

TAXONOMY OF *SHUVOSAURUS*, A LATE TRIASSIC ARCHOSAUR FROM THE CHINLE GROUP, AMERICAN SOUTHWEST

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Abstract—The distinctive, edentulous archosaur *Shuvosaurus inexpectatus* Chatterjee, 1993, was named based on a skull, whereas the postcrania of the same taxon were named *Chatterjeea elegans* Long and Murry, 1995. *Effigia okeeffeae* Nesbitt and Norell, 2006, is the name for the associated skull and postcranium of *Shuvosaurus* and *Chatterjeea*. Therefore, only one generic name, *Shuvosaurus* (= *Chatterjeea*, = *Effigia*), is valid, and the supposed diagnostic features of *Effigia* indicate that, at most, its type material represents a species of *Shuvosaurus* (*S. okeeffeae*) distinct from the type species of *Shuvosaurus* (*S. inexpectatus*). *S. inexpectatus* has a well documented, early Revueltian distribution in Texas-New Mexico, whereas *S. okeeffeae* is well documented from only one Apachean locality in New Mexico.

INTRODUCTION

One of the most unusual tetrapods recovered from the Upper Triassic Chinle Group of the American Southwest is *Shuvosaurus* from the Bull Canyon Formation in West Texas. Originally described as an ornithomimosaurian dinosaur by Chatterjee (1993), *Shuvosaurus* has an edentulous beak, enormous orbits and other features that are, indeed, reminiscent of an ostrich dinosaur. Recently, Nesbitt and Norell (2006) and Nesbitt (2007) described a remarkably similar taxon, *Effigia*, from the Rock Point Formation of the Chinle Group in New Mexico. Here, we argue that *Effigia* is a junior subjective synonym of *Shuvosaurus*.

Institutional abbreviations: AMNH = American Museum of Natural History, New York; TTUP = Texas Tech University Museum, Lubbock.

PREVIOUS STUDIES

Chatterjee (1993) named *Shuvosaurus inexpectatus* for TTUP 9280, a nearly complete skull, left lower jaw and a dorsal vertebra (holotype) and additional, less complete cranial material, part of an atlas and a right scapula (referred specimens) from the Post quarry in the Revueltian Bull Canyon Formation in West Texas. Chatterjee (1993) regarded *Shuvosaurus* as a coelurosaurian theropod dinosaur close to ornithomimosaurians based on a cladistic analysis.

Long and Murry (1995) named *Chatterjeea elegans* for relatively small postcranial material (most notably the holotype, TTUP 9001, a nearly complete postcranial skeleton) of an archosaur from the Post quarry. Chatterjee (1985) had earlier considered these specimens to be juvenile postcrania of *Postosuchus*. Puzzled by the relative abundance of *Chatterjeea* postcrania in the Post quarry, and apparent absence of cranial material of this taxon, Long and Murry (1995, p. 162) suggested that the cranial material named *Shuvosaurus* might belong with the postcranium named *Chatterjeea*. As Long and Murry (1995) acknowledged, this would make *Shuvosaurus* the senior synonym of *Chatterjeea*.

Rauhut (1997) briefly redescribed the skull of *Shuvosaurus* and reaffirmed Chatterjee's conclusion that it is a theropod dinosaur. However, Hunt et al. (1998) argued against the dinosaurian affinities of *Shuvosaurus* and tentatively supported the argument of Long and Murry (1995) that *Shuvosaurus* and *Chatterjeea* are one taxon. Heckert and Lucas (2000) considered *Shuvosaurus* to be a non-dinosaur, as did Mackovicky et al. (2004).

Rauhut (2003) continued to regard *Shuvosaurus* as a bizarre theropod. He also suggested that *Gojirasaurus* from the Revueltian Bull Canyon Formation of east-central New Mexico (Carpenter, 1997) is based on postcrania of *Shuvosaurus*. The type material of *Gojirasaurus* consists of partial postcrania of a large (>5 m total length) theropod dinosaur, and cranial material of *Shuvosaurus* was found at the type

locality of *Gojirasaurus* (Carpenter, 1997; Hunt, 2001). This association, and Rauhut's conclusion that the type skull of *Shuvosaurus* is that of a juvenile (hence its adult postcrania would be as large as those of *Gojirasaurus*), were the basis for Rauhut's suggestion.

Lehane (2005) provided a very detailed description of the cranial anatomy of *Shuvosaurus*. He also assigned it to the Theropoda.

Nesbitt and Norell (2006) and Nesbitt (2007) recently erected *Effigia okeeffeae* for associated cranial and postcranial specimens from the Whitaker quarry at Ghost Ranch, New Mexico, in the Apachean Rock Point Formation of the Chinle Group. *Effigia* has a skull nearly indistinguishable from that of *Shuvosaurus*, and a postcranium remarkably similar to that of *Chatterjeea*, so we argue here that the two taxa are synonymous. The association of a *Shuvosaurus* skull and *Chatterjeea* postcranium in *Effigia* confirms previous suggestions that *Shuvosaurus* and *Chatterjeea* represent one taxon.

SHUVOSAURUS AND CHATTERJEEA

The associated postcrania and skull of *Effigia* demonstrate that the *Shuvosaurus* skull belongs with a *Chatterjeea* postcranium as was postulated previously (Long and Murry, 1995; Hunt et al., 1998; Nesbitt and Norell, 2006; Nesbitt, 2007). Thus, *Chatterjeea elegans* Long and Murry, 1995 is a junior subjective synonym of *Shuvosaurus inexpectatus* Chatterjee, 1993. Furthermore, the associated postcrania demonstrate that *Shuvosaurus* is a suchian archosaur, not a theropod dinosaur (Nesbitt and Norell, 2006; Nesbitt, 2007). The postcrania of *Gojirasaurus* are those of a dinosaur, so despite a taphonomic association, *Gojirasaurus* and *Shuvosaurus* do not represent the same taxon.

TAXONOMIC STATUS OF EFFIGIA

Effigia is very similar to *Shuvosaurus* in many anatomical features that distinguish both from other suchians, especially the edentulous premaxilla, maxilla and dentary and the long dorsal process of the premaxilla (Fig. 1). Nesbitt and Norell (2006, p. 1045) and Nesbitt (2007, p. 6) listed six characteristics that supposedly distinguish *Effigia* from *Shuvosaurus*. Here, we evaluate these characteristics:

1. "Presence of both a dorsal and posterior process of the maxilla": In *Shuvosaurus*, the skull has a relatively small maxilla that sutures to the nasal dorsally, and thus is excluded from contacting the lacrimal. In other words, the maxilla does not form much of the dorsal margin of the antorbital fenestra. In contrast, *Effigia* has been reconstructed to have a dorsal process of the maxilla that forms much of the dorsal border of the antorbital fenestra and meets the lacrimal. This difference appears to us to be genuine, despite damage to and distortion of the holotype skulls of both *Shuvosaurus* and *Effigia*.

2. "Small posterior process of the premaxilla": Both *Shuvosaurus*

vertical (and there is no reason not to do this since the distortion there is clearly diagenetic and artificial), the two reconstructions would be much more similar.

We thus consider *Effigia* Nesbitt and Norell, 2006 to be a junior subjective synonym of *Shuvosaurus* Chatterjee, 1993. Pending further information on cranial variation in *Shuvosaurus*, we very tentatively regard the Ghost Ranch material as a distinct species, *S. okeeffeae*, distinguished from *S. inexpectatus* by the difference in the maxilla originally

used to differentially diagnose *Effigia* from *Shuvosaurus*. *S. inexpectatus* has a well documented early Revueltian distribution in Texas-New Mexico (Hunt, 1991), whereas *S. okeeffeae* is well documented only from one Apachean locality in New Mexico.

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REFERENCES

- Carpenter, K., 1997, A giant coelophysoid (Ceratosauria) theropod from the Upper Triassic of New Mexico: Neues Jahrbuch für Geologie und Paläontologie Abhandlungen, v. 205, p. 189-208.
- Chatterjee, S., 1993, *Shuvosaurus*, a new theropod: National Geographic Research and Exploration, v. 9, p. 274-285.
- Heckert, A. B., and Lucas, S. G., 2000, Global correlation of the Triassic theropod record: Gaia, v. 15, p. 63-74.
- Hunt, A.P., 2001, The vertebrate fauna, biostratigraphy and biochronology of the type Revueltian land-vertebrate faunachron, Bull Canyon Formation (Upper Triassic), east-central New Mexico: New Mexico Geological Society, Guidebook 52, p. 123-151.
- Hunt, A.P., Lucas, S.G., Heckert, A.B., Sullivan, R.M. and Lockley, M.G., 1998, Late Triassic dinosaurs from the western United States: Geobios, v. 31, p. 511-531.
- Lehane, J., 2005, Anatomy and relationships of *Shuvosaurus*, a basal theropod from the Triassic of Texas [M.S. thesis]: Lubbock, Texas Tech University, 92 p.
- Long, R.A. and Murry, P.A., 1995, Late Triassic (Carnian and Norian) tetrapods from the southwestern United States: New Mexico Museum of Natural History and Science, Bulletin 4, 254 p.
- Makovicky, P. J., Kobayashi, Y. and Currie, P. J., 2004, Ornithomimosauria; in Weishampel, D. B., Dodson, P., and Osmólska, H., eds., The Dinosauria: Second Edition: Berkeley, University of California Press, p. 137-150.
- Nesbitt, S.J., 2007, The anatomy of *Effigia okeeffeae* (Archosauria, Suchia), theropod-like convergence, and the distribution of related taxa: Bulletin of the American Museum of Natural History, v. 302, 84 p.
- Nesbitt, S.J. and Norell, M.A., 2006, Extreme convergence in the body plan of an early suchian (Archosauria) and ornithomimosaur (Theropoda): Proceedings of the Royal Society B, v. 273, p. 1045-1048.
- Rauhut, O. W. M., 1997, Zur Schädelanatomie von *Shuvosaurus inexpectatus* (Dinosauria; Theropoda); in Sachs, S., Rauhut, O.W.M. and Weigert, A., eds., 1. Treffen des Deutschsprachigen Paläoherpetologen, Düsseldorf, Extended Abstracts: Terra Nostra, v. 7, p. 17-21.
- Rauhut, O.W.M., 2003, The interrelationships and evolution of basal theropod dinosaurs: Special Papers in Palaeontology, no. 69, 213 p.