

REVIEW OF THE LATE TRIASSIC DINOSAUR RECORD FROM PETRIFIED FOREST NATIONAL PARK, ARIZONA

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WITH THE exception of the *Coelophysis* Quarry at Ghost Ranch, New Mexico, dinosaurs are a rare component of most Late Triassic faunas. Even taxonomically diverse quarries such as the *Placierias* Quarry near St. Johns, Arizona and the Snyder Quarry from the Chama Basin of New Mexico only contain a few dinosaur elements among hundreds of identifiable specimens (Long and Murry, 1995; Heckert et al., 2003).

Padian (1986, 1990) documented the occurrences of the theropod *Coelophysis* sp. and the purported ornithischian *Revueltosaurus callenderi* from the Dinosaur Hill locality in the Petrified Forest National Park. The fauna of this locality is dominated by pseudosuchian archosaurs such as the aetosaur *Typothorax coccinarum*, the crocodylomorph *Hesperosuchus agilis* (Parrish, 1991), phytosaurs, and “rauisuchids”. Also extremely common is the small metoposaur *Apachesaurus gregorii*. By comparison, only a single associated skeleton of *Coelophysis* was recovered.

Long and Murry (1995) described a new dinosaur, *Chindesaurus bryansmalli*, from the Dinosaur Hollow locality of the park. This fragmentary skeleton was collected in 1985 and was mixed with a partial skeleton of a shuvosaurid (Long and Murry, 1995), a suchian archosaur. Long and Murry (1995) tentatively considered *Chindesaurus* to represent a herrerasaurid, a placement that was followed by Hunt et al. (1998); however, recent studies (Langer, 2004; Nesbitt et al., in review) consider *Chindesaurus* a basal saurischian outside Herrerasauridae. The Dinosaur Hill and Dinosaur Hollow localities are both in the Petrified Forest Member of the Chinle Formation.

Hunt et al. (1996), Hunt (1998), and Hunt and Wright (1999) documented purported dinosaur remains (indeterminate theropods and the “ornithischian” *Revueltosaurus callenderi*) from several other localities, including sites from the Blue Mesa Member. However, these specimens have never been described and their preliminary identifications cannot be substantiated given the remarkable convergences between theropod dinosaurs and shuvosaurids (Nesbitt and Norell, 2006). Furthermore, Parker et al. (2005) determined that *Revueltosaurus callenderi* actually represents a pseudosuchian archosaur rather than an ornithischian dinosaur, thus decreasing the number of identifiable dinosaur specimens from the park.

Stocker et al. (2004) and Parker and Irmis (2005) documented the collection of two partial skeletons of *Coelophysis*, a partial skeleton of *Chindesaurus*, and isolated elements of at least two more theropods from a site (The Giving Site) in the Petrified Forest Member. This locality is stratigraphically equivalent to the Dinosaur Hollow site and stratigraphically higher than the Dinosaur Hill site. Other taxa collected from the Giving Site include *Revueltosaurus callenderi*, *Typothorax coccinarum*, indeterminate phytosaurs and crocodylomorphs, *Apachesaurus gregorii*, *Vancleavea* sp., two partial skeletons of a shuvosaurid, and a partial skeleton of *Postosuchus* sp. This site is remarkable because dinosaurs represent a substantial portion of the fauna; it is also the first documented co-occurrence of the basal saurischian *Chindesaurus* and a true theropod, *Coelophysis*.

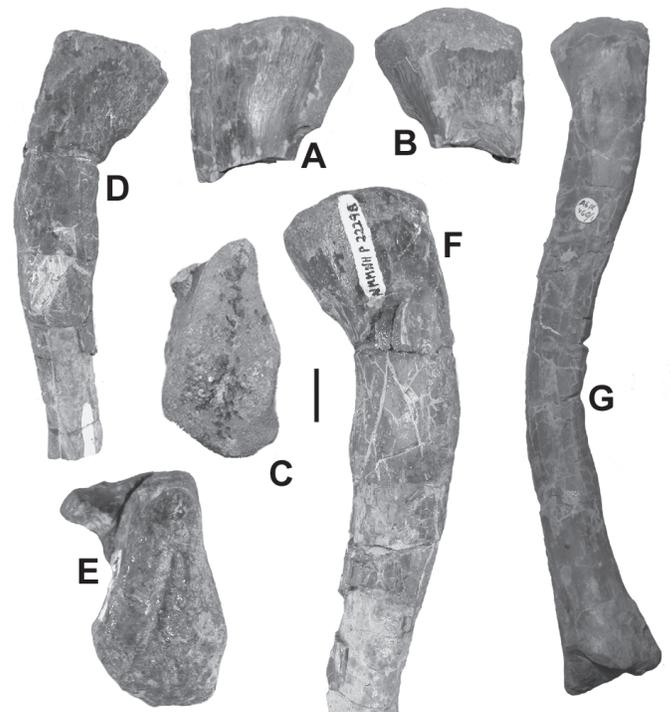


Figure 1. Femora of Late Triassic dinosauriforms. A-C. PEFO 34347, proximal end of left femur; D-F. NMMNH P-22298, *Eucoelophysis baldwini* holotype left femur; A, D. posterior view; B, F. anterior view; C, E. proximal view; G. *Silesaurus opolensis* holotype left femur in anterolateral view. Scale bar = 1 cm.

Sometime around 1996, an unknown individual collected the proximal end of a femur from the Dying Grounds locality in the Blue Mesa Member. We recently re-discovered this specimen and recognized that it is identical to the femora of the dinosauriforms *Silesaurus opolensis* from the Carnian of Poland (Dzik, 2003) and *Eucoelophysis baldwini* from the Norian of New Mexico (Sullivan and Lucas, 1999). Both of these taxa are thought to be basal dinosauriforms outside the Dinosauria (Nesbitt et al., in review). Because this specimen is from the Blue Mesa Member, thought to be Carnian in age on the basis of palynomorphs (Fischer and Dunay, 1984; Litwin et al., 1991), it represents the earliest dinosauriform specimen not only from the Chinle Formation, but from North America as a whole. Given the occurrence of a coelophysoid from the stratigraphically lower *Placerias* Quarry (Long and Murry, 1995; Hunt et al., 1998), this suggests the co-occurrence of basal dinosauriforms and theropod dinosaurs in the lower Chinle Formation of Arizona. This hypothesis will be supported by additional evidence if the assignment of material from the stratigraphically equivalent (and geographically adjacent) Dinosaur Ridge locality by Hunt et al. (1996) to the Theropoda is confirmed.

Confirmed Late Triassic theropod specimens from Arizona are now known from the Mesa Redondo, Sonsela, and Petrified Forest Members of the Chinle Formation, with a probable occurrence from the Blue Mesa Member. The basal saurischian *Chindesaurus* is known from the Petrified Forest Member and co-occurs with true theropods. A newly recognized indeterminate basal dinosauriform taxon occurs in the Blue Mesa Member. Thus, basal dinosauriforms and true theropods appear to occur together in the lower Chinle Formation of Arizona. If we include *Eucoelophysis* from New Mexico, basal dinosauriforms, basal saurischians, and theropods may occur together in the upper Chinle Formation as well, although no basal dinosauriform material has been found in the upper Chinle Formation of Arizona. With the removal of *Revueltosaurus* and similar forms from the Ornithischia, no unambiguous records of this group occur in the Triassic of North America (Irmis et al., in press). The same is true for the sauropodomorphs (Nesbitt et al., in review). Thus, the revised record of specimens from Petrified Forest National Park suggests that at least in the southwestern United States, the taxonomic diversity of dinosaurs and their relatives was low and relatively stable throughout the Late Triassic Period.

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