

PALAEONTOLOGY AND GEOLOGY OF THE BRIDGER FORMATION,
SOUTHERN GREEN RIVER BASIN, S.W. WYOMING, U.S.A.
PART 8¹. FISH OTOLITHS FROM THE TWIN BUTTES MEMBER,
UPPER BRIDGER FORMATION

DIRK NOLF

Koninklijk Belgisch Instituut voor Natuurwetenschappen
Brussels, Belgium

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Screenwashing of fluvial sediments of the Twin Buttes Member, upper Bridger Formation (middle Eocene) has yielded 439 fish otoliths. These are the first to be reported from this formation. From this lot a single specimen belongs to a fossil species of the genus *Amia* Linnaeus, 1758; the remaining 438 otoliths are referred to as 'genus *Percoideorum*' *bridgerensis*, a new species of percoid which should probably be placed in an extinct family.

Key words — Pisces, Osteichthyes, Eocene, Lutetian, U.S.A., new taxon.

D. Nolf, Koninklijk Belgisch Instituut voor Natuurwetenschappen, Departement Paleontologie, Vautierstraat 29, 1040 Brussels, Belgium.

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INTRODUCTION

The continental Eocene strata of southwestern Wyoming, near the borders of Colorado, Utah and Idaho, are renowned for their rich and well-preserved faunas of fossil vertebrates. During the Eocene, a considerable part of the central and southern Green River Basin and adjacent areas was occupied by at least three large lakes. Sediments deposited in these lakes now represent one of the most significant documented accumulations of lacustrine rocks in the world. These sediments, known as the Green River Formation, extend over

an area of more than 65,000 square kilometres and average about 600 metres in thickness (Bradley, 1929, 1964).

Many well-preserved vertebrate skeletons, mainly fish with their bones still in anatomical connection, have been collected from the Green River Formation and are now dispersed over various museum collections over the world. They also are seen frequently in shops trading fossils and other natural history objects. The fossil fishes of the Green River Formation (26 species) have been described recently by Grande (1980). In this well-illustrated monograph, the reader will also find maps indicating the extension and geographic position of the three major fossil Green River lakes (Fossil Lake, Lake Gosiute and Lake Uinta) ranging from the late Palaeocene to the late middle Eocene. During the middle Eocene (Lutetian) fluvial sediments known as the Bridger Formation, were deposited in

¹ Parts 1-7 of this series were published between 1976 and 1984 in the 'Contributions in Biology and Geology of the Milwaukee Public Museum', nos 1-7.

the area immediately adjacent to the western shore of Lake Gosiute. As the lake was constricted in size throughout the middle Eocene, fluvial deposition became dominant so that substantial portions of the Green River Formation are covered by Bridger Formation deposits. These sediments have yielded the extensive faunas which typify the Bridgerian land mammal age of Wood *et al.* (1941).

In recent years, sediments from several localities in the Twin Buttes Member of the Bridger Formation (Bridger C and D) have been screenwashed by Dr R. M. West in order to obtain small fossil vertebrates, particularly mammals and reptiles, but also fish, amphibians and birds. Three localities have also yielded otoliths, which are the first such fish remains to be reported from these deposits.

The present assemblage contains only two species, one referred to the genus *Amia*, represented by a single otolith, and a percoid, represented by 438 otoliths. The samples contain both light buff and white otoliths in which the original aragonitic material has been conserved, and blue or black specimens in which all aragonite has been replaced by calcite, without noticeable change of their morphology. Replacement of aragonite by calcite is not common in fossil otoliths; an explanation of the cause of this diagenesis is not attempted here. All this material is in the vertebrate palaeontology collection of the Milwaukee Public Museum (Wisconsin, MPM registration numbers).

LOCALITY DATA

A generalised geological map of the southern Green River Basin, showing areas and localities of palaeontological interest was published by West (1976). Detailed locality data are to be found in the files of the Geology Section, Milwaukee Public Museum (MPM).

- MPM locality 1102 = Stuck Truck; middle Bridger C; point 8 of West's (1976) map (410 otoliths, 90% of these consisting of calcite and 10% of aragonite).
- MPM locality 2911 = 1,350 m SE of locality 1102; middle Bridger C (28 otoliths, 7.5% of these consisting of calcite and 92.5% of aragonite).
- MPM locality 3078 = Behunin; point 3 of West's (1976) map; basal Bridger D (1 otolith, consisting of aragonite).

SYSTEMATICS

Class	Osteichthyes
Family	Amiidae
Genus	<i>Amia</i> Linnaeus, 1758

Type species — *Amia calva* Linnaeus, 1766.

***Amia* sp.**

Pl. 1, Fig. 8

Material — One lagaenar otolith, MPM locality 1102, MPM 6804.

Description — This specimen closely resembles the lagaenar otoliths of the Recent species, *Amia calva* Linnaeus, 1766 (Nolf, 1985, fig. 31A), but can be distinguished from these by the generally rounded outline and in that the thickest part of the otolith is situated in the central area of the outer face, while in *Amia calva* it is situated in the ventral part.

Although this otolith is clearly different from those of *Amia calva* it appears inappropriate to introduce a new taxon for it, because two other fossil species of *Amia* have been described on the basis of skeletons from the adjacent Green River Formation (Grande, 1980, pp. 52, 53). Unfortunately, otoliths of these species are unknown, but as they are nearly contemporary with the otolith discussed here and occur in the same geographic area, it seems reasonable to assume that the otolith from the Bridger Formation belongs to one of those species.

Infraclass	Teleostei
Suborder	Percoidei <i>incertae sedis</i>

'genus Percoideorum' bridgerensis n. sp.

Pl. 1, Figs 1-7

Primary types — Holotype, a left saccular otolith (Pl. 1, Fig. 7) (MPM 6803) MPM locality 1102. Paratypes: 408 saccular otoliths from MPM locality 1102, six of them here illustrated (Pl. 1, Figs 1-6) (MPM 6797-6802); 28 saccular otoliths from MPM locality 2911 and one specimen from MPM locality 3078.

Dimensions of the holotype — Length 4.0 mm, height 2.7 mm.

Type locality — Twin Buttes Member of the Bridger Formation at MPM locality 1102, southwestern Wyoming, U.S.A.

Etymology — Named after the geological formation from which the material was collected.

Diagnosis — This species is based on elliptical otoliths lacking an ostium clearly opening towards the rim. The outer face, slightly hollowed out antero-

posteriorly, is rugose, but bears no clearly structured ornamentation. The inner face is bulging and provided with a well-incised sulcus consisting of a rather large ostium and a smaller cauda. The posterior part of the cauda is slightly enlarged and curved in the ventral direction. Near the caudal crista inferior there is a collicular crest following part of the ventrally curved posterior caudal end. The anterior part of the salient crista superior is clearly thickened in most of the specimens. There is a ventral furrow; the area below it is more rugose than the area above it. As a rule, otoliths of juveniles of this species have a more rounded outline than those of adults.

Discussion — Although the outline, convexity and sulcus morphology of these otoliths are indicative of a percoid, their detailed morphology does not fall within the range of any of the known families of the suborder. Grande (1980) mentioned two families from the Green River Formation, the Asineopidae, which are *incertae sedis* acanthomorphs and the percoid Priscacaridae, but their otoliths are unknown. It is quite possible that the otoliths here described belong to one of the species referred to these families. Unfortunately, it is unlikely that skeletons with otoliths *in situ* will be found in the Green River Formation; therefore it is preferable to establish a new species for these otoliths, especially since they are morphologically well characterised, and occur in great numbers.

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PLATE I

All the figured specimens are deposited in the collections of the Geology Section, Milwaukee Public Museum, Wisconsin, U.S.A., and have MPM registration numbers.

- Figs 1-7. 'genus *Percoideorum*' *bridgerensis* n. sp. All specimens from MPM locality 1102, southwestern Wyoming, U.S.A.
1-4. left saccular otoliths, inner faces (MPM 6797-6800), paratypes.
5, 6. right saccular otoliths, inner faces (MPM 6801, 6802), paratypes.
7a, b. left saccular otolith, inner face and ventral view, respectively (MPM 6803), holotype.
Figs 8a-c. *Amia* sp. Right lagaenar otolith (MPM 6804), from MPM locality 1102, southwestern Wyoming, U.S.A., inner face, outer face, and posterior view, respectively.

PLATE 1

