

# Discovery of †Obaichthyidae gars (Holostei, Ginglymodi, Lepisosteiformes) in the Aptian Codó Formation of the Parnaíba Basin: Remarks on paleobiogeographical and temporal range



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## ABSTRACT

Here we report the first †obaichthyid gar from the Lower Cretaceous (Aptian) Codó Formation of the Parnaíba Basin, Northeastern Brazil. It shows the following obaichthyid characters: numerous odontodes firmly attached to the outer surface of the dermal bones, free and mobile maxilla, presence of interopercle, lack of contact between the metapterygoid and ectopterygoid, absence of lacrimomaxillary bones, and a prominent spine at the posterior margin of the scales. Due to the presence of scales bearing a prominent ventral posterior spine and a number of additional posterior marginal spines, the fish from the Codó Formation is noticeably the same species found in the Albian Santana Formation of the Araripe Basin, *Dentilepisosteus laevis*. Although probably restricted to fresh or brackish water, the new discovery adds one more taxon to the assemblages found in the Parnaíba and the Araripe basins. The new record extends the temporal range of this species down into the Aptian (about ~10 myr older than the previous occurrence).

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## 1. Introduction

Distributed today in freshwater, and rarely coastal areas of northern parts of the Western Hemisphere, between Southern Canada and Costa Rica, lepisosteiformes, popularly known as gars, are a group of neopterygian fishes with a formerly worldwide distribution, especially during the Cretaceous and Paleogene. Lepisosteiformes *sensu* Grande 2010, had been classified into two families: Lepisosteidae, a group including modern gars, are known from the Late Cretaceous, and include the extant forms as well as various fossils from all continents, except Antarctic and Australia; and Obaichthyidae, a group until now restricted to the «mid» Cretaceous (Albian/Cenomanian) of the western part of Gondwana (Grande, 2010; Alvarado-Ortega et al., 2016).

Obaichthyid gars were first described by Wenz and Brito (1992) who proposed the new genus *Obaichthys* for two species from the Albian Santana Formation of the Araripe Basin: *O. decoratus* and

*O. laevis*. Besides being the oldest lepisosteiformes known, these species also retained some characters considered primitive for neopterygians, such as the presence of a free maxilla, two post-orbital bones, and paleoniscoid-type scales (Wenz and Brito, 1992, 1996; Brito et al., 2006). Grande (2010) reviewed the Lepisosteiformes and proposed a new family Obaichthyidae. He also created a second genus (*Dentilepisosteus*) for *O. laevis*. In the same paper, he described two other species of obaichthyids: *Obaichthys africanus* and ?*Dentilepisosteus kemkemensis* both from the ?Upper Cretaceous Kem Kem beds of Morocco. Recently, Brito and Yabumoto (2011) recorded another obaichthyid in the Crato Formation of the Araripe Basin, that seemed to be more related to *D. laevis* than to *O. decoratus*. Here we report the presence of the obaichthyid, *Dentilepisosteus laevis* (Wenz and Brito, 1992) in the Aptian Codó Formation of the Parnaíba Basin, in northeastern Brazil, the first record of this species outside the Araripe Basin. This new finding extends the temporal range of *Dentilepisosteus laevis* to the Aptian.

## 2. Locality, distribution, and geological age

The specimens described here were collected in the Lower Cretaceous Codó Formation, at the Parnaíba Basin, in the quarries of Perneta Ranch, near the town of Brejo, State of Maranhão,

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northeastern Brazil (Fig. 1). The Parnaíba Basin occupies an area of about 600,000 km<sup>2</sup>, covering the states of Maranhão, Piauí, Pará, Ceará, Goiás, and parts of Tocantins. Its sedimentary succession at its depocenter reaches thicknesses of the order of 3400 m, of which about 500 m represent Mesozoic strata (Mesner and Wooldridge, 1964).

The age of the Codó Formation is widely accepted as Aptian and is mainly based on palynological data (Lima, 1982). Deposits assigned to the Codó Formation are geographically restricted and discontinuous. They are exposed in the beds of rivers that drain the center of the basin, from the western margin, at the confluence of the Tocantins and Araguaia Rivers, until near the margin of the Parnaíba River, in the town of Brejo (Santos and Carvalho, 2009). The Codó Formation is divided into three depositional cycles, following stratigraphical interpretations. The lowest cycle represents a lacustrine facies culminating with evaporite cycles, suggesting a subsequent regression or the establishment of a restricted sea; the second cycle shows a new marine transgression culminating with the third cycle with the establishment of palustrine conditions on a tidal flat (Mesner and Wooldridge, 1964; Rezende and Pamplona, 1970; Leite et al., 1975; Fernandes and Piazza, 1978; Lima and Leite, 1978). Analysis of the paleobiota of the first cycle suggests a marine – brackish lacustrine setting (Lima and Leite, 1978).

### 3. Palaeoenvironment

The Codo Formation has yielded numerous fossils including palynomorphs, macrophytes, foraminifera, crustaceans, bivalves, gastropods, and fishes (Santos and Carvalho, 2009; Lindoso et al., 2011; 2013; Lindoso, 2012). The fishes, which form the most abundant element of this biota, are exceptionally abundant and have affinities with the ichthyofauna of the Santana and Riachuelo formations, respectively from the Araripe and Sergipe/Alagoas basins (Santos and Carvalho, 2009). Fish taxa include *Calamopleurus cylindricus* Agassiz, 1841; *Brannerion latum* (Agassiz, 1841);

*Araripelepidotes temnurus* (Agassiz, 1841); *Tharrhias araripes* Jordan and Branner, 1908; *Vinctifer comptoni* (Agassiz, 1841), *Santanichthys diasii* (Santos, 1958); *Cladocycclus gardneri* Agassiz, 1841, *Codoichthys carnavali* Santos, 1994; *Rhacolepis buccalis* Agassiz, 1841; and mawsoniid coelacanth, probably *Axelrodichthys araripensis* Maisey, 1986 (Santos, 1974, 1985, 1992, 1994; Santos and Carvalho, 2009; Carvalho et al., 2013).

### 4. Material and methods

The present study is based on two partial specimens from the Codó Formation, preserved in calcareous concretions and housed in the Collection of the Universidade Federal do Rio de Janeiro and Centro de Pesquisa de História Natural e Arqueologia do Maranhão, accession numbers respectively are: UFRJ-DG 828P and CPHNAMA-VT 1242. One of these specimens (UFRJ-DG 828P) was prepared using the transfer method of Toombs and Rixon (1959). The prepared fossil comprised two halves of a concretion and reveals part of the skull including dermal bones, part of the braincase, pectoral girdle, some vertebrae, and many scales (Figs. 2 and 3).

**Comparative material** — *Dentilepisosteus laevis*: UERJ-PMB 233 (a semi-complete specimen preserved in lateral view from the Crato Formation), UERJ-PMB 144 (a semi-complete specimen, lacking the skull, preserved in lateral view from the Crato Formation), MPSC 901 (complete specimen, preserved in lateral view from the Santana Formation); “*Belonostomus*” *carinatus*: NHMUK PV P.10062 (some isolated scales from the Marfim Formation, Recôncavo Basin); *Oniichthys (Atractosteus) falipoui*: UERJ-PMB 67 (a semi-complete, three dimensional specimen, lacking the dorsal, anal and caudal fins, from the Kem-Kem beds of Morocco).

### 5. Systematic palaeontology

Neopterygii Regan 1923

Holostei sensu Grande, 2010

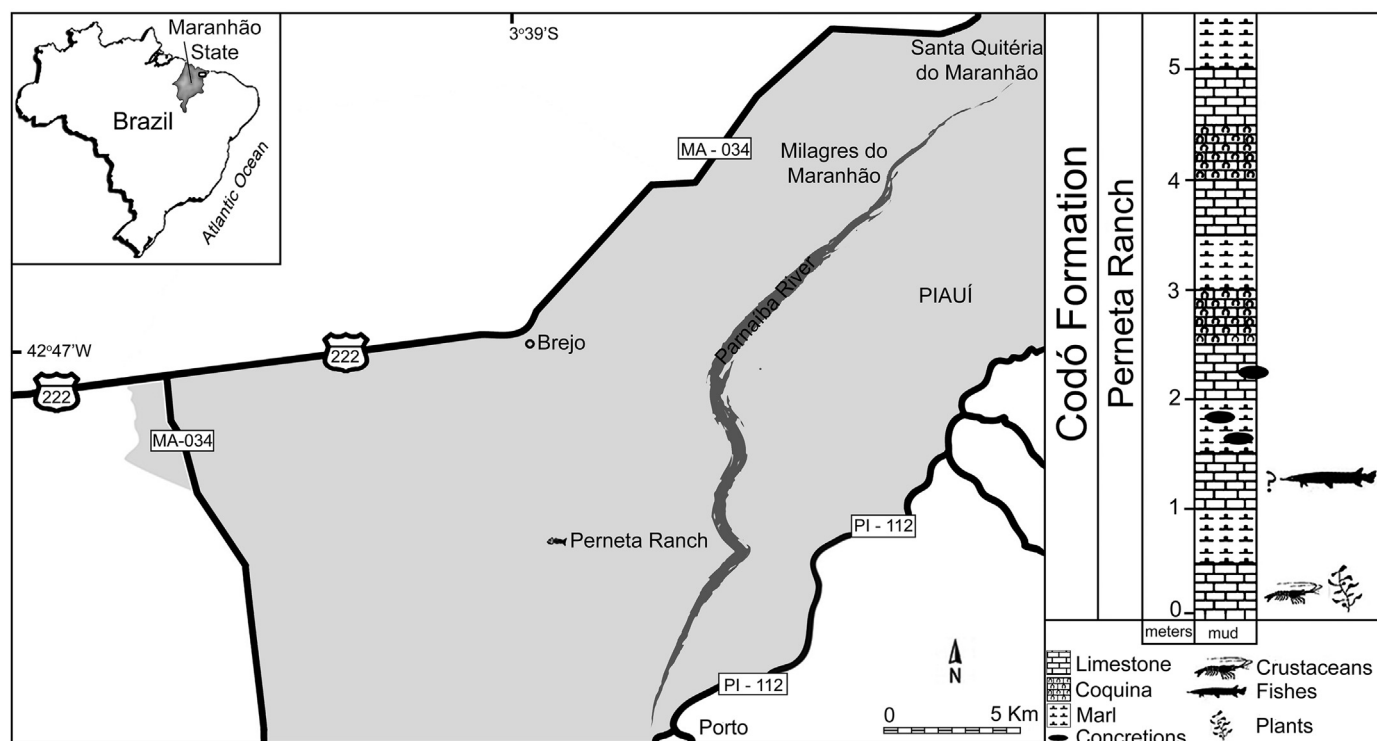


Fig. 1. Map and Stratigraphic column of the Codó Formation, Parnaíba Basin, State of Maranhão, Northeastern Brazil, indicating the location of the fossil locality.

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