A NEW DOSWELLIID ARCHOSAUROMORPH FROM THE UPPER TRIASSIC OF WEST TEXAS

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Abstract—Ankylosuchus chinlegroupensis is a new genus and species of heavily-armored archosauromorph from the Otischalkian Colorado City Formation of the Chinle Group in Howard County, West Texas. The incomplete holotype skeleton consists of cranial and pelvic (?) elements, vertebral centra, a partial limb shaft and numerous osteoderms. The skull elements reveal a thick, heavily armored braincase and skull roof with parasagittal crests. The relatively short sacral vertebrae suggest an animal less than 1 meter in total body length, not including the tail. The morphology of the osteoderms does not match any currently known armored archosauromorph, but it is most similar to doswelliids. Most of the osteoderms possess large, closely packed pits that form no obvious pattern. Some osteoderms have raised, linear ridges running across them and others have anterior laminae with faint patterning on the articular surface. Some of the osteoderms are tightly sutured to each other via digitate sutures; all are relatively thick. The patterning of the osteoderms matches well with that of doswelliids in being coarse, deeply incised and mostly composed of equal-sized pits and in the possession of anterior laminae. Even so, these osteoderms are readily distinguished from those of Doswellia, the only doswelliid previously reported from the Chinle Group, by their coarser pitting, greater thickness and (at least in some osteoderms) fusion with laterally adjacent osteoderms along their mutual sutural boundaries. A. chinlegroupensis is derived from the oldest strata of the Texas Chinle Group, the Otischalkian, whereas the genus Doswellia is known from the Chinle Group in Texas, New Mexico and Utah, in strata of Otischalkian-Adamanian (late Carnian) age. Doswelliids are very rare, but visible components of global Triassic faunas. They include Tarjadia (= Archeopelta) from the Berdyankian (Ladinian) of Argentina and Brazil, Doswellia from the Otischalkian-Adamanian of the American Southwest and the Otischalkian of the Newark Supergroup in the eastern USA, and now Ankylosuchus from the Otischalkian of West Texas.

INTRODUCTION

Archosauromorphs are diverse, abundant and characteristic reptiles in many Triassic vertebrate fossil assemblages. However, many are known only from very fragmentary and/or incomplete remains, among them the doswelliids. Weems (1980) described the first member of this family, Doswellia kaltenbachii, based on a partial skeleton from the Upper Triassic of Virginia. Less complete specimens have been the basis for two other doswelliid taxa, Tarjadia and Archeopelta, from the Middle Triassic of South America (Arcucci and Marsicano, 1998; Desojo et al., 2011). Long and Murry (1995), and most recently Heckert et al. (2012), have described Doswellia specimens from the Upper Triassic Chinle Group in Texas, New Mexico and Utah. Here, we add a new taxon to the sparse record of doswelliids from the Upper Triassic of West Texas (Spielmann et al., 2012). In this paper, NMMNH refers to the New Mexico Museum of Natural History and Science, Albuquerque; USNM refers to the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

PROVENANCE

The new doswelliid fossil, NMMNH P-16723, was collected in June 1990 at NMMNH locality 3101, which is north of Trilophosaurus quarries 1 and 2 (see Gregory, 1945; Lucas et al., 1993, 1994; Spielmann et al., 2007, 2008) in Howard County, Texas (Fig. 1). The bones were all collected from a small outcrop of red mudstone in the Otischalkian interval of the Colorado City Formation of the Chinle Group (Lucas, 1993, 1998, 2010) (Fig. 1). Proximity on the outcrop and similarity of size, preservation and morphology all suggest that the bones that are catalogued as NMMNH P-169723 are from a single individual.

FIGURE 1. Index map and stratigraphic section highlighting the Otischalkian vertebrate fauna, which includes the type locality of Ankylosuchus chinlegroupensis. The Chinle Group outcrop belt is outlined in black.
SYSTEMATIC PALEONTOLOGY

Order Archosauromorpha Huene, 1946
Family Doswelliidae Weems, 1980
Ankylosuchus, new genus

Type species: Ankylosuchus chinlegroupensis, new species.

Included species: Known only from the type species.

Diagnosis: A doswelliid distinguished from other members of the family by its osteoderms, which are very thick and coarsely pitted, and by some individual osteoderms which are fused along their lateral sutural borders. Ankylosuchus may be further distinguished from other doswelliid by its possession of a parasagittal crest.

Etymology: From Greek “ankylos,” fused and “souchos,” crocodile, in reference to the heavily fused armor of this distant relative of crocodiles.

Ankylosuchus chinlegroupensis, new species

Figs. 2-5

Holotype: NMMNH P-16723, partial skeleton consisting of cranial fragments, three vertebral centra and a fragment of a limb bone.

Referred specimens: Known only from the holotype.

Diagnosis: Same as for the genus.

Etymology: For the Upper Triassic Chinle Group, from which the holotype was collected.

DESCRIPTION

We can divide the bones catalogued as NMMNH P-16723 into four categories: (1) pelvic and cranial elements (Fig. 2); (2) vertebral centra (Fig. 3); (3) osteoderms (Figs. 4-5); and (4) a limb bone shaft fragment. None of these bones articulates with another, and the precise anatomical position of many bones (especially the osteoderms) is uncertain. Here, we describe these elements by category.

Pelvic and Cranial Elements

The largest element of Ankylosuchus is a relatively long (~120 mm), arcuate element with ornamentation on three sides (Fig. 2A-C). We originally considered placement of this element as much of the right zygomatic arch preserving part of the floor of the orbit and underlying alveoli of the maxillary dentition as most reasonable. This identifies a relatively robust jugal with its lateral surface ornamented by deep circular pits dorsally and more elongate and reticulated ridges and grooves ventrally. The jugal thus has a shelf on its dorsal surface ornamented with pits similar to those on the osteoderms. The anterior part of the jugal has a broad ornamented dorsal shelf lateral to an unornamented orbital floor. The maxillary, according to this interpretation, has five shallow, rectangular grooves, which may be tooth alveoli, or at least the bases of alveoli. The teeth in these alveoli were apparently transversely broad and robust. Alternatively, these transverse grooves may not be alveoli but instead form a corrugated edentulous surface at the back of the maxillary. The outline shape of the jugal in this interpretation is very arcuate, unlike the more straight but slightly widening to the posterior shape of the jugal of Doswellia.

However, R. Weems (written commun., 2012) has suggested to us that this element is part of the armor that wraps around the iliac blade. In this interpretation, which we accept here, the grooves on one side of the element are likely tooth marks made by a predator or scavenger, not alveoli.

An element we more confidently identify as cranial appears to be part of the skull roof, probably the posterior part of the supraoccipital (Fig. 2D-F). It is a long, bilaterally symmetrical element around an evident midline suture on its ventral surface. The dorsal surface has two ridges that border concave surfaces laterally and rise above a shallow median sulcus that broadens to a posterior indentation. They are parasagittal crests in this placement of the element.

Other skull fragments (Fig. 2G-M) are not so easily allocated. Indeed, some of these fragments may be part of the body armor, not cranial material. They are thick pieces of bone ornamented on more than one side. They bear one or more sutural edges. Ornamentation on one side of each fragment is circular or near circular pits, whereas the other side has ornamentation consisting of anastomosing ridges. We interpret the pitted surfaces as dorsal, whereas the ridged surfaces are likely ventral. All of the cranial elements are robust – thick and massive.

Vertebral Centra

NMMNH P-16723 includes three vertebral centra and a fragment of a fourth (Fig. 3). These centra are shallowly amphicoelous, slightly constricted in the middle, dorso-ventrally flattened and lack ventral keels (their ventral surfaces are smoothly convex). The articular surfaces for the neural arch cover much of the dorsal surface of each centrum and border at least the anterior half of the neural canal. Two of the centra have a laterally projecting facet, one near the posterior end (Fig. 3E-F), the other near the anterior end (Fig. 3A-B). We identify the centrum in Figure 3E-F as the first sacral based on the extent of the lateral facet, and the other two as posterior dorsals, based on the presence of distinct para- and diapophyses. A fourth fragment of a centrum is an articular end similar to that of the others (width = 19.5 mm).

Measurements of the vertebrae are: Figure 3A-B: l (length of centrum) = 27.8 mm, aw (anterior width of articular surface) = 21.4 mm, pw (posterior width of articular surface) = 18.3 mm; Figure 3C-D: l = 31.2 mm, aw = 24.2 mm, pw = 19.5 mm; Figure 3E-F: l = 33.8 mm, aw = ~17.3 mm, pw = 20.1 mm.

Osteoderms

We illustrate eight of the most complete osteoderms catalogued under NMMNH P-16723 (Fig. 4). There are 23 other osteoderm fragments that are part of the specimen. All of these osteoderms are relatively thick bones (thickness ranges from ~8 to 12 mm) covered on their dorsal surfaces with deep, round, closely-packed pits that form no regular pattern. Some of the osteoderms display a keel or ridge (Fig. 4E) that we interpret as medial or on the dorsal surface of the osteoderm and antero-posteriorly oriented. All of the osteoderms illustrated here appear to have a single side with ornamentation that is broadly convex (dorsal) and an unornamented more nearly concave side (ventral). The more complete osteoderms (Fig. 4L, S) have an anterior bar (articular surface) that lacks pits but has a finely reticulated surface texture. The posterior ventral edges of these same osteoderms (see especially Fig. 4T) have a similarly textured, concave area – clearly the reticulate anterior bar was thus overlapped by this recticulated area when the osteoderms were articulated, so they were well imbricated antero-posteriorly when articulated.

Perhaps most unusual are the sutures between osteoderms. Some of the osteoderms are evidently fused together along very tight, interlocking sutures (Fig. 4J, N). Several of the other osteoderms have strong sutural edges (Fig. 4B) that suggested they, too, were tightly sutured to each other. The osteoderms suggest that Ankylosuchus was a heavily armored animal with a thick, tightly sutured and relatively inflexible dermal skeleton (as suggested by Weems, 1980, for Doswellia).

Limb Bone Fragment

A piece of limb bone shaft (not illustrated) has a maximum diameter of about 36 mm. It is smoothly convex, but too incomplete to assign to an element with certainty, though size and shape suggest it is part of a femur.

DISCUSSION

Features of Ankylosuchus that identify it as a doswelliid are in the
osteoderms, which are ornamented with relatively deeply incised and coarse, subcircular to circular pits with an unornamented anterior lamina, all features considered synapomorphies of the Doswelliidae (Desojo et al., 2011). Nevertheless, the osteoderms of *Ankylosuchus* are unique among doswelliids (Fig. 5) in being relatively thick, coarsely pitted, lacking spikes and being composed of separate, sutured elements. *Ankylosuchus* thus stands out as a very heavily and rigidly armored doswelliid, one readily distinguished from other doswelliids just by the morphology of its osteoderms.

**TARJADIA AND ARCHEOPELTA**

Arcucci and Marsicano (1998) named *Tarjadia ruthae* for skull fragments, osteoderms and vertebral centra from the Middle Triassic (Berdyankian) Los Chañares Formation of Argentina. *Tarjadia* is a doswelliid (Desojo et al., 2011) distinguished from *Ankylosuchus* by features of the osteoderms: those of *Tarjadia* have a finer and more reticulate pitting, are relatively thinner and lack inter-osteoderm sutures.

Desojo et al. (2011) named another doswelliid, *Archeopelta arboresis*, for a partial skeleton from the Santa Maria Formation in southern Brazil. The type locality of *A. arboresis* is in the Dinodontosaurus assemblage zone, so it is also of Berdyankian age and correlative (within current resolution) to the type locality of *Tarjadia ruthae* (e.g., Lucas, 2010).

Most of the diagnostic characters of *Archeopelta* listed by Desojo et al. (2011, p. 844) do not distinguish the genus from *Tarjadia*, simply because they pertain to anatomy not known from the fragmentary type material of *Tarjadia*. But, Desojo et al. (2011, p. 844) did state that *Archeopelta* “differs from *Tarjadia* by a vertical ridge on the dorsal surface of the supraoccipital and the absence of laterally concave dorsal vertebra [sic] centra.” However, the fragment of the supraoccipital of the holotype of *T. ruthae* (Arcucci and Marsicano, 1998, fig. 2c-d) is so incomplete we cannot judge whether or not it has a “vertical ridge” (sagittal crest). And, we see no difference in the degree of lateral concavity of the dorsal centra of *Tarjadia* (Arcucci and Marsicano, 1998, fig. 3) and *Archeopelta* (Desojo et al., 2011, fig. 8). The osteoderms of *Tarjadia* (Arcucci and Marsicano, 1998, fig. 4) and of *Archeopelta* (Desojo et al., 2011, fig. 13) are indistinguishable, as indicated by Desojo et al. (2011, p. 856). However, their claim (p. 856) that *Tarjadia* has a single row of paramedian osteoderms (unlike the double row claimed for *Archeopelta*) appears impossible to verify given the fragmentary nature of the *Tarjadia* material.

We thus conclude that *Archeopelta* is a junior subjective synonym of *Tarjadia*. *Tarjadia* is thus a doswelliid known from the Berdyankian of Argentina and Brazil.

**ACKNOWLEDGMENTS**

Carl Frailey and Robert Kahle made fieldwork in West Texas possible. Phil Bircheff and Larry Rinehart prepared the fossils described here. Robert Emry and Michael Brett-Surman made access to the USNM collection possible. Robert Sullivan and Robert Weems provided helpful reviews of the manuscript.

**REFERENCES**


