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A LATE JURASSIC CROCODILE FROM NEW MEXICO

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Abstract—New Mexico has a relatively sparse record of Jurassic fossil vertebrates because the Middle Jurassic stratigraphic units in the state consist of eolian and evaporitic facies and relatively little exploration has been undertaken of the more promising Upper Jurassic facies (Morrison Formation). Thus, the only Middle Jurassic vertebrates from New Mexico are “holostean” fish from the Callovian Luciano Mesa Member of the Todilto Formation, whereas the Morrison Formation vertebrate-fossil record is dominated by fragmentary remains of sauropod dinosaurs. We add to this sparse record the first Jurassic crocodile fossil from New Mexico. This fossil is from the Brushy Basin Member of the Morrison Formation at NMMNH (New Mexico Museum of Natural History) locality 12333 in the Ojito Wilderness Area of Sandoval County. One of us (Ben C.) discovered this fossil in 2018, and it consists of part of the postero-dorsal skull roof of a goniopholidid crocodile catalogued as NMMNH P-81149. This fossil includes much of the parietal, fragments of the squamosals and frontals, the medial margins of both supratemporal fenestrae and part of a natural endocast. We cannot distinguish this fossil from *Eutretauranosuchus* or *Amphicotylus*, but it is so incomplete that we only identify it as Goniopholididae. Scaled to a complete skull of *Eutretauranosuchus*, NMMNH P-81149 had a skull with a total length of 26 cm and a total body length of about 1.5 m, which is a characteristic body size of an adult Morrison goniopholidid. This discovery of a Morrison Formation crocodile in New Mexico comes more than one century after the first discovery of dinosaur bones in the New Mexico Morrison. The discovery of the crocodile fossil, as well as the relatively recent discovery (early 2000s) of a Morrison turtle fossil in New Mexico, provide incentive to search further for relatively small, non-dinosaurian vertebrate fossils in the New Mexican Morrison Formation.

INTRODUCTION

Sedimentary rocks of Jurassic age are widely exposed in New Mexico and are almost totally of nonmarine origin, yet they have yielded a relatively sparse record of vertebrate fossils. In part, this is because a substantial part of the Jurassic strata in New Mexico are in facies—eolian and evaporitic—that do not usually yield vertebrate fossils. The only Middle Jurassic vertebrates from New Mexico are “holostean” fish from the Luciano Mesa Member of the Todilto Formation (Hunt and Lucas, 1993; Lucas and Heckert, 2015). However, a lack of searching New Mexico’s Jurassic rocks for fossil vertebrates is a significant factor in our limited knowledge of the Jurassic vertebrate fossil record in New Mexico (Lucas and Hunt, 1985; Hunt and Lucas, 1993; Lucas et al., 1996; Lucas and Heckert, 2000, 2015). Most of New Mexico’s Jurassic vertebrate fossils are from the Upper Jurassic (Kimmeridgian-Tithonian?) Brushy Basin Member of the Morrison Formation and include the turtle *Glyptops*, the theropod dinosaurs *Allosaurus* and *Saurophaganax*, the ornithischians *Stegosaurus* and an ankylosaur and (mostly) sauropod dinosaurs identified as *Apatosaurus*, *Brachiosaurus*, *Camarasaurus* and *Diplodocus* (= “*Seismosaurus*”). Here, we add to the sparse record of vertebrate taxa from the Morrison Formation in New Mexico a goniopholidid crocodilian, the first Jurassic crocodile fossil discovered in New Mexico. In this paper, NMMNH refers to the New Mexico Museum of Natural History and Science in Albuquerque.

PROVENANCE

The crocodile fossil documented here was discovered in September 2018 by Ben Chesebrough in the Ojito Wilderness area near San Ysidro in Sandoval County (Fig. 1). In July 2019, Lucas, accompanied by the Chesebroughs and BLM staff, collected the fossil with hand tools. The fossil locality is locality 12333 in the NMMNH database, and detailed locality data are available to qualified researchers.

The fossil was in a calccrete-pebble conglomerate at the base of a crossbedded sandstone and above green- and salmon-colored mudstone, stratigraphically low in the Brushy Basin Member of the Morrison Formation (Fig. 1). Locally, the Brushy Basin Member is ~ 80 m thick, and NMMNH locality 12333 is stratigraphically below most of the dinosaur localities in the area, including the type locality of the sauropod dinosaur “*Seismosaurus*” *hallorum* (Anderson and Lucas, 1996, fig. 5).

DESCRIPTION

NMMNH P-81149 (Fig. 2) is part of the medial, postero-dorsal region of the skull (part of the posterior skull table). It includes most of the unpaired parietal, fragments of the frontals, fragments of the left squamosal and a partial endocast. Indeed, the parietal appears to have broken close to its sutures with the squamosals (laterally) and the frontals (anteriorly). The parietal is trapezoidal to nearly square in dorsal view, and its posterior edge is flat to slightly concave. The dorsal surface of the parietal is covered by the ridge-and-pit sculpture of the dermal bone that is characteristic of many crocodilians. Width across the posterior end of the parietal is ~ 32 mm.

The medial edge of the right supratemporal fenestra is a nearly vertical, smooth bone surface that is concave laterally. The same surface of the left supratemporal fenestra is displaced by fracturing so that it faces nearly dorsally. The visible portion of the endocast reveals the broad cerebrum ventral to the frontal that tapers anteriorly to a short, anteriorly convex olfactory peduncle (cf. Storrs et al., 1983, fig. 1).

IDENTIFICATION AND SIZE

On NMMNH P-81149, there is no exposure of the supraoccipital on the dorsal skull roof, a feature considered a synapomorphy of the Goniopholididae (Pritchard et al., 2013). Other features of the specimen are a close match to the morphology of *Eutretauranosuchus* and *Amphicotylus*. However, the specimen is too incomplete to be assigned to a

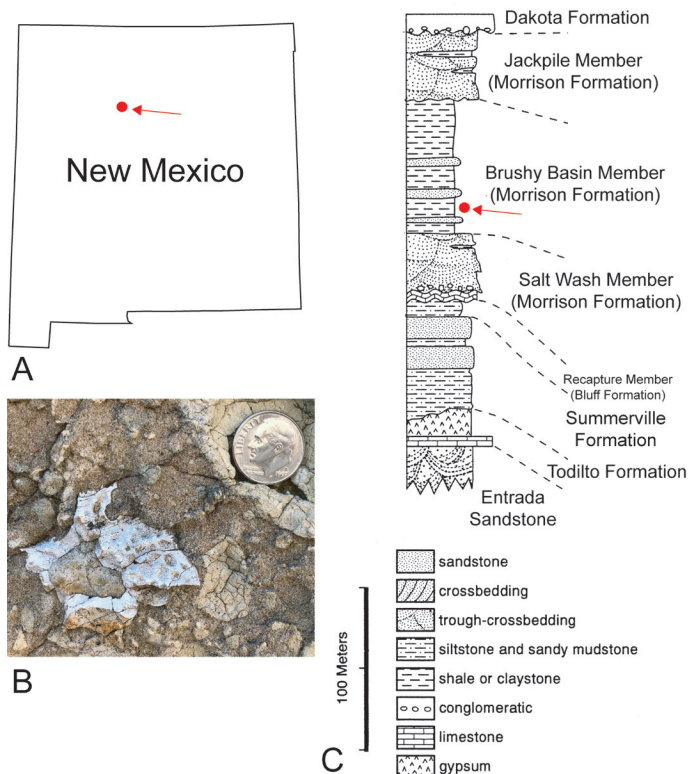


FIGURE 1. Index map (A), photograph of crocodilian skull fragment in situ (B) and generalized Morrison Formation stratigraphic section in the San Ysidro area (C, modified from Anderson and Lucas, 1996) showing location of NMMNH locality 12333 (red dot), the locality of the crocodilian fossil described here.

genus, so we identify it only as a goniopholidid.

Scaled to the skull of *Eutretauranosuchus delfsi* illustrated by Pritchard et al. (2013, fig. 2), NMMNH P- 81149 represents a skull about 26 cm long. By comparison to complete skulls and skeletal material of goniopholidids (e. g., Salisbury et al., 1999; Schwartz, 2002; Andrade et al., 2011; Pritchard et al., 2013), the New Mexico fossil represents a crocodile with a total body length of about 1.5 m. This seems small for a modern crocodile, but it is an average size for a Late Jurassic goniopholidid crocodile (Fig. 3).

SIGNIFICANCE

The Morrison Formation has yielded a diverse assemblage of crocodilians, mostly from fossils found in Wyoming, Colorado and Oklahoma (Foster, 2003, 2006, 2018; Hups et al., 2006; Foster et al. 2020). These are large, semi-aquatic neosuchians, the goniopholidids *Amphicotylus* and *Eutretauranosuchus*, and smaller, more terrestrial taxa such as *Hallopus*, *Fruitachampsia* and *Macelognathus*. According to Hups et al. (2006), there are at least 44 fossil neosuchian crocodilian localities known in the Morrison Formation. Most of these localities are in river channel or wet overbank floodplain deposits. The goniopholidid fossil reported here fits that pattern as it is from a calcrete-pebble conglomerate at the base of a channel sandstone bed.

Relatively little effort has been made by paleontologists to look for vertebrate fossils in the Morrison Formation in New Mexico. A good example is the extensive Morrison outcrop belt in the southeastern San Juan Basin, which has been little explored for fossils. The discovery of a Morrison Formation crocodilian fossil documented here comes more than one



FIGURE 2. NMMNH P-81449, stereophotograph of partial skull table of a goniopholidid crocodilian from the Morrison Formation at NMMNH locality 12333. Abbreviations are: e = endocranium, p = parietal and s = supratemporal fenestra.



FIGURE 3. Artist's reconstruction of a Late Jurassic goniopholidid crocodilian (artwork by Matt Celeskey).

century after the first discovery of dinosaur bones in the New Mexico Morrison. The discovery of the crocodile fossil, as well as the relatively recent discovery (early 2000s) of a Morrison turtle fossil in New Mexico, provide incentive to search further for relatively small, non-dinosaurian vertebrate fossils in the New Mexican Morrison Formation.

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