

## **A Temnospondyl Tooth from the Middle Triassic of the Ordos Basin, Shaanxi Province (Postprint)**

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### **Abstract**

An isolated large temnospondyl tooth was discovered from the Middle Triassic Tongchuan Formation, Weibei Oilfield, Ordos Basin, Shaanxi Province of China. Compared with the teeth of crocodylomorphs, plesiosaurs and temnospondyls, the tooth can be referred to temnospondyl based on the following features: the crown is elongated and recurved with a circular cross-section; there are no denticles or carinae on the crown; well-marked apicobasal grooves are shown on the crown surface. This tooth represents the first temnospondyl found in the Middle Triassic Tongchuan Formation and is the youngest fossil record of temnospondyls in the North China Block.

### **Full Text**

## **A Temnospondyl Tooth from the Middle Triassic of the Ordos Basin, Shaanxi Province**

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### **Abstract**

An isolated large temnospondyl tooth was discovered in the Middle Triassic Tongchuan Formation, Weibei Oilfield, Ordos Basin, Shaanxi Province, China. Based on the following features, the tooth can be referred to Temnospondyli: the crown is elongated and recurved with a circular cross-section; there are no denticles or carinae on the crown; and well-marked apicobasal grooves are present on the crown surface. This tooth represents the first temnospondyl

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**Keywords:** Ordos Basin, Middle Triassic, Tongchuan Formation, Temnospondyli, Tooth

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## Introduction and Geological Context

An isolated large temnospondyl tooth (CUGW VH100) was collected from the 7th member of the Yanchang Formation in the 5th Well of Weibei Oilfield, Ordos Basin, Shaanxi Province, China, which corresponds to Member II of the Tongchuan Formation (Li et al., 2016; Liu et al., 2018; Tong et al., 2019). The Tongchuan Formation was deposited during the late Middle Triassic, and abundant vertebrate fossils have been collected there, including the fishes *Hybodus*, *Triassodus*, and *Boreosomus* (Liu, 1962; Su, 1984; Yang et al., 2016; Deng et al., 2018) and the archosauriform *Yonghesuchus sangbiensis* (Liu et al., 2001; Wu et al., 2001). The Sinokannemeyeria-Fauna also extends to Member I of the Tongchuan Formation in the Ordos Basin (Liu et al., 2018). The tooth is referred to Temnospondyli based on the following features: slender, conical tooth with a circular cross-section; slightly recurved crown; no denticles or carinae on the crown; and well-marked apicobasal grooves on the surface. It represents the youngest fossil record of temnospondyls in the North China Block.

## Description

The tooth crown of CUGW VH100 is slender and recurved, with a nearly circular cross-section. The crown tip is cone-like and slightly worn, with several homocentric dark growth lines. The maximum preserved length and crown height (CH) are 44 mm and 35 mm, respectively [Figure 1: see original paper]. Only a small part of the root is preserved (9 mm) on the lingual side.

Both the anterior and posterior carinae are absent, and there are no serrations. Numerous grooves are clearly visible on the crown surface and are nearly parallel to each other. There are two types of grooves: long grooves that extend up two-thirds of the crown's height, and short grooves that only extend to the mid-region. Between these grooves, some weak wrinkles are mainly longitudinally arranged on the convex surface. Generally, these wrinkles are short compared to the grooves and are closely arranged but not parallel to each other.

In CT images, several longitudinal channels with regular distribution can be observed around the transverse section of the crown base. Some radial channels are visible in the inner region, and these radial channels vary longitudinally along the long axis of the crown.

## Comparison and Discussion

The conical shape of the tooth and the longitudinal ornamentations along the crown are widespread in different tetrapod groups from the Triassic to the Late Cretaceous, including some crurotarsal archosaurs, crocodylomorphs, temnospondyls, pistosauroids, and plesiosaurs. However, the teeth of these groups differ in the morphology of ornamentations, their arrangements on the crown surface, the development of carinae, and the distributions of serrations on the anterior and posterior edges (Cheng et al., 2006; Moser and Schoch, 2007; Baczko and Ezcurra, 2016). The absence of serrations differs from most crurotarsal archosaurs and crocodylomorphs (Hungerbühler, 1998; Clark and Sues, 2002; Sulej, 2010). The crown shape and surface ornamentations of CUGW VH100 differ from those of plesiosaurs and pistosauroids, in which the crown is more slender with numerous longitudinal ridges rather than grooves (Yang, 1965; Rieppel, 1999; Cheng et al., 2006; Kear et al., 2006; Vecchia, 2006; Sato et al., 2007).

Combined with morphological characteristics and geological age, CUGW VH100 is most similar to a fossil tooth (SMNS 55911) of *Mastodonsaurus* (Temnospondyli, Capitosauroida), which is conical in shape and has no carinae or serrations, with obvious groove-like ornamentations that do not extend to the tip (Moser and Schoch, 2007). However, SMNS 55911 has an irregular “labyrinthine structure” on the cross-section, which is an external expression of the dentine folding inside the tooth (Romer, 1956). Dentine folding is common in amniotes, especially in some basal groups including sarcopterygians (*Latimeria chalumnae*), actinopterygians (*Lepisosteus*), some basal tetrapods, and some ichthyosaurs (Maxwell and Lamoureaux, 2011; Meunier et al., 2015), and the shape of dentine folding varies greatly longitudinally along the crown (Moser and Schoch, 2007). CUGW VH100 lacks any apparent “labyrinthine structure” in the CT image, which may be affected by preservation and small density discrepancy between enamel and dentine. This tooth is here identified as a temnospondyl tooth.

Although temnospondyls survived into the Jurassic in Sichuan, the youngest record in the North China Block was previously from the Ermaying Formation (Li et al., 2008). CUGW VH100 thus represents the youngest fossil record of temnospondyl from the North China Block. The tooth crown with conical shape and circular cross-section is highly adapted to fishing (Damiani et al., 2000; Dias and Schultz, 2003; Moser and Schoch, 2007), and the coexisting *Hybodus youngi* fish fauna could have provided sufficient food resources.

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### Institutional Abbreviations

CUGW, China University of Geosciences (Wuhan), Wuhan, China; IVPP, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences, Beijing, China; SMNS, Staatliches Museum für Naturkunde Stuttgart, Stuttgart, Germany.

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