

A new Pycnodontid (Actinopterygii) in the late Jurassic of the Solnhofen Archipelago

Martin Ebert^{1,*}, Martina Kölbl-Ebert¹ and Christian Schulbert²

¹Staatliche Naturwissenschaftliche Sammlungen Bayerns - Jura - Museum Eichstätt, Willibaldsburg,
D-85072 Eichstätt, Germany

²GeoZentrum Nordbayern – Paläontologie Friedrich-Alexander Universität Erlangen-Nürnberg,
Loewenichstrasse 28, D-91054 Erlangen, Germany

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Abstract - Pycnodontiformes are an extinct order of Actinopterygian fishes, present from the Late Triassic (Norian) to the Eocene. With their mostly deep, laterally compressed bodies and comparatively large fins, these fishes were mostly highly manoeuvrable reef fish. The genus *Macromesodon* Blake, 1905 (sensu Poyato-Ariza and Wenz, 2004) is divided again in the genus *Macromesodon*, with *Macromesodon macropterus* (Agassiz, 1834) as the only species and the genus *Apomesodon* Poyato-Ariza and Wenz, 2002.

Keywords: Fossil Fish, Pycnodontiformes, Late Jurassic, Solnhofen Archipelago

1. Introduction

Pycnodontiformes are an extinct order of Actinopterygian fishes, present from the Late Triassic (Norian) to the Eocene (Poyato-Ariza and Wenz, 2002). With their mostly deep, laterally compressed bodies and comparatively large fins, these fishes were mostly highly manoeuvrable reef fish. With their characteristic durophagous dentition, columnar- or incisiform-shaped anterior teeth (premaxilla and dentary) and the posterior crushing teeth of the prearticular and vomer, the whole group was highly specialized with regard to their diet (Kriwet, 2005). They were predators on the reef itself or on hard shelled organisms.

This commonly holds also true for the genus *Macromesodon* Blake, 1905, of which at least four species were described (*M. macropterus* (Agassiz, 1834) and *M. gibbosus* (Wagner, 1851) both from the late Jurassic of the Solnhofen Archipelago, Germany; *M. comosus* (Thiollière, 1858) and *M. surgens* (Poyato-Ariza and Wenz, 2002) both from the late Jurassic of Cerin, France).

2. Materials and Methods

2.1 The examined material belongs to the following institutions: BSPG: Bayerische Staatssammlung für Paläontologie und Geologie, Munich, Germany; JME: Jura-Museum Eichstätt, Germany. JME-ETT: ETT indicates that the fish was collected in Ettling; JME-SOS: SOS indicates that the fish was collected at an unspecified locality in the Solnhofen limestones. FSL: Collection de la Faculté des Sciences, Lyon, France; MCSNB: Museo

Civico di Scienze Naturali Bergamo, Italy; MHNL: Muséum d'Histoire naturelle de Lyon, France; Museum Bergér Eichstätt, Germany; NHMUK: Natural History Museum, London, U.K; Tierpark Bochum, Germany

2.2 Material Examined: *Apomesodon comosus* (Thiollière, 1858: MHNL20015201, 20015261, 20015330, 20150725, 20015346; *Apomesodon gibbosus* (Wagner, 1851): BSPG-AS-VII-346 (holotype); *Apomesodon* sp.: FSL 93095, JME-SOS-3572; Tierpark Bochum (collection Leich, without number); *Apomesodon surgens* Poyato-Ariza and Wenz, 2002: MHNL20015433, 20015660 (holotype) & counterpart MNHN CRN 69;

Arduafrons prominoris Böss in Frickhinger, 1991: NHMUK P.8658; *Brembodius ridens* Tintori, 1981: MCSNB 4896, 4898, 4900, 4933; cf. *Apomesodon*: JME-ETT4103; *Eomesodon liassicus* (Egerton, 1855): NHMUK 19864; '*Eomesodon*' *barnesi* (Woodward, 1906): NHMUK P.12511; '*Eomesodon*' *hoeferi* Gorjanovic-Kramberger, 1905: JME-1971-47; *Macromesodon macropterus* (Agassiz, 1834): BSPG-AS-VII-345 (holotype), 1955-I-82, 1965-II-5, 1990-XVIII-294; Museum Bergér, (two specimens without numbers).

3. Description and Discussion

3.1 Genus *Macromesodon* Blake, 1905 versus *Apomesodon* Poyato-Ariza and Wenz, 2002

The family name Macromesodontidae which Nursall and Maisey (1991:125) created for the genus *Neoproscinetes*,

*Author for correspondence: Martin.Ebert@jura-museum.de

is no longer in use since Nursall (1996) and Poyato-Ariza and Wenz (2002) included *Neoprosclinetes* into the family Pycnodontidae Berg, 1940. Poyato-Ariza and Wenz (2004) in their revision of the genus *Macromesodon* excluded *Macromesodon* from Pycnodontidae.

The type species of the genus *Macromesodon*, *Macromesodon macropterus* (Agassiz, 1834) (Fig. 1), is a small pycnodont, up to 13 cm standard length (holotype BSPG-AS-VII-345). *M. macropterus* has fully developed ganoin scales in the anterior half of the body, whereas the posterior part of the body is scale-less (loricate scale pattern sensu Nursall, 1996).

The holotype (BSPG-AS-VII-346; Fig. 2) of '*Macromesodon*' *gibbosus* (Wagner, 1851), to which our new specimen (JME-ETT4103, Fig. 3) resembles most, is only 6.8 cm in standard length. Both specimens have fully developed scales only in the anterior-ventral part of the body and scale bars on the anterior-dorsal part of the body and persisting to the caudal area. There are further specimens up to 60 cm in length, referred to '*Macromesodon*' *gibbosus* by Poyato-Ariza and Wenz (2004), but because of differences in scale pattern (fully developed scales in the complete anterior part of the body and scale bars persisting to the caudal area) we exclude them from '*Macromesodon*' *gibbosus* and prefer to refer them to *Apomesodon* sp. (for specimens see section: Material Examined).

According to Poyato-Ariza and Wenz (2004), *Macromesodon* was a "primitive pycnodontoid fish with the following unique combination of primitive and derived characters: dorsal prominence angle-shaped, with straight dorsal border present; loricate scale pattern; caudal pedicle not differentiated; frontals curved and short; tubular infraorbitals and infraorbital tesseræ present; 4 dentary

teeth; 3 prearticular tooth rows; 30 or more vertebrae (epaxial elements excluding those of the caudal endoskeleton); dorsal fin rounded anteriorly; more than 17 dorsal ridge scales" (Poyato-Ariza and Wenz 2004, p. 367).

The characters 'dorsal prominence angle-shaped, with straight dorsal border present and loricate scale pattern' (only the anterior part of the body with scales), however, are present in *Brembododus ridens* Tintori, 1981 (Triassic, Brembodontidae) and *Eomesodon liassicus* (Egerton, 1855) (Lower Jurassic) as well, and a loricate scale pattern is lacking or at least modified in '*Macromesodon*' *gibbosus*, '*Macromesodon*' *surgens* and '*Macromesodon*' *comosus* which have no loricate scale pattern sensu stricto, but scale bars persisting to the caudal area. For these reasons, describing a new genus may be necessary for these fishes, or preferably reactivating the genus *Apomesodon*, Poyato-Ariza and Wenz (2002), which was synonymized with *Macromesodon* by Poyato-Ariza and Wenz (2004). A further difference between *Macromesodon* and *Apomesodon* is the ornamentation of skull bones and scales. In *Macromesodon* the scales and some skull bones are ornamented with a pattern of grooves, whereas scales and skull bones in *Apomesodon* are ornamented with small spines. Therefore, renaming *Apomesodon gibbosus* in *Macromesodon macropterus*, as suggested by Cawley and Kriwet (2017), is rejected here. For a revision of these fishes, the dentition might be most helpful. Unfortunately the dentition of the type specimens of *Macromesodon macropterus* (type species), '*Macromesodon*' *gibbosus*, '*Macromesodon*' *comosus* and most of the other specimens of these rare fishes are missing. We have started to x-ray and CT-scan some of the specimens to see more of the dentition. A revision of the whole group is in preparation by the authors.



Figure 1. *Macromesodon macropterus* (Agassiz, 1834) BSPG-1955-I-82, with a standard length of 7.1 cm, from the late Jurassic of Solnhofen, Germany.



Figure 2. Holotype of *Apomesodon gibbosus* (Wagner, 1851) BSPG-AS-VII-346, with a standard length of 7.5 cm, from the late Jurassic of Kelheim, Germany.

3.2 New specimen from Ettling

In 2016, a new pycnodontid was found in the quarry of Ettling (Markt Pförring, Bavaria, Southern Germany; Late Jurassic; Ebert et al. 2015) by the excavation team of the Jura-Museum Eichstätt. Superficially, the specimen JME-ETT4103 (Fig. 3) resembles most closely to *Apomesodon gibbosus*, albeit some features (40 neural spines from cranium to caudal fin in the holotype of *A. gibbosus* versus 34 in JME-ETT4103; 36 dorsal and 21 anal pterygiophores

in the holotype of *A. gibbosus* versus 31 dorsal and 24 anal pterygiophores in JME-ETT4103; and shape of dorsal prominence) suggest that describing a new species may be necessary. The most striking feature of this new Pycnodontid, however, is the unusual dentition, suggesting an unusual mode of predation compared to all other known pycnodontids. The CT-scans of these teeth are in preparation and will be presented at the Mesozoic Fishes conference in Maharakham (a detailed publication is in preparation).

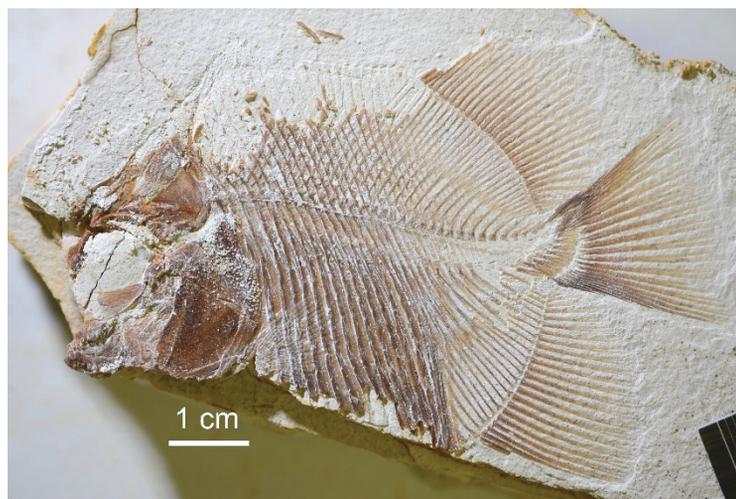


Figure 3. JME-ETT4103a (cf. *Apomesodon*), with a standard length of 7.1 cm, from the late Jurassic of Ettling, Germany.

4. Conclusion

The genus *Macromesodon* Blake, 1905 (sensu Poyato-Ariza and Wenz, 2004) is divided again in the genus *Macromesodon*, with *Macromesodon macropterus* (Agassiz, 1834) as the only species and the genus *Apomesodon* Poyato-Ariza & Wenz 2002. Following Poyato-Ariza and Wenz (2002) the genus *Apomesodon* includes *Apomesodon gibbosus* (Wagner, 1851) as type species, *Apomesodon comosus* (Thiollière, 1858) and *Apomesodon surgens* Poyato-Ariza and Wenz, 2002. *Macromesodon* has a loricate scale pattern (sensu Nursall 1996; only the anterior

part of the body with scales) and *Apomesodon* has fully developed scales in the anterior part of the body and scale bars persisting to the caudal area.

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