



A new species of the genus *Sinocyclocheilus* (Teleostei: Cypriniformes), from Jinshajiang Drainage, Yunnan, China

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Abstract: *Sinocyclocheilus huizeensis*, a new cyprinid species was discovered from a spring at Niulanjiang River in Huize County, Yunnan, China. This new species can be distinguished from its congeners by the following characters, e.i. body, normal; lateral-line scales, 70~73; scales above lateral-line, 25~33; scales below lateral-line, 9~12; scales around caudal peduncle, 40~46; first gill arch, with 5~6 rakers; eyes, normal; eye diameter, 5.4%~7.2% of standard length; interorbital width, 3.6%~9.7% of standard length; nostrils, closer to preopercular margin than to snout; width between posterior nostrils, 5.0%~7.3% of standard length; mouth inferior, with its width 7.0%~9.3% of standard length; upper jaw length, 7.0%~9.1% of standard length; superior angle of gill opening, below level line of superior border of eyes; rostral barbels, extending beyond anterior margin of eyes, but not reaching posterior margin of operculum; maxillary barbels, extending almost to posterior margin of preopercular; pectoral-fin, originating posterior to ventral line of dorsal-fin origin, stretching about 4/5 of the distance between pelvic-fin and anal-fin origins, reaching anus; pelvic fin, narrow; axillary scales, present.

Keywords: New species; *Sinocyclocheilus*; Yunnan; China

Introduction:

The *Sinocyclocheilus* is the most diverse genus of Cyprinidae in China (Zhao, et al. 2009). Most species of the genus are cave-dwelling forms or troglomorphic. Both China and Southeast Asia have rich subterranean ichthyofauna (Trajano, et al. 2004; Romero and Paulson, 2001). The genus *Sinocyclocheilus* is endemic to the Karst area of the Yunnan-Guizhou Plateau (Zhao, et al. 2006). So far, 60 valid species have been recognized in this genus, and seven species have been identified in Jinshajiang River drainage, including *S. wumengshanensis* (Li, et al. 2003), *S. grahami* (Regan, 1904), and *S. multipunctatus* (Pellegrin) (Chu, et al. 1989).

In 2013, several specimens of *Sinocyclocheilus* were collected from Dalong Spring in Huize County, Qujing City, Yunnan, China. Subsequent examination supporting that the specimen was represented a new cave-dwelling species of genus *Sinocyclocheilus*.

Materials and Methods:

We accounted and measured the samples according Zhao's methods (Zhao et al, 2009). The measurements were taken point to point with a digital caliper (0.1mm precision). The osteological features were examined with soft X-ray photographs. Measurements and counts were periodically taken from the left side of the specimens. All Specimens examined are deposited in the collection of the Kunming Institute of Zoology (KIZ), Chinese

Academy of Sciences (CAS).

Abbreviations. Standard Length=SL; county=Co.

Holotype. KIZ 2013001246, 85.6 mm SL, from Dalong Spring, Huize County, Qujing, Yunnan, China, 17th, May, 2013, collected by Pan Xiaofu, Li Jianyou and Zhao Donggou.

Paratype. KIZ 2013001237–1245, 1247–1255, 18 specimens were examined, 80.9~102.4mm SL; collected date with the holotype.

Results:

Diagnosis

The new fish species shows following characteristics that are distinctively different: body normal, lateral-line scales 70~73; scales above lateral line 25~33, scales below lateral line 9~12, scales around caudal-peduncle 40~46; first gill arch with 5~6 rakers; eyes normal, eye diameter 5.4%~7.2% of SL; interorbital width 3.6%~9.7% of SL; nostrils closer to preopercular margin than to snout tip; width between posterior nostrils 5.0%~7.3% of standard length; mouth inferior, its width 7.0%~9.3% of standard length, upper jaw length 7.0%~9.1% of standard length; superior angle of spiracle below level line of superior border of eyes; rostral barbels extending beyond the anterior margin of eyes, but not reaching posterior margin of operculum, maxillary barbels extending almost to posterior margin of preopercular; pectoral-fin length 16.8%~23.6% of standard length, last unbranched ray of dorsal fin



Figure 1. Lateral view of *Sinocyclocheilus huizeensis*, and the holotype is KIZ2013001246.

Table 1. the morphological measurement of *Sinocyclocheilus huizeensis*.

Characteristic	Holotype	Mean±SD (min-max)
Lateral-line scales	70	71(70-73)
Scale rows above lateral line	30	30(25-33)
Scale rows below lateral line	10	11(10-12)
Predorsal scales	30	34(30-36)
Circumped uncular scales	40	44(40-46)
Total length	106.3	113.6±8.3(100.4-128)
Standard length	85.6	91.3±6.9(80.9-102.4)
Percentage (%) of SL		
Head length	27.9	27.3±0.1(22.3~29.3)
Body depth	26.7	24.9±5.2(17.5~27.0)
Predorsal length	48.1	46.7±4.8(37~50.7)
Length of dorsal-fin base	20.1	19.6±0.3(17.8~22.2)
Dorsal-fin length	27.9	27.2±5.0(20.1~30.9)
Preal length	67.3	68.5±0.8(66.2~72)
Length of Anal-fin base	10.5	10.3±0.5(9.5~11.5)
Anal-fin length	18.4	18.3±1.1(12~20.6)
Prepectoral length	24.0	24.4±0.4(22.5~27.1)
Length of pectoral-fin base	7.1	6.4±0.8(5.0~7.9)
Pectoral-fin length	23.2	21.4±0.8(16.8~23.6)
Prepelvic length	45.8	47.3±0.8(45.0~50.4)
Length of pelvic-fin base	8.7	8.0±0.7(6.4~9.5)
Pelvic fin length	21.3	19.6±0.8(17.5~21.3)
Caudal-peduncle length	22.3	22.1±1.0(19.8~25.4)
Caudal-peduncle depth	12.9	13.2±0(12.4~14.1)
Head depth	18.6	17.5±0.6(16.4~18.6)
Head width	14.2	14.5±0.7(13.1~15.9)
Snout length	9.0	9.2±(8.3~10.30)
Eye diameter	5.8	6.1±0.1(5.4~7.2)
Interorbital width	8.9	8.7±3.6(3.6~9.7)
Prenasal length	5.1	5.1±0.3(4.3~6.3)
Width between posterior nostrils	5.6	6.1±1.2(5.0~6.8)
Upper jaw length	8.6	8.0±1.4(6.2~8.6)
Lower jaw length	6.6	6.7±0.4(6.1~7.3)
Mouth width	8.1	8.0±0.9(7.0~9.3)
Rostral barbel length	9.4	8.9±0.4(7.0~10.7)
Maxillary barbel length	10	10.9±1.6(9.1~13.1)
Eye diameter	3.5	3.7±1.9(2.8~6.4)

thickened and hard, with serrations along posterior edge; pelvic-fin branched rays 10; pelvic fin long, originating posterior to ventral line of dorsal-fin origin, stretching about 4/5 of the distance between pelvic-fin origin and anal-fin origin, reaching anus; pelvic fin narrow, axillary scales present.

Morphological characteristics are shown in Table1. Dorsal-fin rays III, 7; anal-fin rays III, 5; pectoral-fin rays I, 15-16; pelvic-fin rays I, 10; vertebrae: 4+(38~39) (Fig.2);first gill arch with 5~6 rakers;

pharyngeal teeth in three rows, 4·3·2-2·3·4.

Body shape is narrow at lateral side. Dorsal surface is slightly convex.

The greatest body depth is located at dorsal fin origin.

Head shape is narrow. Eyes are normal. Nostrils are located around anterior margin of eyes than snout tip. Anterior and posterior nostrils are close to each other. Anterior nostrils possess a rimand and form a complete oblique tube with an enlarged fleshy flap on the posterior edge, which covering tube forward and posterior nostrils backward. Posterior nostrils are oval shaped and open. The mouth is slightly inferior, thin and simple. The upper jaw is a bit longer than the lower one. Posterior lip furrows extending toward the chin, postlabial groove is interrupted. Two pairs of barbels; rostral barbells are extended beyond anterior margin of eyes. Maxillary barbells are extended toward posterior margin of preoperculum. Gill opening is big and its upper angle is below level line of superior border of eyes. Opercular membrane is connected at isthmus. Outside of gill rakers are triangular with 5~6 on first arch.

The origin of dorsal fins are close to snout tip than to caudal-fin base. The last un-branched ray of the dorsal fins is strong with serrations on the posterior edge. Pectoral fin below posterior margin of operculum does not reach pelvic-fin origin, but beyond 3/4 of distance between pectoral-fin and pelvic-fin origin. Pelvic-fin origin anterior to ventral line of dorsal-fin origin is slightly anterior to the middle between pectoral-fin and anal-fin origin, It is extended to 4/5 of the distance between the two origins, reaching anus. The anal-fin origin next to anus is midway between pelvic-fin origin and caudal-fin base. Caudal fin divides two branches.

Fish body is covered with tiny and rounded scales. Lateral line is originated at superior angle of spiracle, and descends toward the point above pectoral fin. It ascends toward the posterior point above anal fin, and finally extends to the middle of caudal peduncle. Pelvic fin is narrow. Axillary scales are present.

Color

Coloration in preservative (Fig.1): After fixed in 10% formalin, the color of body become black and fulvous first, then become darker at the end. 20~25 black blotches exist above abdominal region, and are parallel to lateral line.

Distribution

So far, the species is only found in Dalong Spring, whose water comes from a hill nearby, a tributary of the Niulanjiang River, Huize County, Qujing

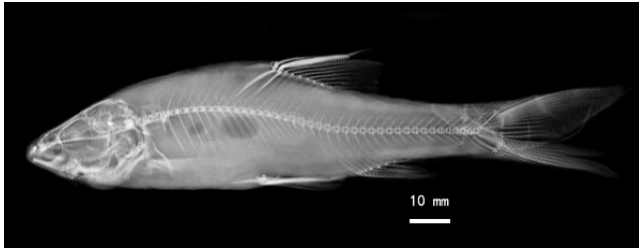


Figure 2. Radiograph of *S. huizeensis*. The holotype is KIZ 2013001246.

city, Yunnan province, China, draining into the Jinshajiang River (Fig.3). The Dalong spring is a hole between mountains, and found by local people. The water flow a few meters on the floor and then flow into underground. We don't find this species by fish investigation that carried out recent years in Niulanjiang River.

Etymology

The name of the species, *huizeensis*, is derived from the name of the collection locality, Huize County.

Remarks

1. Normal eyes vs. vestigial eyes, can be distinguished from *S. Anatirostri* (*S. albeoguttatus*, *S. anatirostris* and *S. grangxiensis*, synonym of *S. anatirostri*), *S. anophthalmus*, *S. anshuiensis*, *S. aquihornes*, *S. flexuosdorsalis*, *S. hyalinus*, *S. jinxiensis*, *S. tianlinensis*, and *S. xunlensis* (Zhao et al., 2009; Gan et al., 2013; Zheng et al., 2013).
2. Normal body shape vs. an angle forward on the nape, can be distinguished from *S. angularis*, *S. biangularis*, *S. bicornutus*, *S. broadihornes*, *S. cyphotergous*, *S. dongtangensis*, *S. flexuosdorsalis*, *S. rhinocerosus*, and *S. tileihornes* (Zhao et al., 2009; Li et al., 1996; Zhou et al., 2011; Zhu et al., 2012).
3. Normal body shape vs. a strongly humped back, can be distinguished from *S. altishoulderus*, *S. brevibarbus*, *S. brevis*, *S. hugeibarbus*, *S. jiuxuensis*, *S. liboensis*, *S. luopingensis*, *S. maculates*, *S. mashaensis*, *S. microphthalmus* (*S. halfbindus*, synonym of *S. microphthalmus*), *S. multipunctatus*, *S. yaolanensis*, *S. yimenensis* (Zhao et al., 2009; Li et al., 2004; Wu et al., 2010; Zhou, 2009).
4. The last unbranched ray of dorsal fin; hard at the base, softening toward the tip, with serrations along the posterior edge vs. a completely soft ray, can be distinguished from *S. guilinensis*, *S. huangtianensis*, *S. gracilis*, *S. jii*, *S. macrolepis*, *S. malacopterus*, *S. yishanensis* (Zhao et al., 2009; Zhu et al., 2011; Li et al., 2014).
5. Mouth morphology; slightly inferior vs. terminal, slightly superior, can be distinguished from *S. macrocephalus*, *S. macroscalus*, *S. yangzongensis* (Zhao et al., 2009).
6. Pectoral fin; not reaching pelvic-fin origin vs. extending beyond pelvic-fin origin, can be distinguished from *S. huaningensis*, *S. longifinus*, *S. luolouensis* (Zhao et al., 2009; Li et al., 1996; Lan et al., 2013).
7. Superior angle of spiracle; below level line of superior border of eyes vs. on or above level line of superior of eyes, can be distinguished from *S. aluensi*, *S. lingyunensis*, *S. longibarbus*, *S. multipunctatus*, *S. wui*, *S.*

huanjiangensis, *S. guanduensis*, *S. hei*, *S. huanglongdongensis* (Zhao et al., 2009; Chu et al., 1989; Wui et al., 2010; Xiao et al., 2004).

8. Pelvic-fin origin; anterior to ventral line of dorsal-fin origin vs. on the ventral line of dorsal-fin origin, can be distinguished from *S. angustiporus*, *S. maitianheensis*, *S. oxycephalus* (*S. lunanensis*, synonym of *S. oxycephalus*), *S. wumengshanensis*, *S. xichouensis* (Zhao et al., 2009; Pan et al., 2014).

9. The number of rakers; 5–6 on first gill arch vs. more than 7 on first gill arch, can be distinguished from *S. donglanensis*, *S. gracilicaudatus*, *S. macrophthalmus*, *S. qiubeiensis* (*S. jiuchengensis*, synonym of *S. qiubeiensis*), *S. robustus*, *S. tingi* (Zhao et al., 2009; Wang et al., 2014).

10. The number of pelvic-fin branched rays; 10 vs. less than 9, can be distinguished from *S. lateristriatus*, *S. purpureus*, *S. qujingensis*, *S. yimenensis* (Zhao et al., 2009).

11. The new species is similar to *S. grahami*. However, the new species is distinguishable by the following characteristics; nostrils closer to preocular margin than to snout; rostral barbels extending beyond anterior margin of eyes; maxillary barbels extending almost to posterior margin of preoperculum; predorsal length 37.5%–48.5% of standard length; while *S. grahami* nostrils is in the middle of snout and preocular margin of eyes; rostral barbels extending beyond anterior margin of eye, maxillary barbels extending just beyond posterior margin of eyes; predorsal length 27.4~30.8% of standard length.

There are eight species of *Sinocyclocheilus* distribute in Jinshajiang River drainage. There are several common characteristics of *Sinocyclocheilus* including normal eyes, normal body shape, the mouth slightly inferior or terminal, the last unbranched ray of dorsal fin hard at the base, and the serrations along the posterior edge. By using morphological keys shown below, the species can be easily identified.

- | | |
|---|--------------------------------------|
| 1a axillary scales absent on pelvic-fin base..... | <i>S. multipunctatus</i> (pellegrin) |
| 1b axillary scales present on pelvic-fin base..... | 2 |
| 2a Pectoral fin reaching pelvic-fin origin..... | <i>S. wumengshanensis</i> |
| 2b Pectoral fin not reaching pelvic-fin origin..... | 3 |
| 3a Lateral line scales 79 or more..... | <i>S. wui</i> |
| 3b Lateral line scales less than 79..... | 4 |
| 4a Maxillary barbels extending not to posterior margin of preopercular..... | <i>S. grahami</i> |
| 4b Maxillary barbels extending to or beyond posterior margin of preopercular..... | <i>S. huizeensis</i> |



Figure 3. A map showing the distribution of *S. huizeensis*.

Comparative materials

Sinocyclocheilus grahami: KIZ 201000949~1950, KIZ2010221952, 1954~1955, five ex., 85.47~94.3mm SL, Huize Co, Qujing, Yunnan, China.

Sinocyclocheilus malacopterus: KIZ 1997000961~965, five ex. Luoping Co, Qujing, Yunnan, China.

Sinocyclocheilus multipunctatus (pellegrin): KIZ 1991000491, KIZ 1991493, two ex., Luoci, Yuanfeng, Guizhou, China.

Sinocyclocheilus angustiporus: KIZ 2008006602~6606, five ex.

Sinocyclocheilus wumengshanensis: KIZ2006007290, KIZ2008004525, two ex., Jinsuo, Xundian, Yunnan, China.

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