We have now discovered skeletal material of *R. callenderi* in the Petrified Forest National Park (AZ, USA), as the result of an ongoing palaeontological inventory of the park (Parker & Clements 2004), including hundreds of cranial and postcranial elements of at least six individuals from a single quarry. Apart from fragmentary material referable to a poposaurid similar to *Chatterjeea*, all of the material from the quarry belongs to a single taxon and includes individuals of varying size. The chatterjeeid material is considerably larger and was only recovered in a small area of float. The most important specimen (PEFO 33787) consists of a partial articulated skeleton, including the skull, vertebral column, osteoderms, forelimb and hindlimb material, which was collected *in situ*. In many cases, the *Revueltosaurus* material collected on the surface of the quarry was associated, providing further evidence that the material described here represents one taxon. All postcranial remains described here have been found in direct association with cranial remains identifiable as *Revueltosaurus*. The quarry is still being developed and is producing numerous additional *in situ* elements of the same taxon. Additionally, identical cranial and postcranial material has been found in collections from Dinosaur Hill in Petrified Forest National Park, where Padian (1990a) reported the presence of *R. callenderi* teeth. This further strengthens the association of the material.

Because much of the material is still being prepared, a full description of the material will not be given here. Our

* Author for correspondence (william_parker@nps.gov).