

犁齿鱼(Phareodus) 在我国发现¹⁾

张江永

(中国科学院古脊椎动物与古人类研究所 北京 100044)

摘要 首次记述了亚洲北大陆的犁齿鱼化石。标本产自湖北松滋县黑垱口洋溪组。新的标本在个体较小、最大体高位于臀鳍起点处、背鳍起点靠后、背鳍具有 12 根鳍条、尾上骨缺失、第一末端尾椎(U1 + 2)上只有一根神经棘等方面显著不同于犁齿鱼属的三个已知种(*P. encaustus*、*P. testis* 和 *P. queenslandicus*)，代表了一新种(松滋犁齿鱼 *Phareodus songziensis* sp. nov.)。

P. encaustus 和 *P. testis* 幼体的体形较长，为纺锤形，但到成体后，体形明显加高。*P. encaustus* 的体长可达 54cm，*P. testis* 的可达 30cm，而松滋犁齿鱼的体长可能只有 12cm，和上述两个种的幼体差不多。但是，松滋犁齿鱼的体形较高，其轮廓和北美两个种的成体很相似，因此，虽然松滋犁齿鱼的体形较小，但很可能代表了成年个体。

松滋犁齿鱼的体形和东南亚的 *Musperia radiata* (可能为 *Phareodus* 的同物异名) 比较相似。*Musperia* 的背鳍较大、背鳍鳍条为 23 根、背鳍起点和臀鳍起点相对、背鳍第一鳍条支持骨和臀鳍第一鳍条支持骨与同一个脊椎相连、第一末端尾椎上有两个神经棘，这些特征说明，*Musperia* 和松滋犁齿鱼不同，而和北美的 *Phareodus* 的关系可能更近。

关键词 湖北松滋，始新世，骨舌鱼科，动物地理

中图法分类号 Q915.862

FIRST PHAREODUS (OSTEOGLOSSOMORPHA : OSTEOGLOSSIDAE) FROM CHINA

ZHANG Jiang-Yong

(Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences Beijing 100044)

Key words Songzi, Hubei, Eocene, Osteoglossidae, Zoogeography

1 Introduction

The specimens described here were discovered from the lacustrine deposits of Lower Eocene Yangxi Formation of Heidangkou, Songzi County, Hubei Province, China. Only posterior half of the body was preserved, with complete dorsal, pelvic, anal and caudal fins and a nearly complete caudal skeleton.

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The Yangxi Formation in which the fossil fish was collected is 100 ~ 150 m in thickness and contacts conformably or disconformably with underlying Paomagang Formation and overlying Pailoukou Formation. Besides fishes, ostracods, gastropods, charophytes, spores and pollen, birds and mammals were also found in the formation. The age of the strata is Early Eocene (Editorial Committee of Stratigraphical Lexicon of China, 1999).

Phareodus was first discovered from the Green River Formation of North America (Cope, 1871; Leidy, 1873). The American *Phareodus* includes five nominal species (*P. acutus*, *P. encaustus*, *P. aequipinnis*, *P. brevicaudatus*, and *P. testis*), but Grande (1981), Li (1994) and Li et al. (1997) believed that only two species (*P. encaustus* and *P. testis*) are valid.

Phareodus queenslandicus was named on the materials from the Redbank Plains Formation of southern Queensland, Australia (Hills, 1934). *Brychaetus* is possible marine osteoglossomorph and was named based on the concretions with skulls from the early Eocene London Clay (Woodward, 1901). Li et al. (1997) suggested that *Brychaetus* should be synonymized with *Phareodus*.

The specimens studied are deposited in the collection of Institute of Vertebrate Paleontology and Paleoanthropology (IVPP), Chinese Academy of Sciences. The specimens were mechanically prepared. The drawings were executed under a Wild MZ8 microscope with camera lucida attachment.

2 Systematic paleontology

Family Osteoglossidae Bonaparte, 1832

Subfamily Osteoglossinae Bonaparte, 1832

Genus *Phareodus* Leidy, 1873

Phareodus songziensis sp. nov.

(Figs. 1 ~ 2)

Holotype Posterior part of the body, part and counterpart, IVPP V 12751A, B.

Horizon and locality Yangxi Formation (Lower Eocene); Songzi County, Hubei Province, China.

Diagnosis A species that differs from the other species of *Phareodus* by the following characteristics: short standard length, deepest point of the body at the anal fin origin, more posteriorly located dorsal fin, dorsal fin rays 12, epural absent, neural spines on U1 + 2 only one.

Description The body of the fish is deep (Fig. 1), with its deepest point at the anal fin origin. According to the distance between the pelvic origin and the posterior end of the fish body (7.5 cm), the standard length of the fish is about 12 cm. The body depth is 3.5 cm. The caudal peduncle is 0.6 cm in length and 1.3 cm in depth.

Pectoral fin Only the posterior part of the first pectoral fin ray was preserved. It is segmented at the distal end and extending posteriorly beyond the pelvic fin origin.

Pelvic fin The pelvic fin is small and ventrally located. There are six pelvic fin rays, of which the first one is relatively strong and only segmented distally while the other rays are branched and segmented.

Dorsal and anal fins The dorsal fin is small and originates posteriorly to the origin of the anal fin by six centra. It consists of 12 principal fin rays. The first fin ray is segmented but unbranched and the others are segmented and branched. Anterior to the principal rays, there are two short precurrent rays.

The anal fin is long. There are 23 principal fin rays and two precurrent rays. The first principal ray is segmented and unbranched while the others are segmented and branched. Except for the impression of the first pterygiophore of the anal fin that is probably connected with the first caudal centrum, no other pterygiophores of the pelvic, dorsal and anal fins are preserved.

Vertebral column There are about 24 caudal vertebrae, which are slightly deeper than long.

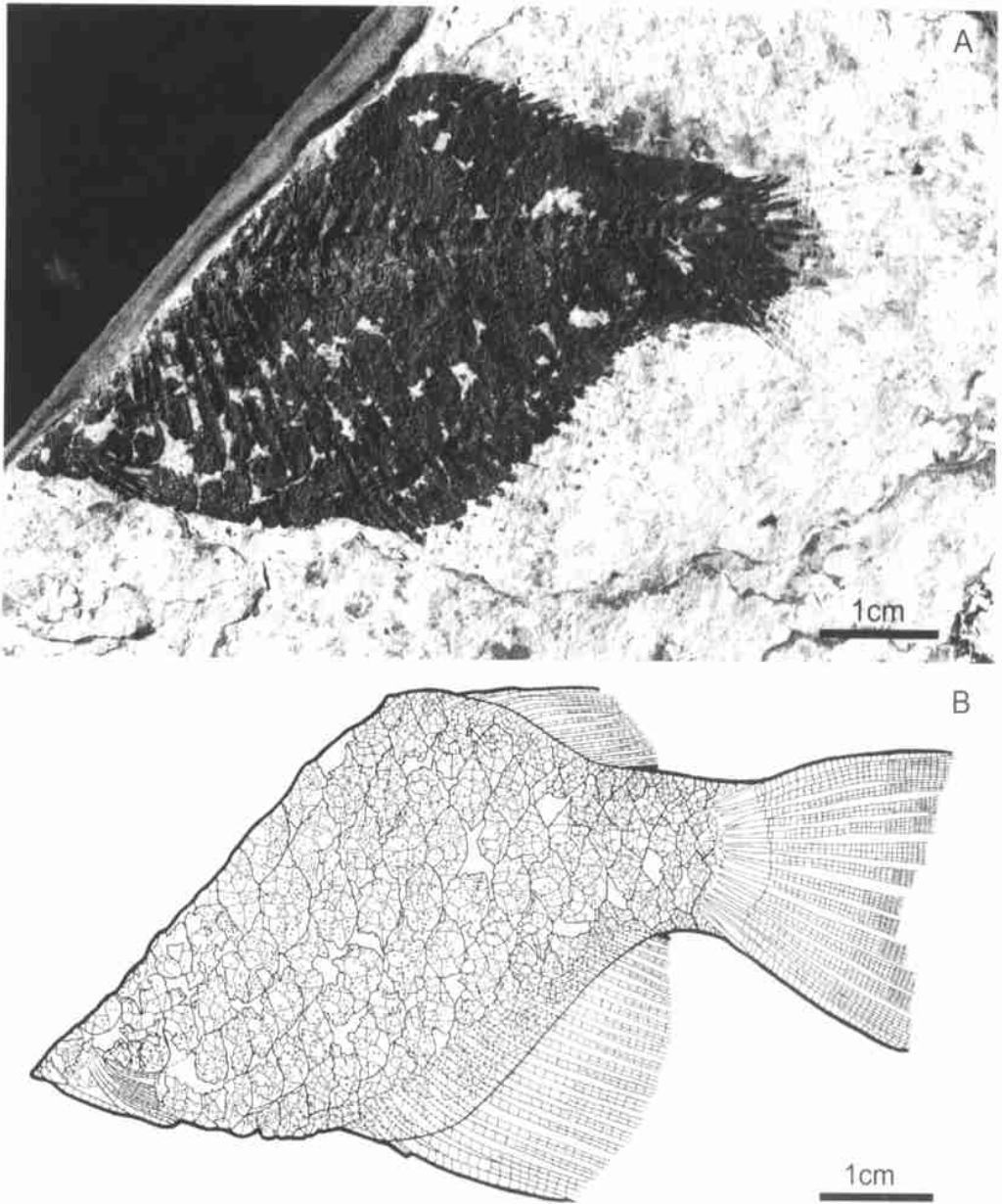


Fig. 1 Photograph (A) and line-drawing (B) of *Phareodus songziensis* sp. nov. (V 12751A)

The impressions of the last several pairs of ribs and that of the neural spines of the first to sixth centra are visible.

Caudal skeleton and fin The caudal skeleton (Fig. 2) is basically similar to that of the North American species. The preural centra gradually become smaller in size posteriorly from the fourth to first preural centra. The last three haemal spines and the last four neural spines are lengthened to support the caudal fin; the haemal spines are gradually thickened from the one on the third preural centrum to the parhypural. The first preural centrum bears a complete neural spine. The first ural centrum (U1 + 2) is as long as the first preural centrum and bears only one complete neural spine

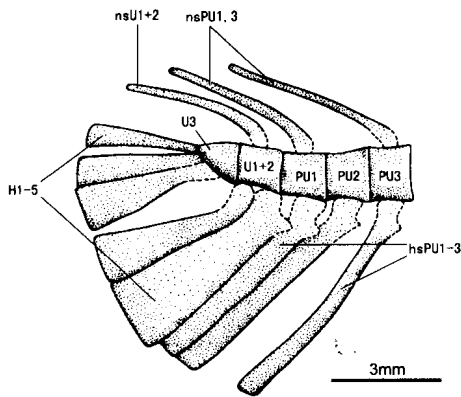


Fig. 2 Caudal skeletons of *Phareodus songziensis* sp. nov. (V 12751B)

Abbreviations: HI-5, hypurals 1 ~ 5; hsPU1-3, haemal spines on PU1 ~ 3; nsPU1, 3, neural spines on PU1, 3; nsU1 + 2, neural spine on U1 + 2; PU1-3, preural vertebrae 1 ~ 3; U1 + 2, urocentra 1 + 2; U3, urocentrum 3

(two in *P. testis* and *P. encaustus*). The second urocentrum is small and nearly triangular in shape.

There are five hypurals (Fig. 2). Hypural 1 is the largest and hypural 2 is only half the width of the first. The first two hypurals articulate with the first urocentrum. Hypurals 3 ~ 5 articulate with the second urocentrum and gradually decrease in length and size.

No epural and uroneural were found. The caudal fin is shallowly forked, with 16 principal fin rays.

Scales The fish body is covered with relatively large cycloid scales. The mesial side of the scale shows the reticulation and ornaments with sparse coarse tubercles. The impressions of fine tubercles on the outside of the scale are visible. The lateral line passes just under the vertebral column.

3 Discussion

In terms of the above described features, the specimens from Songzi, Hubei, central China can be referred to *Phareodus*. This new species differs from *Phareodus encaustus* and *P. testis* from North America and *P. queenslandicus* from Australia in body shape, origin of the dorsal fin, number of the dorsal fin rays, epural and neural spine on the first urocentrum (Table 1).

Table 1 Comparison of some characters among *Phareodus* species

taxa	<i>P. songziensis</i> sp. nov.	<i>P. encaustus</i>	<i>P. testis</i>	<i>P. queenslandicus</i>
Standard length (mm)	120	up to 540	up to 304	-
Deepest point of the body	at the anal fin origin	slightly anterior to the pelvic fin origin	slightly anterior to the pelvic fin origin	-
Caudal vertebrae	24	25 ~ 27	24 ~ 28	~ 26
Pelvic fin rays	6	4 ~ 6	4 ~ 6	~ 4
Origin of the dorsal fin	5 centra behind the anal fin origin	opposite to the anal fin origin	1 ~ 2 centra behind the anal fin origin	-
Dorsal fin rays	12	17 ~ 22	16 ~ 20 (mainly 18)	~ 19
Anal fin rays	23	22 ~ 25	24 ~ 28 (mainly 26)	~ 26
Caudal fin rays	16	17	17	16
hypurals	5	5 ~ 6 (mainly 5)	5 ~ 6 (mainly 6)	-
Epural	0	1	1	-
Neural spines on U1 + 2	1	2	2	-

The body of both *P. encaustus* and *P. testis* is elongate and fusiform in the juvenile, and deeper or oval in the adult. The standard length of the adult may reach 54 cm in *P. encaustus* and 30 cm in *P. testis*. *P. songziensis* is about 12 cm in standard length, about the size of the juveniles of *P. encaustus* and *P. testis*. However, its body shape is deeper, similar to that of the adult *P. encaustus* and *P. testis*. Therefore, *P. songziensis* is probably an adult individual with a

small body size.

The body shape of *P. songziensis* resembles that of *Musperia radiata* (*Musperia* was considered a synonym of *Phareodus* by Li et al. in 1997) from Sumatra (Sanders, 1934; Taverne, 1978). *M. radiata* has a relatively large dorsal fin that consists of 23 dorsal fin rays, with its beginning opposite to that of the anal fin. The first ural centrum of *M. radiata* bears two complete neural spines. These features of *M. radiata* show that the fish is different from *P. songziensis*, but closely related to North American species.

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References

- Cope E D, 1871. On the fishes of the Tertiary shales of Green River, Wyoming Territory. In: Hayden F V ed. Preliminary Report of the United States Geological Survey of Wyoming. Washington: Government Printing Office. 425 ~ 431
- Editorial Committee of Stratigraphical Lexicon of China, 1999. Stratigraphical Lexicon of China-The Tertiary. Beijing: Geological Publishing House. 1 ~ 163 (in Chinese)
- Grande L, 1981. Paleontology of the Green River Formation, with a review of the fish fauna. Bull Geol Surv Wyoming, **63**: 1 ~ 334
- Hills E S, 1934. Tertiary fresh water fishes from southern Queensland. Mem Queensl Mus, **10**: 157 ~ 174
- Leidy J, 1873. Notice of remains of fishes in the Bridger Tertiary Formation of Wyoming. Proc Acad Nat Sci Philadelphia, **25**: 97 ~ 99
- Li G Q, 1994. New Osteoglossomorphs (Teleostei) from the Upper Cretaceous and Lower Tertiary of North America and their phylogenetic significance. Ph.D. Thesis, University of Alberta, Canada. 1 ~ 290
- Li G Q, Grande L, Wilson M V H, 1997. The species of *Phareodus* (Teleostei: Osteoglossidae) from the Eocene of North America and their phylogenetic relationships. J Vert Paleont, **17**(3): 487 ~ 505
- Sanders M, 1934. Die fossilen fische der alttertiären süßwasserablagierungen aus Mittel-Sumatra. Verhandelingen van het Geologisch-Mijnbouwkundig Genootschap voor Nederland en Kolonien, Geol Ser, **11**: 1 ~ 144
- Taverne L, 1978. Ostéologie, phylogénèse et systématique des Téléostéens fossiles et actuels du super-ordre des Ostéoglossomorphes. Deuxième partie. Ostéologie des genres *Phareodus*, *Phareoides*, *Brychaetus*, *Musperia*, *Pantodon*, *Singida*, *Notopterus*, *Xenomystus* et *Papyrocranus*. Acad R Belg, Mem Cl Sci, Coll in-8^e sér, **42**(6), : 1 ~ 213
- Woodward A S, 1901. Catalogue of the Fossil Fishes in the British Museum (Natural History). Part . London: Trustees. 1 ~ 636