

A GAR-BITTEN COPROLITE FROM THE
EOCENE GREEN RIVER FORMATION
NEAR KEMMERER, WYOMING, U.S.A.

George Frandsen^{*, 1} and Stephen J. Godfrey^{2, 3}

* Author for correspondence.

¹PO Box 350426, Jacksonville, FL 32235 U.S.A.
gnfrandsen@yahoo.com

²Department of Paleontology, Calvert Marine
Museum, PO Box 97, Solomons, Maryland,
20688, U.S.A.

Stephen.Godfrey@calvertcountymd.gov

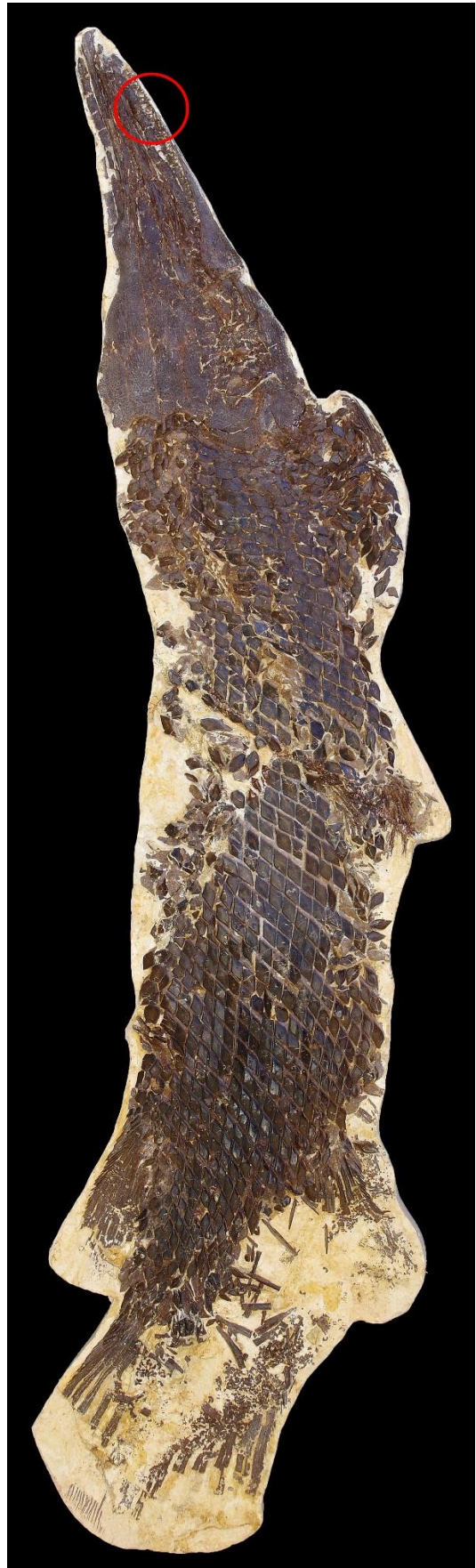
³Research Associate, National Museum of
Natural History, Smithsonian Institution,
Washington, DC, 20560, U.S.A.

Abstract: Known vertebrate-bitten coprolites (fossilized feces) are exceedingly rare in the fossil record. Here we describe the first vertebrate-bitten coprolites preserved within the mouth of a vertebrate, a gar (*Atractosteus simplex*). Two of the gar's lower teeth are imbedded in one of the coprolites. The Eocene epoch coprolite-biting gar derives from the mini-fish beds near the K-spar tuff bed near Kemmerer, Wyoming. These approximately 52 million-year-old fossil-rich sediments form part of the Fossil Butte Member of the Green River Formation. This remarkable specimen is the first-known fossil to show an animal with feces in its mouth at the time of death. *Atractosteus simplex* probably preyed on other fishes. Gars are not known to engage in coprophagy (the eating of feces), so the occurrence of coprolites in the mouth of this specimen is unexpected and many have been serendipitous/taphonomic.

INTRODUCTION

Of all the coprolites known from the fossil record, only three have been formally recognized as preserving vertebrate tooth impressions or bite traces (Godfrey and Smith, 2010; Godfrey and Palmer, 2015). However, other vertebrate-bitten coprolites are known to exist in private collections.

Figure 1. Nearly complete and articulated skeleton of *Atractosteus simplex* (catalog number W20) in a right lateral view. The red circle towards the top of the image outlines the area where the coprolites between the jaws of the gar are preserved.



Here we describe one of these (Figs. 1-3), an articulated Eocene gar (*Atractosteus simplex*) in which two of the teeth in its lower jaw are

imbedded in a coprolite. (This specimen, catalogued as W20, is presently in the private collection of the primary author (GF) and will be made available to qualified researchers upon request). It is estimated that only one in every 5000 fishes excavated from the Fossil Butte Member are gars, making this a rare find. Fish coprolites like the ones figured here are fairly common in the Fossil Butte Member (Edwards, 1976). However, to date, no coprolite has ever been found in the mouth of any fossilized vertebrate. Therefore, the presence of two coprolites in the mouth of W20 is, to our knowledge, unique in the fossil record. It is the first known fossil to show an animal with feces in its mouth at the time of death.

GEOLOGIC SETTING

The Eocene fossil gar was excavated from the mass mortality mini-fish beds near the K-spar tuff bed. This 52 million-year-old fossil-rich rock layer is part of the Fossil Butte Member of the Green River Formation. Most of the vertebrate fossils discovered in this area comprise well-preserved fish from an Eocene complex of intermontane lakes that once occupied the landscape 53-49 million years ago (Smith and Carroll, 2015). A variety of fossilized plants, amphibians, reptiles, birds, mammals, and trace fossils including coprolites have also been found in the area (Grande, 2013). Much has been written on the Eocene biota known from the Green River Formation (including Scudder, 1878; Piccini, 1997; Grande, 2013; Smith and Carroll, 2015 and the references therein).

MATERIAL AND METHODS

The *Atractosteus simplex* (W20) specimen figured here (Figs. 1-3) was discovered by Dean Sherman in 2017 in his private fossil quarry near Kemmerer, Wyoming (<https://instonefossils.com/p/fossil-excursion>). Sherman recovered this 914mm (36 inches)-long and 144mm (5.6 inches)-wide specimen in several pieces. He reassembled the pieces and removed the thin veneer of rock covering the fish. While preparing the head, he noticed the two coprolites between its jaws (Figs. 2-3).



Figure 2. View of the right mid-jaw section of the gar, W20. The red circle outlines the coprolite in which two teeth are imbedded (see also Figure 3 for more detail).

DESCRIPTION

Gande (2010) has provided multiple photographs and given a detailed description of the anatomy of the simplex gar.

The coprolites (Fig. 3) in the gar's mouth are similar in size, shape, texture, and color to other fish coprolites found in the Fossil Butte Member of the Green River Formation (Edwards, 1976). (However, no chemical or spectral analysis was conducted on these to confirm their identity as coprolites.) The largest coprolite was bitten through its width, leaving a 3.67mm (.14 inches) circular remnant embedded in between two teeth. This indicates that the original fecal mass was durable, yet soft, when it entered the gar's mouth. The smaller coprolite is 2.52mm (.09 inches) long with a diameter of 1.48mm (.05 inches) in length and is 2mm away from the larger piece (Fig. 3, the smaller coprolite is in the upper left-hand quadrant of the image).

DISCUSSION

Godfrey and Palmer (2015) described a gar-bitten coprolite from South Carolina. Because gars are not known to engage in coprophagy, Godfrey and Palmer (2015) attributed the bite marks to an accidental or serendipitous strike, rather than to a deliberate attempt by the gar to eat the feces.

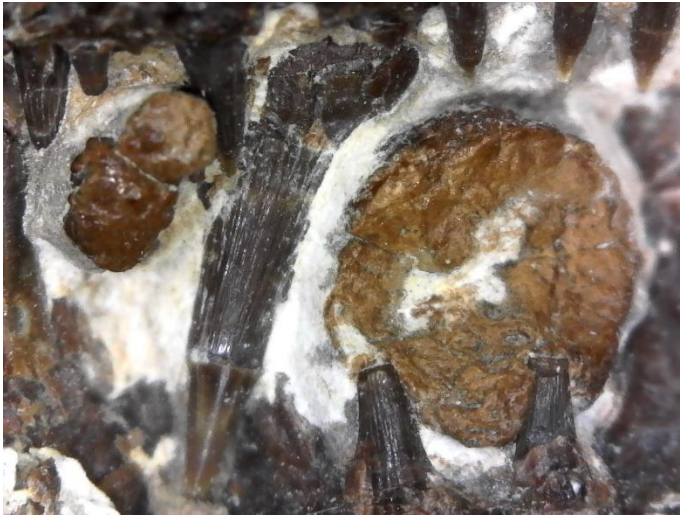


Figure 3. Detailed view of the two coprolites in the mouth of the simplex gar, W20. Two of the gar teeth are imbedded in the larger coprolite seen on the right side of the photo.

In reference to W20, we do not know that the gar was deliberately trying to consume the feces at the time of death. If gars were not so heavily scaled, it would be easier to analyze the stomach contents of fossilized individuals (Grande, 2010). So the occurrence of the coprolites in the mouth of this specimen many have been serendipitous/taphonomic (i.e., they entered the gar's mouth unintentionally at or near the time of death). Although much less likely because the coprolites are so well formed, the reader should know that we could not rule out the possibility that these bromalites (Hunt and Lucas, 2012; i.e., material from the digestive system of an organism) actually represent regurgitalites, that is, vomit that made its way into the gar's mouth just before, during, or immediately after it died and then fossilized.

ACKNOWLEDGMENTS

We would like to thank Dean Sherman for discovering, preparing, and allowing the primary author to purchase this gar for their collection. (This specimen will be made available to qualified researchers upon request.) This article was made possible in part by funding from the citizens of Calvert County and the County Board of Calvert County Commissioners.

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