

FOSSIL FISHES FROM THE SHANWANG SERIES OF SHANTUNG*

By C. C. YOUNG (楊鍾健) AND T. L. TCHANG (張春霖)

(Cenozoic Research Laboratory, National Geological Survey of China
and The Fan Memorial Institute of Biology)

For every detail concerning the discovery and the stratigraphy of the rich fossiliferous Shanwang series in E. Linchühsien, we shall refer the reader to the geological report published by one of the authors (C. C. Young) in the Bull. Geol. Soc. China, Vol. XV, p. 171. Be it sufficient to say here that after the fossil flora which amounts to more than one thousand specimens, the fish fauna represents the most important part of the Shanwang collections. The original association of the fish with the plants is absolutely sure, both fish and leaves being occasionally impressed in the same plate of shale¹. Most of the fishes were collected in the white greyish tuffaceous paper shales. A few of them however have been found in the thicker dark grey marly shale occurring in the lower levels of the paper shales.

Although numerous, the collected specimens represent a small number of forms: four species only (all new), belonging to three genera can be definitely recognised and are described in the present paper. All of them belong to the family Cyprinidæ.

DESCRIPTION OF THE SPECIES

Family CYPRINIDÆ

Genus *Leuciscus* Klein

Leuciscus miocenicus Young and Tchang (sp. nov.)

(Pl. I, Fig. 1)

* Received for publication in March 1936.

1 According to earlier information, it was wrongly assumed that the plants were found in Shanwang and fishes in Lingshan, some 5 li N. of Shanwang. Lingshan is also a basaltic hill, but there the basalt lies directly over Cretaceous beds without any trace of the Shanwang series.

This interesting fish is represented by only one individual impressed in two (positive and negative) plates of shales. The following description is based on the better print.

Length of head (with opercular apparatus) 3 in length of body; depth of body $3\frac{1}{4}$ in length of body without caudal; diameter of eye $3\frac{1}{4}$ in length of head; mouth terminal, slightly vertical; operculum large, rectangular in outline; preoperculum smaller than operculum; inter-

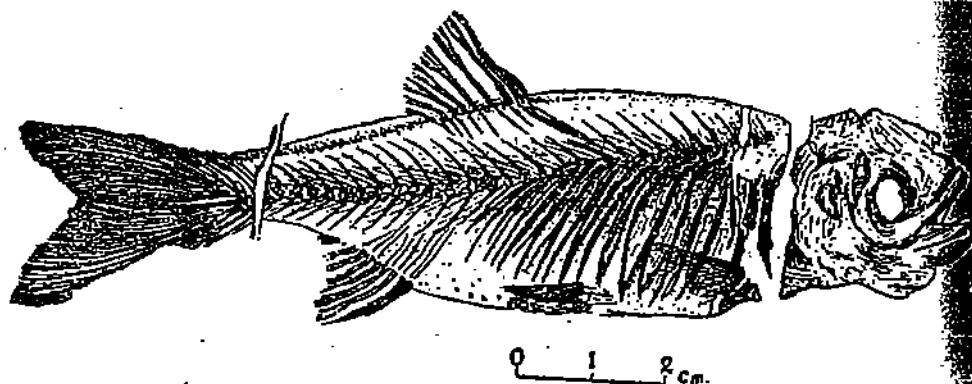


Fig. 1. *Leuciscus miocenicus* Young and Tchang (sp. nov.). Right side aspect. Nat. size.

operculum triangular; vertebræ 34-35 and a hypural at the end; ribs 14 pairs; about 10 interneural spines under dorsal; 9 interhæmal spines about anal; dorsal fin without spines, with 3 simple rays and 7 branched ones, its origin much nearer caudal base than end of snout, behind ventral origin; anal with 3 simple and 8 branched rays, its origin behind dorsal; pectoral fin not reaching ventral; ventral fin not reaching anal; caudal forked, each lobe with 10 longer and 6 shorter rays.

Measurements:

Depth of body before dorsal....	30 mm
Total length of body ...	135 mm
Length of body without caudal ...	103 mm
Length of head ...	35 mm
Length of dorsal base ...	13 mm
Length of anal base ...	10 mm
Length of pectoral ...	15 mm
Length of ventral ...	14 mm
Length of longest ray of caudal ...	28 mm

The genus *Leuciscus* is now distributed in Kansu, Honan, Shensi, Suiyuan and the Liaoho region, but rarely in Hopei province, and no record exists concerning the presence of this genus in the Shantung area. It is a Paleo- and Nearctic type.

On account of the geographical isolation and some characteristic features (different head length and body depth) we consider it as a new species for which the name *Leuciscus miocenicus* Young and Tchang (sp. nov.) is proposed, indicating the geological horizon of this interesting fish-bearing series.

Genus *Barbus* Cuv.

Barbus linchilensis Young and Tchang (sp. nov.)

(Pl. I, Fig. 2)

About 16 pieces of young and adult (mostly fragmentary) specimens can be referred to this species. The important characters and descriptions of the best specimen are given below. Unfortunately the original was a little damaged after the picture and sketch were taken.

Anterior part of head broken, posterior part present; depth of body about $2\frac{1}{2}$ in body length, length of head about 2.5-3 in body length without caudal; suborbitals large; preoperculum smaller than

operculum; interoperculum triangular; operculum large, rectangular outline; diameter of eye $3\frac{1}{2}$ in length of head; lateral line present; 2 scales on lateral line, 5 between dorsal and lateral line and 5 between lateral line and ventral base; vertebrae about 27 in number; interneural spine 14 under dorsal; interhaemal spines 7 above anal; about 14 pairs of ribs; dorsal fin with 11 branched rays and 4 simple ones, the last simple ray strong and serrated; the dorsal origin nearer caudal base than end of snout, before ventral origin; anal fin with 5 branched and 1 simple rays, the last simple one strong and serrated, its origin behind dorsal fin; pectoral not reaching ventral; ventral not reaching anal; caudal deeply forked, each lobe with 10 longer and 6 shorter rays.

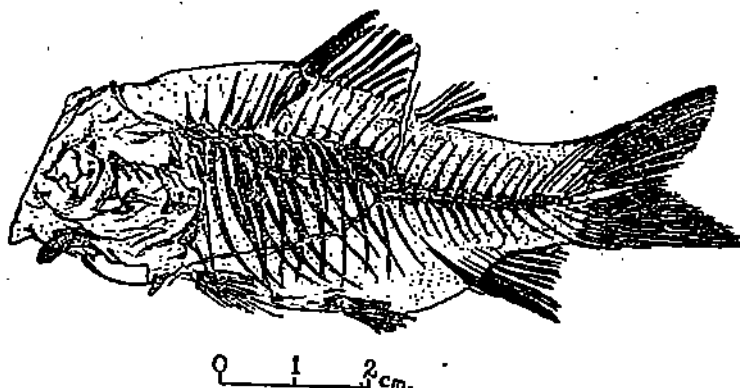


Fig. 2. *Barbus linchiensis* Young and Tchang (sp. nov.).
Left side view. Nat. size.

Measurements:

Depth of body before dorsal	32 mm
Length of body from posterior margin of preoperculum to caudal base	58 mm
Depth of head	27 mm
Diameter of eye	9 mm
Length of dorsal base	19 mm
Length of anal base	6 mm
Length of pectoral	13 mm
Length of longest ray of caudal	22 mm

The above mentioned characters (number of dorsal rays and anal spine, etc.) differ remarkably from those of the most closely related forms. We incline to name it *Barbus lingchiensis* (sp. nov.).

Barbus scotti Young and Tchang (sp. nov.)

(Pl. II, Fig. 1)

A second species of this genus is represented by 13 specimens of young and adult individuals, several of them are well preserved. The description based on the best specimen is given as follows:

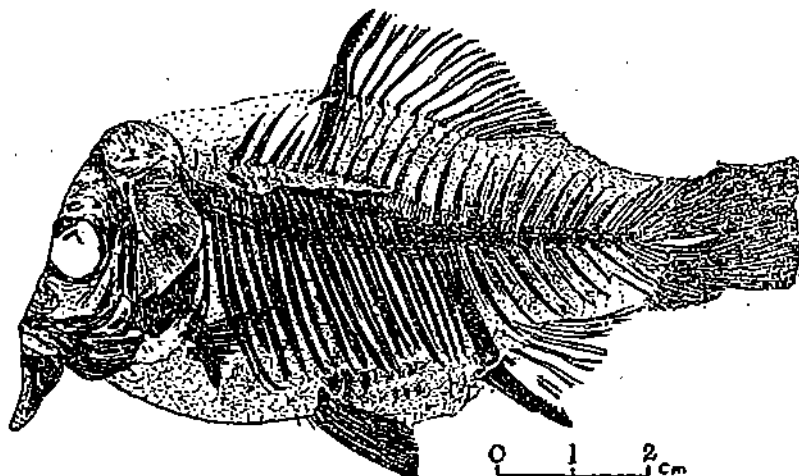


Fig. 3. *Barbus scotti* Young and Tchang (sp. nov.). Left side view. Nat. size.

Anterior part of head and posterior part of caudal fin broken; depth of body about 2 in. length of body, length of head about 3 in. length of body without caudal; diameter of eye about $3\frac{1}{2}$ in. length of head; preoperculum smaller than operculum; operculum large, rectangular in outline and with radial grooves; interoperculum triangular; lateral line present; about 29 scales on lateral line, 5 between it and dorsal, and 5 between it and ventral; interneural spines 12-13; interhæmal spines 6-7;

dorsal fin with 11 branched rays and 4 simple ones, the last simple ray strong and serrated, its origin behind that of the ventral; anal fin with 5 branched and 3 simple rays, the last simple one strong and serrated; caudal deeply forked, each lobe with 10 longer rays and 6 shorter ones; pectoral reaching ventral; ventral not reaching anal.

Measurements:

Depth of body before dorsal	44 mm
Length of body posterior margin of preoperculum	
to caudal base	70 mm
Diameter of eye	9 mm
Length of dorsal base	21 mm
Length of anal base	8 mm
Length of pectoral	20 mm
Length of ventral	16 mm

Owing to some important characters (number of dorsal rays, anal spine and origin of dorsal, etc.) we consider this also as a new species for which the name *Barbus scotti* Young and Tchang (sp. nov.) is proposed. The species is given in honor of Prof. Scott in Cheeloo University who has helped us very much during our trip in Shantung and sent us a list of the first collection of Shanwang fish, kept in his department.

The distribution of the genus *Barbus* is limited to subtropical and tropical regions of the old continent. In China species of this genus are found in Hangchow, Canton, Yunan, Hainan, Fukien, Chekiang and all along the Yangtze river from Szechuan down to Shanghai, but never north of that region. The record of fossil *Barbus* in Shantung, north of Taishan range, is therefore of great interest, since it indicates some important change of fauna, and consequently of climate since the Miocene time.

Genus *Pseudorasbora* Bleeker

Pseudorasbora macrocephala Young and Tchang (sp. nov.).

(Pl. II, Fig. 2)

This is by far the most common fish found in Shanwang, represented as it is by at least 80, mostly complete specimens. The following description is based on one of the best specimens.

Depth of body 5 in length of body; length of head $3\frac{1}{2}$ in length of body without caudal fin; mouth vertical; eye large; operculum larger than preoperculum; vertebrae about 34; 14 pairs of ribs; dorsal fin without spinous rays, with 7 branched and 4 simple rays, its origin nearer caudal base than end of snout, opposite to ventral fin; anal with 3 simple and 6 branched rays; pectoral not reaching ventral; ventral not reaching anal; caudal forked.

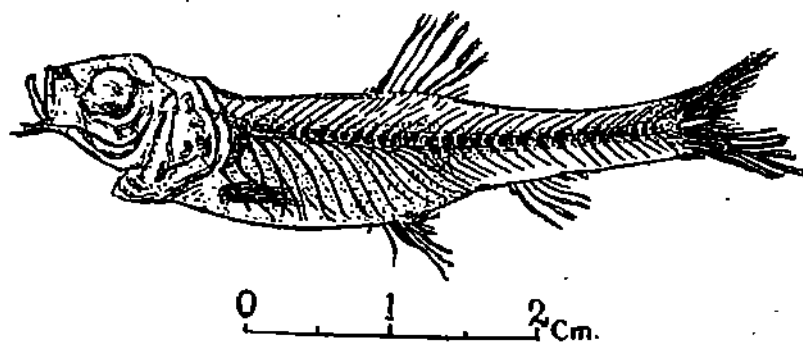


Fig. 4. *Pseudorasbora macrocephala* Young and Tchang (sp. nov.). Left side aspect. $\times 2$.

Measurements:

Length of head	14 mm
Depth of body	9 mm
Total length of body with caudal	54 mm
Length of dorsal base	5 mm
Length of anal base	4 mm
Length of pectoral	9 mm
Length of ventral	6 mm
Length of longest ray of caudal	8 mm

For this species which is mainly characterized by its comparatively large head the name *Pseudorasbora macrocephala* Young and Tchang (sp. nov.) is proposed.

The genus *Pseudorasbora* is commonly found both in N. and S. China, also in Japan.

Summary. All the described four species are new on account of the differences mentioned above. With exception of the last named genus, the other two genera seem to be absent in Shantung now, and may be regarded as extinct at least from the Shantung area. The fish fauna of Shanwang therefore affords some new data concerning the zoogeographical distribution of this group and the climate of that time.

A SUMMARY OF CENOZOIC FOSSIL FISHES IN CHINA

Up to a recent date, fish remains were rare in China. Even in many cases, for instance in Ertemte and in the Nihowan beds of Sanmen, etc., they were only known by fragments of teeth and vertebrae. In *Taiku* (*Carassius auratus*) and in Mongolia, (*Pappichthys mongoliensis* and *Rhineastes grangeri*) they were however better represented. Recently only a very rich fish fauna was discovered from a fissure in Choukou-tien, which is now under study. A stratigraphic distribution with geographical remarks of the fish remains of China is summarized in the following table:—

Pleistocene	<i>Ctenopharyngodon idellus</i> Cuv. and Valen., Loc. 3, Choukoutien. Bien ¹ .
Pliocene	<div> <i>Cyprinus</i> sp. <i>Ctenopharyngodon</i> sp. <i>Hypophthalmichthys</i> sp. </div> } Sanmen. Bien. ² <i>Carassius auratus</i> L. Taiku ³ . Cyprinid indet. Ertemte ⁴ . <i>Barbus szechuanensis</i> Tchang ⁵ . <i>Barbus brevicephalus</i> Chang sp. nov.
Miocene	<div> <i>Leuciscus miocenicus</i> Young and Tchang <i>Barbus linchiensis</i> Young and Tchang <i>Barbus scotti</i> Young and Tchang <i>Pseudorasbora macrocephala</i> Young & Tchang <i>Rhineastes grangeri</i> Hussakof (Tungur)⁶ </div> } Shanwang.
Eocene	<div> <i>Pappichthys mongoliensis</i> Hussakof⁶ <i>Catostomus</i> sp. Cyprinid vertebræ </div> } Shara murum <i>Pappichthys mongoliensis</i> Hussakof (Ulan Shireh) ⁶ <i>P. ? mongoliensis</i> (Indin manha)
	With exception of <i>Pappichthys</i> which is a genus of Amiidae, all the other fishes belong to Cyprinidae. From the Pliocene on no difference seems to exist between the fossil and living species.

- 1 Bien, M. N. On the fossil Pisces. Amphibia and Reptilia from Choukoutien Localities 1 and 3. Pal. Sin., Ser. C. Vol. X, Fasc. 1.
- 2 Bien, M. N. Cenozoic Deposits of the lower Huangho valley. Bull. Geol. Soc. China, Vol. XIII. p. 441.
- 3 Tchang, T. L. Notes on a fossil fish from Shangsi. Bull. Geol. Soc. China, Vol. XII, p. 467.
- 4 Schlosser, M. Tertiary Vertebrates from Mongolia. Pal. Sin., Ser. C, Vol. I, Fasc. 1, 1924, p. 97.
- 5 Personal communication of Prof. H. C. Chang.
- 6 Hussakof, L. Fossil fishes collected by the Central Asiatic Expeditions. Amer. Mus. Nov., No. 553, 1932.



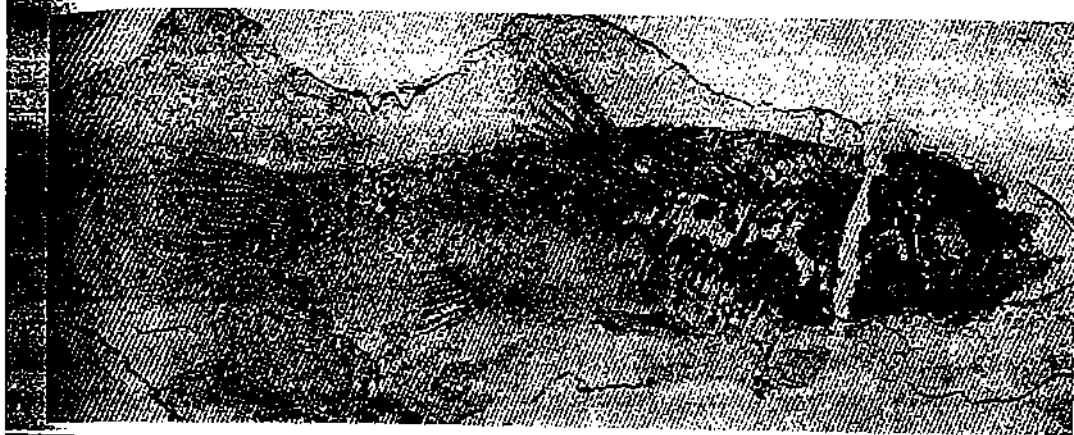


Fig. 1. *Leuciscus miocenicus* Young and Tchang (sp. nov.).
Lateral view. Natural size.



Fig. 2. *Barbus linchiensis* Young and Tchang (sp. nov.).
Lateral view. Natural size.



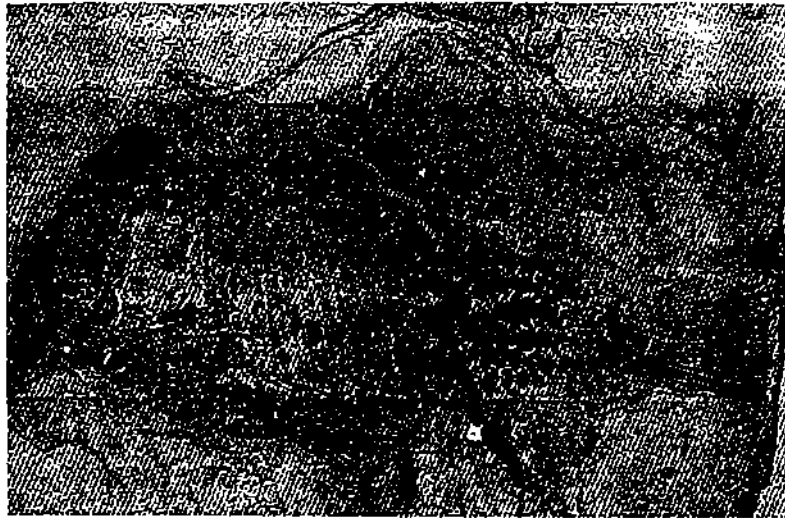


Fig. 1. *Barbus scotti* Young and Tchang (sp. nov.).
Lateral view. Natural size.



Fig. 2. *Pseudorasbora macrocephala* Young and Tchang (sp. nov.).
Lateral view. $\times 2$.