

New remains of the mosasaur *Globidens alabamaensis* from the North Sulphur River of Texas

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Abstract:

Here, we report on the important discovery of two well-preserved maxillae from the durophagous mosasaur *Globidens alabamaensis* Gilmore, 1912. The maxillae were found in the Ozan Formation embedded in the North Sulphur River channel near Ladonia, Fannin County, Texas, USA. Both maxillae preserve nearly complete tooth rows. In North America, *Globidens* is amongst the rarest mosasaurs, with remains consisting predominantly of isolated teeth and jaw fragments.

Key words: Mosasaur, *Globidens*, Late Cretaceous, Campanian, Texas.

Introduction

The mosasaurid reptile *Globidens* possessed tribodont teeth and massive jaws for a specialized durophagous diet (Martin and Fox, 2007). This genus is currently known by five species: *G. alabamaensis* Gilmore, 1912 from the Early to mid-Campanian of Alabama, Mississippi and Texas, USA, and Hainaut, Belgium; *G. dakotensis* Russell, 1975 from the Campanian of Kansas and South Dakota, USA; *G. phosphaticus* Bardet et al., 2005 from the Maastrichtian of Angola, Brazil, Egypt, Israel, Jordan, Morocco, and Syria; *G. schurmanni* Martin, 2007 from the Campanian of South Dakota, USA; and *G. hisaensis* Kaddumi, 2009 from the Late Campanian/Early Maastrichtian of Jordan. These occurrences predominantly exist between subtropical paleolatitudes, seemingly indicative of an equatorial geographic range that tracked benthonic bivalve populations along the coral and rudist reefs of the Late Cretaceous.

Within Cretaceous exposures of the Western Mississippi Embayment, *Globidens* is among the rarest mosasaurs (Thurmond, 1969). Complete and near-complete material is exceedingly uncommon with remains mostly consisting of isolated teeth and jaw fragments. Here, we report on a pair of well-preserved maxillae from the species *Globidens alabamaensis* recovered by fossil hunter Courtney Travanini from the Ozan Formation of northeastern Texas, USA.

Material and Methods

The studied specimens come from the Ozan Formation (Lower Taylor Marl *sensu* Beall, 1964) of northeast Texas, USA. This formation is part of the Gulfian series of North America,

laid down during the mid-Campanian in an inner to outer shelf depositional environment of moderate depth (Dane, 1926; Echols, 1984). Its lithology consists of blue-gray calcareous mudrocks and sandy clays containing the oyster shell *Exogyra ponderosa* Roemer, 1852.

A condensed zone in the Ozan Formation is composed of glauconitic packed biomicrite containing phosphatic nodules, iron-manganese casts, and many vertebrate and invertebrate fossils (Echols, 1972). It is approximately 8 inches thick and occurs 150 feet above the Gober Chalk (Paulson, 1960). *Inoceramus*, *Hamites*, and *Baculites* are abundant throughout. The condensed zone spans the *Baculites aquilaensis* to *B. mclearnii* zones of Echols (1984) and Cobban (1993). Outcrops are rusty red due to the weathering of glauconite. Fossil content in the condensed zone is frequently disarticulate and heavily worn. Mosasaurid remains are frequently found in and above the condensed zone.

The fossils were discovered associated *in situ* and are currently retained in the discoverer's collection. Figures were prepared using GIMP 2.10.20. Anatomical terminology follows Russell, 1967. Dental terminology follows definitions outlined in Hornung and Reich, 2015 and subsequent usage in Rempert et al., 2022.

Abbreviations: BHIGR – Black Hills Institute of Geological Research, Hill City, SD, USA; CTC – Courtney Travanini personal collection; ERMNH – Eternal River Museum of Natural History, Amman, Jordan; FMNH – Field Museum of Natural History, Chicago, IL, USA; SDSM – School of Geology, South Dakota School of Mines and Technology, Rapid City, SD, USA; SMU – Shuler Museum of Paleontology, Southern Methodist University, Dallas, TX, USA; USNM – United States National Museum, Washington, D.C., USA; WFFM – World Fossil Finder Museum, Hot Springs, SD, USA.

Systematic Paleontology

Order Squamata Oppel, 1811
Family Mosasauridae Gervais, 1853
Subfamily Mosasaurinae Gervais, 1853
Genus *Globidens* Gilmore, 1912
Globidens alabamaensis Gilmore, 1912

Referred material – CTC 01, left and right maxillae with associated rooted teeth (Fig. 1,2).

Locality and horizon – All material was found *in situ* within the “red bed” of the Ozan Formation (Lower Taylor Marl) near Ladonia, Fannin County, Texas, USA.

Description

CTC 01 comprises two complete maxillae from the same individual. The left maxilla preserves 12 maxillary tooth positions with the third, fourth, sixth, eighth, tenth, and eleventh tooth crowns present; the right maxilla preserves 12 maxillary tooth positions with the second through thirteenth tooth crowns present. Additionally, two isolated rooted teeth were also found in close association. Based on the size and morphology of the isolated teeth, they presumably originated from the mid-margin of the dentary.

The maxillae are robust and massive, similar to those seen in large prognathodontin mosasaurs (Longrich et al., 2022). While obscured due to preservation, the emargination of the dorsal margin of the maxillae as described by Gilmore (1912) can be observed above the fifth

maxillary teeth. The outer cortical surface of the maxillae is eroded, preventing observation of foramina.



Figure 1. A) Left maxilla in labial view. B) Right maxilla in labial view.

Tooth crowns in the first three maxillary tooth positions are tall and cylindrical with a posteriorly pointing apex. Starting with the fourth and continuing to the thirteenth maxillary tooth, crowns are subspherical in shape. Tooth size generally increases from first through tenth maxillary tooth positions. The eleventh to thirteenth tooth crowns are low-domed and considerably shorter than the preceding teeth.

All teeth bear coarse anastomosing enamel that consists of a fine wrinkled texture that thickens near the apex. Enamel thins towards the base of the crown to the point that crown bases are often smooth to the touch. Tooth crowns are equipped with minute carinae that point antero-posteriorly. Carinae do not bear serrations or crenulations. Tooth crowns are circular in basal cross-section. There is no constriction of tooth roots below the crown bases.

Pits for replacement teeth are visible on the medial side of the left maxilla at tooth positions four, six, and seven. A germ tooth in the left seventh maxillary tooth alveolus is approximately the same size as a mature one (Fig. 3).

Discussion

The new material can be confidently referred to *Globidens* Gilmore, 1912 based on the robust mosasaurian maxillae bearing heterodont, globular teeth (Gilmore, 1912; Gilmore, 1927).

While the holotype maxilla of *G. alabamaensis* (USNM 6527) is incomplete, an undescribed specimen in the collections of Southern Methodist University suggests it would have



Figure 2. Associated rooted tooth in Labial view.



Figure 3. Lingual view of the right maxilla showing germ tooth in 7th tooth position.

borne 13 teeth (SMU “Gary Wallace specimen”). In comparison, the maxillary tooth count of *G. dakotensis* is 13 (FMNH PR 846), 11 in *G. schurmanni* (SDSM 74764), and 10 in *G. phosphaticus* (BHIGR unnumbered, WFFM 22-3-0027, WFFM 20516). The maxillae in CTC 01 each preserve 12 tooth positions with evidence of the anteriormost tooth alveolus having been worn away. The maxillary ventral margin of CTC 01 is straight, as it is in all *Globidens* species.

The crushing teeth of CTC 01 possess the subspherical morphology typical of *G. alabamaensis* (Fig. 4). While similar in shape to the teeth of *G. dakotensis*, the crowns of CTC 01 are generally taller and narrower, as is expected of *G. alabamaensis*. The teeth of CTC 01 differ widely from those of *G. schurmanni*, which had symmetrical bell-shaped teeth, and *G. phosphaticus*, which had teeth with pronounced posterior buttressing and sulci. In comparison with material from *G. hisaensis* (ERMNH HPF/HM 1-12), *G. phosphaticus*, and *G. schurmanni*, teeth of CTC 01 lack an apical nubbin (raised mammilla of Everhart, 2008) and root constriction below the crown base.

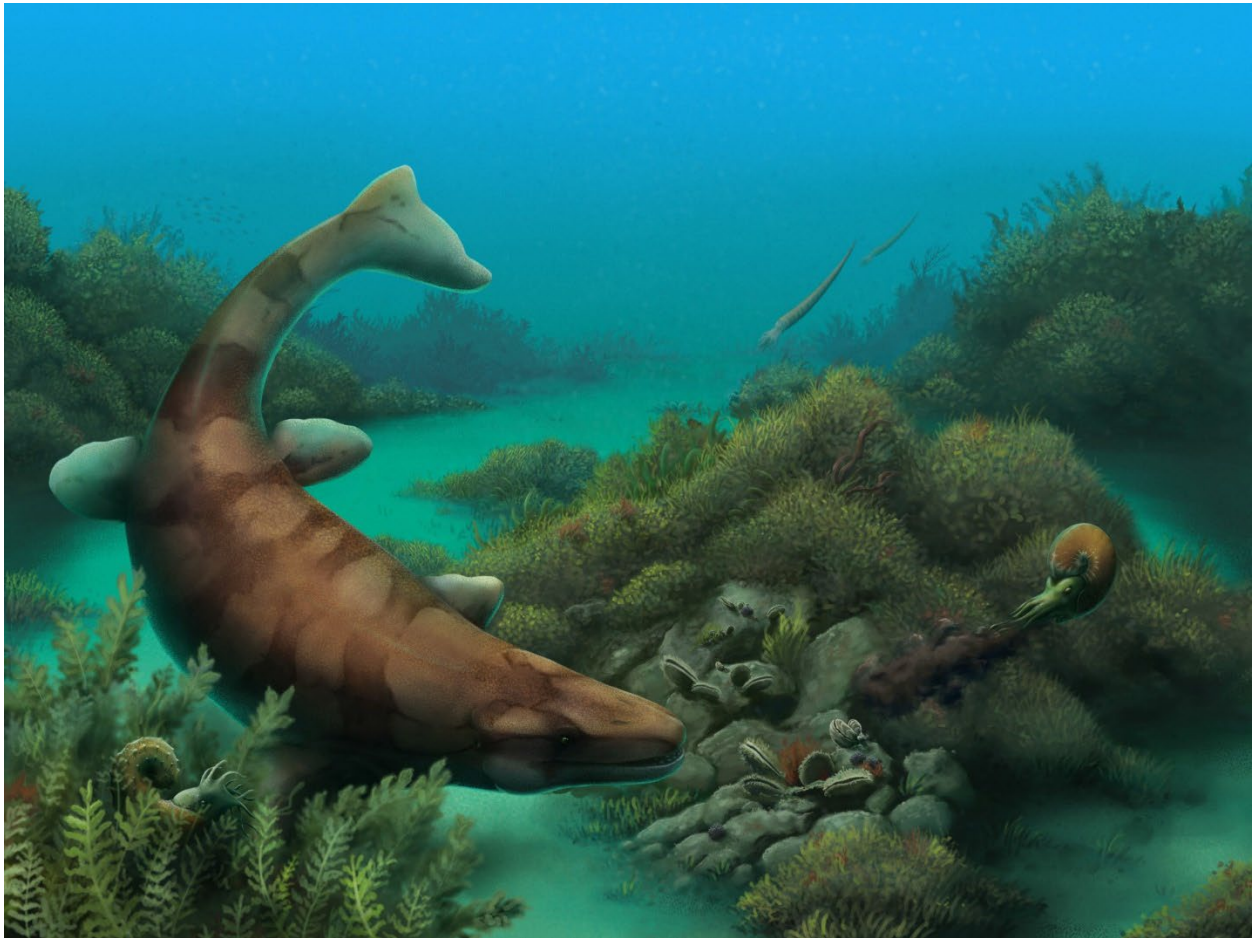


Figure 4. Reconstruction of *Globidens alabamaensis* Gilmore, 1912. Illustration by Nathan Dehaut.

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