



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 comprise 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

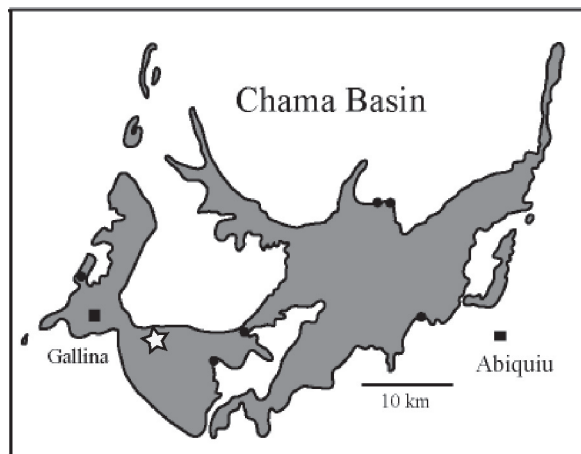


FIGURE 1. Map of the distribution of Upper Triassic Chinle Group strata (star indicates approximate position of Coyote amphitheater).

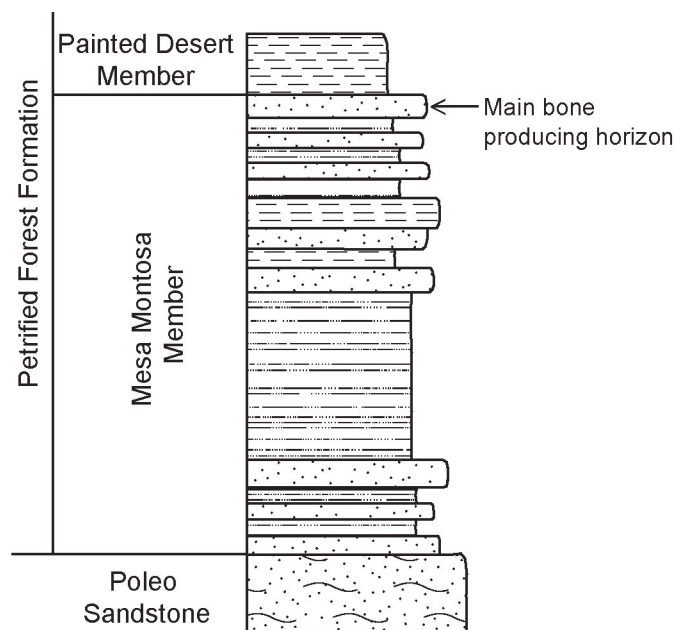


FIGURE 2. Stratigraphic column of Mesa Montosa Member measured at Coyote amphitheater (arrow indicates brown pebbly sandstone/conglomerate from which most vertebrate fossil material is weathering).

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 marginal 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 subround 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 quadratojugals 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 archosaur, 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,

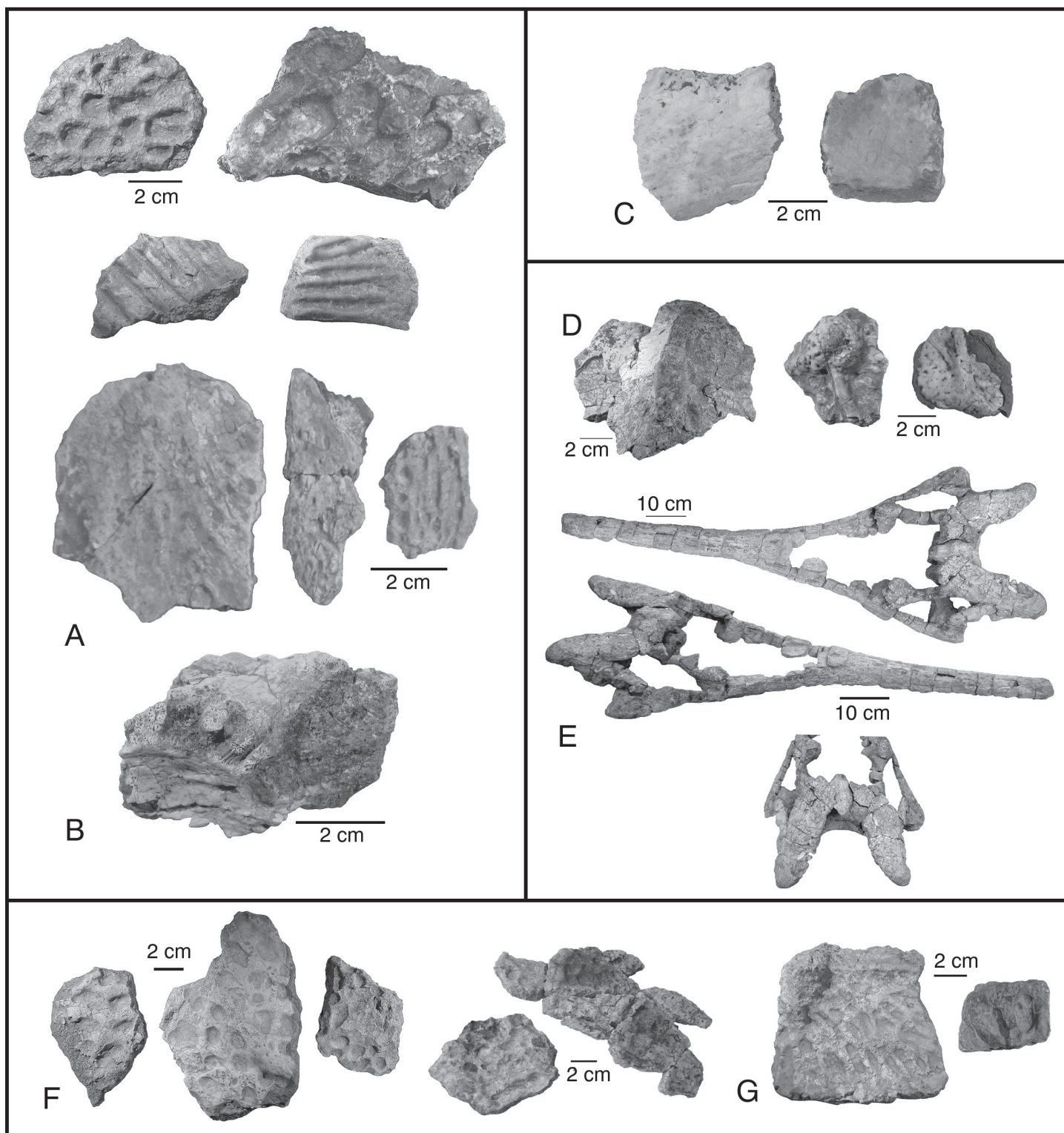


FIGURE 3. Vertebrate fossils from the Mesa Montosa Member, Petrified Forest Formation, Coyote amphitheater. **A-B**, *Buettneria* sp. fossils **A**, skull or girdle fragments (NMMNH P-44861, 44810, 44807). **B**, palatal fragment with partially preserved labyrinthodont teeth in occlusal view (NMMNH P-44809). **C**, possible turtle shell marginals (NMMNH P-44806). **D**, indeterminate phytosaur dorsal and appendicular scutes (NMMNH P-44808). **E**, *Pseudopalatus buceros* skull (NMMNH P-11076) in dorsal (top), lateral (middle) and close-up of dorsal view of occipital region (bottom) views. **F**, *Typothorax coccinarum* scute fragments (NMMNH P-44857, 11004). **G**, *Paratypothorax* sp. scute fragments (NMMNH P-44811).

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 *Paratypothorax*, 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 *Paratypothorax* sp. (NMMNH P-44811; Fig. 3G).

?Pterosauria indet.

A single, small vertebra, approximately 2 cm long (Fig. 4A), is mediolaterally compressed with the anterior zygapophyses 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, fig. 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.

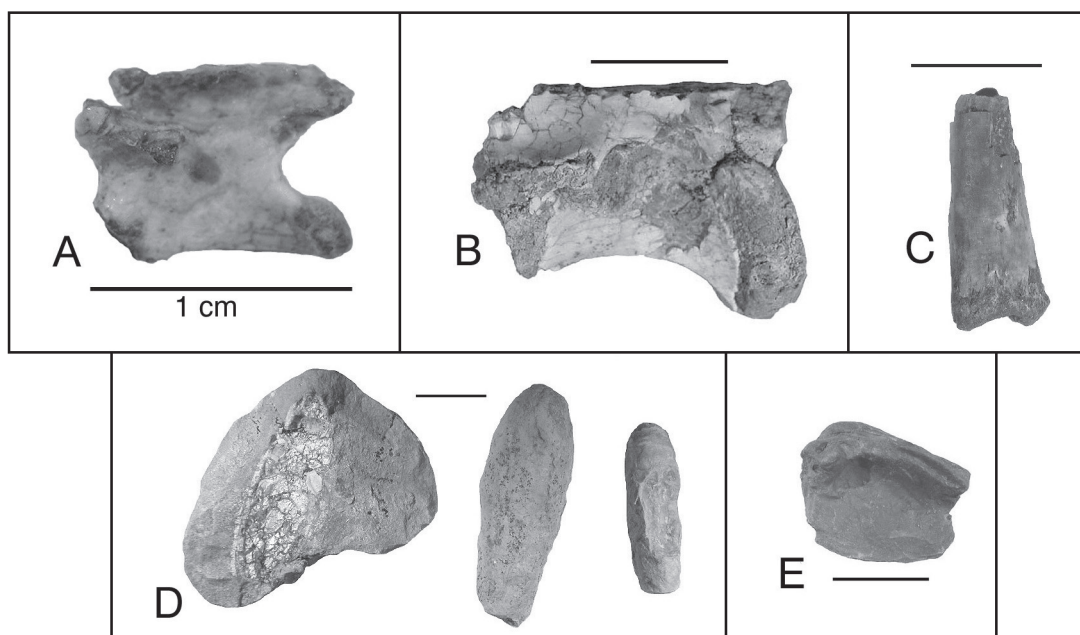


FIGURE 4. Vertebrate and other fossil material from the Mesa Montosa Member, Petrified Forest Formation, Coyote Amphitheater. **A**, cf. Pterosauria vertebra in left lateral view. **B**, *Vancleavea* sp. vertebra in right lateral view. **C**, possible theropod dinosaur distal femur fragment in anterior view. **D**, Coprolites. **E**, unionid bivalve shell fragments. Scale bar = 2 cm, unless otherwise indicated.

4D) and some unionid bivalve shell fragments (Fig. 4E). The coprolites are long and cylindrical and average 4-5 cm long and 1-2 cm wide. They show no distinctive external morphology. Unionid bivalve shell fragments are rarely whole, though they usually consist of the beak and at least half of the valve.

DISCUSSION

Intensive prospecting of the Mesa Montosa Member of the Petrified Forest Formation has greatly expanded the vertebrate fauna of this unit. The fossil assemblage recovered thus far includes the amphibian cf. *Buettneria* sp., the phytosaur *Pseudopalatus buceros* and the aetosaurs *Typothorax coccinarum* and *Paratypothorax* sp. The phytosaur *Pseudopalatus buceros* and the aetosaur *Typothorax coccinarum* indicate that the Mesa Montosa Member is Revueltian in age (Fig. 5). Material attributable to *Buettneria* sp. is common to abundant in the Mesa Montosa Member, but no specimens of the small amphibian *Apachesaurus* have been positively identified. The discovery of putative shell material that may pertain to a turtle and of a vertebra that could pertain to Pterosauria are important, as both of these groups are rare in the Chinle Group.

The fossil material recovered from the Mesa Montosa Member comes primarily from a brown calcrete-pebble conglomerate that is the uppermost bed of this unit. The vast majority of the fossils recovered from this unit were found disarticulated, badly abraded, fractured and weathered, indicating that they have been subjected to subaerial weathering and long-distance transport processes. The presence of complete elements, such as the possible Pterosauria vertebra, is a rare occurrence. Thus, the vast majority of this attritional fossil assemblage was most likely derived from the surrounding floodplain, and these skeletal elements were swept into the main channel system that deposited the conglomerate.

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REFERENCES

Colbert, E.H., 1989, The Triassic dinosaur *Coelophysis*: Museum of Northern Arizona, Bulletin 57, 160 p.
Colbert, E.H. and Imbrie, J., 1956, Triassic metoposaurid amphibians: American Museum of Natural History, Bulletin 110, p. 399-452.
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 100th Meridian [Wheeler Survey], Appendix LL, Annual Report Chief of Engineers for 1875, p. 61-97 of separate issue, 981-1017 of full report.
Gaffney, E.S., 1986, Triassic and Early Jurassic turtles: in K. Padian, ed., The Beginning of the Age of Dinosaurs: Cambridge, Cambridge University Press, p. 183-187.
Gaffney, E.S., 1990, The comparative osteology of the Triassic turtle *Proganochelys*: Bulletin of the American Museum of Natural History, v. 194, 263 p.
Heckert, A.B. and Lucas, S.G., 2002, Historical taxonomy of the aetosaurs *Typo-*

thorax and *Desmatosuchus* (Archosauria: Crurotarsi) with a lectotype designation for *Desmatosuchus haplocerus*: New Mexico Museum of Natural History and Science, Bulletin 21, p. 193-203.
Heckert, A.B., Zeigler, K.E., Lucas, S.G. and Rinehart, L.F., 2003, Coelophysids (Dinosauria: Theropoda) from the Upper Triassic (Revueltian) Snyder quarry: New Mexico Museum of Natural History and Science, Bulletin 24, p. 127-132.
Hunt, A.P., 1994, Vertebrate paleontology and biostratigraphy of the Bull Canyon Formation (Chinle Group, Upper Triassic), east-central New Mexico with revisions of the families Metoposauridae (Amphibia: Temnospondyli) and Parasuchidae (Reptilia: Archosauria) [Ph.D. dissertation]: Albuquerque, University of New Mexico, 404 p.
Hunt, A.P., Heckert, A.B., Lucas, S.G. and Downs, A., 2002, The distribution of the enigmatic reptile *Vancleavea* in the Upper Triassic Chinle Group of the western United States: New Mexico Museum of Natural History and Science, Bulletin 21, p. 269-273.
Kaye, F.T. and Padian, K., 1994, Microvertebrates from the Placerias quarry: A window on Late Triassic vertebrate diversity in the American Southwest: in N.C. Fraser and H.-D. Sues, eds., In the shadow of the dinosaurs: Cambridge, Cambridge University Press, p. 171-196.
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.
Lucas, S.G. and Hunt, A.P., 1992, Triassic stratigraphy and paleontology, Chama Basin and adjacent areas, north-central New Mexico: New Mexico Geological Society, 43rd Field Conference Guidebook, p. 161-167.
Lucas, S.G., Heckert, A.B. and Hunt, A.P., 2000, Probable turtle from the Upper Triassic of east-central New Mexico: Neues Jahrbuch für Geologie und Paläontologie Monatshefte, v. 2000, p. 287-300.
Lucas, S.G., Heckert, A.B. and Hunt, A.P., 2002, A new species of the aetosaur *Typothorax* (Archosauria: Stagonolepididae) from the Upper Triassic of east-central New Mexico: New Mexico Museum of Natural History and Science, Bulletin 21, p. 221-233.
Lucas, S.G., Heckert, A.B., Zeigler, K.E. and Hunt, A.P., 2002, The type locality of *Belodon buceros* Cope, 1881, a phytosaur (Archosauria: Parasuchidae) from the Upper Triassic of north-central New Mexico: New Mexico Museum of Natural History and Science, Bulletin 21, p. 189-192.
Lucas, S.G., Zeigler, K.E., Heckert, A.B. and Hunt, A.P., 2003, Upper Triassic stratigraphy and biostratigraphy, Chama Basin, north-central New Mexico: New Mexico Museum of Natural History and Science, Bulletin 24, p. 15-39.

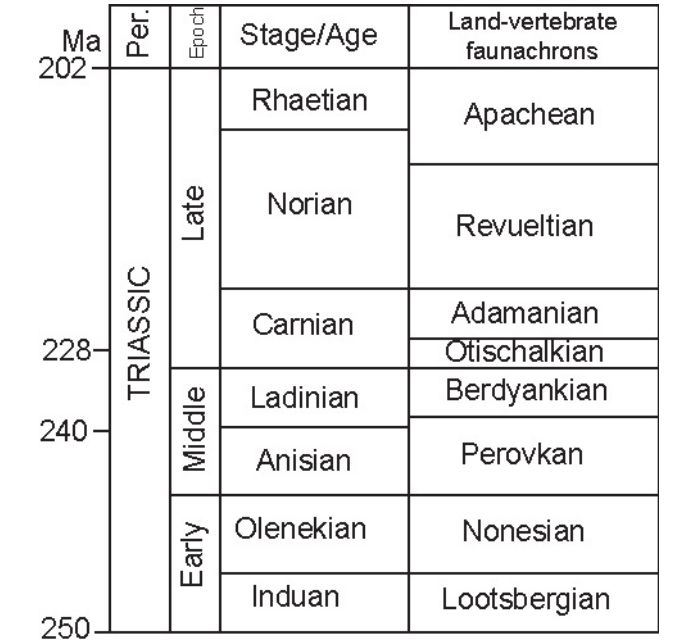


FIGURE 5. Land-vertebrate faunachrons for the Late Triassic (Lucas, 1998).

- Renesto, S., 1994, *Megalancosaurus*, a possibly arboreal archosauromorph (Reptilia) from the Upper Triassic of northern Italy: *Journal of Vertebrate Paleontology*, v. 14, p. 38-52.
- Renesto, S., 2000, Bird-like head on a chameleon body: new specimens of the enigmatic diapsid reptile *Megalancosaurus* from the Late Triassic of northern Italy: *Rivista Italiana di Paleontologia e Stratigrafia*, v. 106, p. 157-180.
- Wild, R., 1978, Die Flugsaurier (Reptilia, Pterosauria) aus der Oberen Trias von Cene Bei Bergamo, Italien: *Bollettino della Società Paleontologica Italiana*, v. 17, 257 p.
- Zeigler, K.E., Heckert, A.B. and Lucas, S.G., 2003a, Paleontology and geology of the Upper Triassic (Revueltian) Snyder quarry, New Mexico: New Mexico Museum of Natural History and Science, Bulletin 24, 132 p.
- Zeigler, K.E., Heckert, A.B. and Lucas, S.G., 2003b, Phytosaur (Archosauria: Parasuchidae) cranial and mandibular material from the Upper Triassic Snyder quarry (Petrified Forest Formation, Chinle Group): New Mexico Museum of Natural History and Science, Bulletin 24, p. 81-88.