Vertebrate fauna of the Upper Triassic Mesa Montosa Member (Petrified Forest Formation, Chinle Group), Chama Basin, northern New Mexico

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VERTEBRATE FAUNA OF THE UPPER TRIASSIC MESA MONTOSA MEMBER (PETRIFIED FOREST FORMATION, CHINLE GROUP), CHAMA BASIN, NORTHERN NEW MEXICO

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ABSTRACT.—The vertebrate fauna of the Mesa Montosa Member of the Petrified Forest Formation of the Chinle Group in the Chama Basin of northern New Mexico is generally not well known. However, recent work has greatly expanded the known vertebrate fauna from this unit. Taxa include the metoposaurid amphibian cf. Buettneria sp., the phytosaur Pseudopalatus buceros (Cope) as well as indeterminate phytosaurs (Parasuchidae), the aetosaurs Typothorax coccinarum and Paratypothorax sp., the enigmatic archosaur Vancleavea sp. and theropod dinosaurs. An unusual vertebra and a distinctive shell(?) fragment may pertain to a pterosaur and a turtle, respectively, both of which are rare in the Chinle Group. Other fossil material recovered from the Mesa Montosa Member includes numerous vertebrate coprolites, charcoal and unionid bivalve shells. The assemblage of fossil vertebrates indicates that the Mesa Montosa Member is Revueltian in age. Most of the fossils were collected from a coarse brown sandstone that contains some pebbles and calcrete nodules and is less than a meter below the contact between the Mesa Montosa Member and the overlying Painted Desert Member. These fossils are disarticulated and fragmentary, very few of the fossils are unweathered and many are abraded to the point where identification is impossible. Thus, these fossils represent a time-averaged attritional assemblage that is most likely derived from the floodplain near the channel system that deposited the sandstone. More complete skeletal elements have been recovered from a green shaley siltstone underlying the sandstone, but fossils from this layer are much less abundant.

INTRODUCTION

The upper half of the Petrified Forest Formation in the Chama Basin of northern New Mexico is exceptionally well known in terms of its vertebrate fauna, mostly due to the discovery of several diverse and rich quarries, including the Snyder, Canjilon and Hayden quarries (Lucas and Hunt, 1992; Lucas et al., 2003; Zeigler et al., 2003a). However, the fossil vertebrates of the lower part of the Petrified Forest Formation, the Mesa Montosa Member, are not well known. In order to determine the relative age of this part of the Petrified Forest Formation, we prospected intensively in an area known as Coyote Amphitheater, just northwest of Coyote, New Mexico (Fig. 1). As a result, many new fossils have been discovered in the past two years that have greatly expanded the known fauna from the Mesa Montosa Member. In this article, NMMNH = New Mexico Museum of Natural History and Science, Albuquerque.

GEOLOGY AND STRATIGRAPHY

In the Chama Basin, the Mesa Montosa Member is the lower of the two units that compromise the Petrified Forest Formation (Fig. 2). It lies conformably above the Poleo Formation and conformably below the Painted Desert Member of the Petrified Forest Formation (Lucas et al., 2003). The Mesa Montosa Member consists of interbedded pale green mudstone and greenish brown to brown, laminated and ripple laminated, fine-grained sandstone. This unit is capped locally by a brown calcrete-pebble conglomerate to coarse sandstone that contains relatively abundant vertebrate fossils.

PALEONTOLOGY

Here, we document the vertebrate fossils known from the Mesa Montosa Member.

cf. Buettneria sp.

Material pertaining to the metoposaurid amphibian cf. Buettneria sp. consists primarily of skull and/or pectoral girdle elements (NMMNH P-44861, 44810, 44809, 44807; Fig. 3A, B) with a dimpling pattern on the external surfaces that is characteristic of the genus Buettneria (Colbert and Imbrie, 1956; Hunt, 1994). Usually fossils from the skull region are much thicker than

FIGURE 1. Map of the distribution of Upper Triassic Chinle Group strata (star indicates approximate position of Coyote amphitheater).
bone from the girdle region. Some girdle fragments have parallel ridges and grooves. A single palatal fragment has been recovered that contains teeth that display the intricate infolding of the enamel that is characteristic of labyrinthodont teeth. Thus far, no vertebrae or limb fragments have been identified. Fossil material of cf. *Buettneria* sp. is common in the Mesa Montosa Member. *Testudines indet.*

Two small fragments of bone that could not be positively attributed to Aetosauria may pertain to a turtle (NMMNH P-44806; Fig. 3C) primarily based on the lack of ornamentation on the dorsal surfaces, as well as the presence of a faint groove on the lateral margin. These fragments are less than 4 cm in length and width and only 0.5 cm thick. The lateral margin shows a faint groove that is less than 1 mm deep, and the fragments are unornamented. These may be fragments of marginal plates from the shell of an early turtle. They resemble marginal shell material of *Proganochelys* (Gaffney, 1990) and also of *Proterochersis*, Late Triassic turtles from the German Stubensandstein (Gaffney, 1986). Both genera have rectangular to subrectangular scutes with shallow sulci where the scutes articulate. If these fragments do indeed pertain to a turtle, then they represent one of the few Late Triassic records of turtles in North America (e.g., Lucas et al., 2000).

*Parasuchidae indet.*

Phytosaurs, the common name for Parasuchidae, are very common in the Late Triassic fossil record and in the Mesa Montosa Member are mostly represented by dorsal and appendicular scutes or osteoderms (e.g., NMMNH P-44808; Fig. 3D). The dorsal scutes are, on average, 6-8 cm in length antero-posteriorly and they have a pronounced dorsal ridge that rises up to 3 cm above the dorsal surface of the scute and runs antero-posteriorly. The appendicular scutes are subrounded with small pits scattered randomly across the dorsal surface.

*Pseudopalatus*

*Pseudopalatus buceros*

Lucas and Hunt (1992, fig. 13G) illustrated an incomplete phytosaur skull (NMMNH P-11076; Fig. 3E) they identified as *Pseudopalatus pristinus*, recovered from the Mesa Montosa Member in Coyote amphitheater. The skull is approximately 120 cm long and 35 cm wide (measured from quadrate to quadrate). Post-mortem distortion has crushed the skull deck dorsoventrally, and the skull roof anterior of the squamosals and postfrontals is not present. The premaxillae, ventral-most maxillae, jugals, and quadratojugal are present, though fractured. The anterior-most rostrum is missing, and no teeth are preserved. We assign this skull to *Pseudopalatus buceros* (Cope) based upon the following characteristics (Long and Murry, 1995; Lucas et al., 2002; Zeigler et al., 2003b): the squamosals have a prolonged posterior process, are narrow dorsoventrally and taper to a point. The rostrum is long and slender so that the rostral length is greater than the length of the posterior portion of the skull. The parietal-occipital complex is an inverted "u" in outline, as seen in posterior view, and the supratemporal fenestrae are narrow and recessed below the skull deck.

*Typothorax coccinarum*

*Typothorax coccinarum*, an armored, herbivorous archosauromorph, is among the most common tetrapod fossils discovered in upper Chinle Group strata (Lucas and Hunt, 1992). Fossils of *T. coccinarum* were the first Late Triassic tetrapod fossils described from the American Southwest (Cope, 1875; Lucas and Hunt, 1992; Heckert and Lucas, 2002; Lucas et al., 2002). Dorsal paramedian scutes of *Typothorax* are diagnosed by a relatively dense, random pattern of subcircular pits covering the dorsal surface of the scute, as well as the presence of a pronounced anterior bar and a strongly developed ventral keel that runs mediolaterally (Long and Murry, 1995). *Typothorax coccinarum* dorsal paramedian scutes are four times wider than long, and lateral scutes have an acute angle of flexure.

The Mesa Montosa Member material is not referable to *T. antiquum* because the pitting on these specimens is denser and better developed (not as coarse) than in *T. antiquum* (Lucas et al., 2002). Material pertaining to *Typothorax coccinarum* that has been recovered from the Mesa Montosa Member consists primarily of fragments of dorsal paramedian scutes that show diagnostic features of the species (NMMNH P-44857, 11004; Fig. 3F).

*Paratypothorax* sp.

Scutes of the aetosaur *Paratypothorax* can be distinguished from other genera of aetosaurs by their distinctive pattern of long,
parallel ridges and grooves that radiate from a central point on the dorsal surface of the scute (Long and Murry, 1995). Some scutes from the Mesa Montosa Member have a moderately pronounced dorsal boss at the center point of the radial pattern. However, unlike most specimens of *Paratypothonax*, this boss sits near the anterior edge of the scute. There is a pronounced anterior bar, but no strongly developed ventral keel as in *Typothorax*. Two scute fragments have been recovered from the green mudstone just below the brown conglomerate that are here identified as *Paratypothonax* sp. (NMMNH P-44811; Fig. 3G).

**?Pterosauria indet.**

A single, small vertebra, approximately 2 cm long (Fig. 4A), is mediolaterally compressed with the anterior zygopophyses preserved, and is procoelous. The articulation for the neural arch broadens mediolaterally from a constricted base on the dorsal surface of the centrum. This articulation surface is a wide platform that has a shallow groove running the length of the dorsal surface and is buttressed by three ridges of bone that run mediolaterally across the dorsal groove. This specimen appears to be most similar to caudal vertebrae described for the pterosaur *Eudimorphodon*, which are also long and slender with an articulation surface for the neural arch that is a wide platform (Wild, 1978). A similar vertebra was collected from the Placerias quarry in Arizona and was assigned simply to “Reptilia problematica” (Kaye and Padian, 1994, pig. 9.76). We do not believe that this vertebra can be assigned to drepanosaurs because it lacks the prominent anterior articular ball and low, anteriorly-inclined neural arch of *Megalancosaurus* (e.g., Renesto, 1994, 2000).

**Vancleavea sp.**

Only a single vertebra has been recovered from the Mesa Montosa Member that can be positively identified as pertaining to the enigmatic archosauromorph *Vancleavea*. The vertebra is 4 cm long and is laterally compressed with planoconcave articular surfaces (Fig. 4B). It is twice as long as it is high or wide, and the anterior articular surface projects much farther ventrally than does the posterior facet. This vertebra is similar to those illustrated in Long and Murry (1995) and Hunt et al. (2002), though the anterior articular surface is more pronounced than in the vertebrae they illustrated. All processes have been broken or abraded off of the specimen.

**Theropoda indet.**

A single fragment of a limb bone has been found in Mesa Montosa strata that may pertain to a theropod dinosaur. This specimen is ~3 cm long and is hollow, with the center of the bone infilled with sparry calcite (NMMNH P-44804; Fig. 4C). The bone walls are relatively thin compared to the overall diameter of the shaft (cf. Heckert et al., 2003). The distal condyles are present, but are badly worn or weathered. In examining femora pertaining to *Coelophysis*, they show similar conjoined condyles that are not prominently developed (Colbert, 1989).

**Other Fossils**

Other fossils recovered from the Mesa Montosa Member of the Petrified Forest Formation include numerous coprolites (Fig.
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REFERENCES


Cope, E.C., 1875, Report on the geology of that part of northwestern New Mexico examined during the field season of 1874: Annual Report Upon the Geographical Explorations West of the 100° Meridian [Wheeler Survey], Appendix II, Annual Report Chief of Engineers for 1875, p. 61-97 of separate issue, 981-1017 of full report.


