

Aphyocypris pulchrilineata, a new miniature cyprinid species (Teleostei: Cypriniformes: Cyprinidae) from Guangxi, China

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Abstract *Aphyocypris pulchrilineata* sp. nov., a miniature cyprinid fish, was described from a small branch of the Hongshuihe River, which belongs to the Pearl River drainage. The new species can be distinguished from the species of *Yaoshanicus*, *Nicholsicypris*, *Pararasbora* and some species of *Aphyocypris* (*Aphyocypris chinensis* and *Aphyocypris kikuchii*) by the lack of a lateral line, either complete or partial. The new species is most similar to *Aphyocypris lini* morphologically. However, *A. pulchrilineata* lacks a large black spot on the caudal-fin base which *A. lini* has. A key to the species of the genus *Aphyocypris* is provided in the paper.

Keywords Freshwater · Cypriniformes · New species · *Aphyocypris pulchrilineata* sp. nov. · China

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Introduction

The cyprinid genus *Aphyocypris* was established by Günther in 1868, with the type species, *Aphyocypris chinensis* Günther 1868, based on the specimens collected by Fortunes from Zhejiang, China. It can be diagnosed by having a sub-superior mouth, no barbel, no knob on the anterior medium of the lower jaw fitting into a notch in the upper jaw, a keel between the base of the pelvic fin and the anus, and an incomplete lateral line or its absence (Chen and Chu 1998). Following Chen and Chu's revision, three species were recognized in the genus. *Aphyocypris chinensis* has a broad distribution including the east of China, Russia (Far East), Japan and Korea Peninsula, mainly from the Amur River to the Pearl River drainages. *Aphyocypris kikuchii* (Oshima 1919) is endemic to Taiwan and mainly distributed in the east part of the island (Lin et al. 2008). *Aphyocypris lini* (Weitzman and Chan 1966) (garnet minnow) is a replacement name for *Aphyocypris pooni* Lin 1939. Two months before the publication of *A. pooni* Lin, Herre (1939) published a brief description for the white cloud mountain fish and gave it the same name *Aphyocypris pooni*, which has been synonymized with *Tanichthys albonubes* Lin 1932 by Weitzman and Chan (1966). Therefore, *Aphyocypris pooni* Lin is a junior primary homonym of *Aphyocypris pooni* Herre (= *Tanichthys albonubes*). Then Weitzman and Chan (1966) redescribed the former, put it into the genus *Hemigrammocypripis* Fowler 1910 and gave it a new replacement name *Hemigrammocypripis lini*, which was moved to the genus *Aphyocypris* later (Chen and Chu 1998). The known distribution of *A. lini* is only in Hong Kong. Although being popular as ornamental fish in the aquarium market, it was considered to be extinct in the field by Yue and Chen (1998).

In a survey of the freshwater fishes made in 2008 in Guangxi, China, we found some specimens belonging to

the genus *Aphyocypris*, which are different from other known species. They are therefore described as a new species here.

Materials and methods

All specimens were fixed in formalin (5 %) and preserved in ethanol (70 %). Methods for counts and measurements follow Chen (1998). Measurements were made with a digital caliper and recorded to 0.1 mm. All measurements are made point to point, never by projections, and taken on the left side of the body whenever possible. Standard length (SL) is measured from the tip of the snout to the end of the hypural complex. The length of the caudal peduncle is measured from behind the base of the last anal-fin ray to the end of the hypural complex, at mid-height of the caudal-fin base. Scales along lateral series are counted from the anteriormost scale (the first one touching the shoulder girdle) to the last scale on the caudal fin. Gill rakers are counted on the outer margin of the outermost gill arch. The last two branched rays articulating with a single

pterygiophore in the dorsal and anal fins are counted as one. The holotype is included in the calculation of means and standard deviation (SD) in Table 1. Institutional abbreviations follow Leviton et al. (1985).

The holotype of *Aphyocypris lini* was deposited in the University of Hong Kong and might have been lost (D. Dudgeon, personal communication). We tried to find specimens of *A. lini* from aquarium market as comparative materials. But almost all individuals of Jin Si Yu, an aquarium name for *A. lini*, are actually *Tanichthys albonubes*. Therefore, data for *A. lini* were taken from Lin (1939) and Weitzman and Chan (1966). The only available paratype of *A. lini*, SU 34385, was included in Weitzman and Chan (1966).

***Aphyocypris pulchrilineata* sp. nov.** (New Chinese name: Li Xian xi ji; Fig. 1; Table 1)

Holotype. ASIZB 183459, 32.0 mm SL, Chengjiang River at Chengjiang town (23°55'45"N, 108°06'18"E), Du'an County, Guangxi Zhuang Autonomous Region, China, Nov. 2008, collected by Y. Zhu.

Table 1 Meristic counts and morphometric measurements of *Aphyocypris pulchrilineata* sp. nov. and *A. lini*

	<i>A. pulchrilineata</i> sp. nov.			<i>A. lini</i> ^a
	Holotype	Paratypes	Mean ± SD	
Dorsal-fin rays	III, 7	III, 7		III, 7
Anal-fin rays	III, 7	III, 7		III, 8
Pectoral-fin rays	I, 10	I, 10–12		I, 10–13
Pelvic-fin rays	I, 7	I, 6–7		I, 6–7
Scales in a lateral series	30	30–32		30–31
Predorsal scales	16	15–17		15–18
Circumpeduncular scales	12	12		12
Gill rakers	7	7–8		
Pharyngeal teeth		1.4.5–5.4.1		2.4.4–4.4.2 or 2.4.5–4.4.2
Standard length (SL, mm)	32.0	26.5–34.9	31.4 ± 3.4	18.1–35.1
Head length (HL, mm)	7.9	6.8–8.6	7.89 ± 0.6	
Percentage of SL				
HL	24.7	23.9–26.6	25.2 ± 0.9	25–29
Body depth	23.4	20.2–29.4	24.5 ± 4.3	24.4
Predorsal length	57.2	44.2–58.7	51.4 ± 5.7	55–62
Prepelvic length	46.9	36.7–52.5	44.89 ± 6.2	
Caudal-peduncle length	23.5	18.8–24.3	21.8 ± 1.9	19–25
Caudal-peduncle depth	8.4	7.5–10.5	9.2 ± 1.1	9–11
Percentage of HL				
Snout length	24.9	17.6–29.6	24.6 ± 5.1	33.3
Eye diameter	32.9	23.9–32.9	29.1 ± 3.4	34–38
Interorbital width	31.4	28.5–38.0	34.2 ± 3.8	

^a Data cited from Weitzman and Chan (1966) and Lin (1939)

Fig. 1 *Aphyocypris pulchilineata* sp. nov., holotype, ASIZB 183459, 32.0 mm SL



Paratypes. Six specimens, ASIZB 183460–183465, 26.5–34.9 mm SL. Same data as holotype.

Diagnosis. *Aphyocypris pulchilineata* is distinguished from all other species of *Aphyocypris* by the absence of a lateral line and a large black spot on the caudal-fin base.

Description. Meristic and morphometric data for holotype and six paratypes are given in Table 1.

Body elongate, slender and laterally compressed; dorsal contour convex, ventral contour slightly concave, tapering gradually toward anal-fin end; highest point in front of dorsal-fin origin, then tapering toward caudal-fin base; abdomen round; ventral keel present from midpoint between beginning of pelvic-fin bases to vent. Head moderately pointed in lateral view, compressed. Mouth sub-superior, lower jaw projecting little, symphyseal knob absent, maxilla and premaxilla extending to slightly beyond vertical through anterior margin of orbital, lips smooth. No tubercles on lower jaw. Barbel absent; two pairs of nostrils in front of eye, anterior and posterior nostrils neighbored, anterior nostril round with very short tube, posterior nostril elliptic; eye large, round, eye diameter longer than snout length.

Dorsal-fin origin approximately 3–4 scales (3 in holotype) behind vertical line of pelvic-fin origin, distance from dorsal-fin origin to snout tip longer than to caudal-fin base. Posterior margin of dorsal fin slightly convex, last unbranched ray soft, no serration; seven branched rays, second one longest. Pectoral-fin origin slightly behind vertical line of posterior margin of opercle; pectoral fin short, reaching to two-third of distance between pectoral- and pelvic-fin origins. Pelvic fin pointed, origin midway between snout tip and caudal-fin base, posterior margin straight; pelvic fin short, reaching to two-third distance from pelvic-fin insertion to vent. Anal-fin origin start just behind vent, one-third distance between pelvic-fin origin and caudal-fin base. Caudal fin bilobate and forked, lobes almost equal in length.

Lateral line absent. Scales in lateral series 30 (4 specimens, including holotype), 31 (1) or 32 (2). Circumpeduncular scales 12 (7), dorsal and ventral line one row, respectively, transverse scales 6. Pelvic-fin axillary scale 1 (7). Gill rakers 7 (2, including holotype) or 8 (1). Pharyngeal teeth 3 rows, 1·4·5–5·4·1.

Coloration in life. Back dark gray, pale grey at abdomen. A distinct longitudinal black stripe along body

midline from snout tip to caudal-fin base. A narrow yellowish (including holotype) or golden stripe immediately above the black stripe running from posterior edge of eyes to caudal-fin base. A thin black stripe along dorsal midline from head to caudal-fin base. A black line between anal- and caudal-fin bases. All fins hyaline. Specimens, including the holotype, have been fed in an aquarium of our lab for 3 years and never showed a large black spot on the caudal-fin base (Fig. 1).

Coloration in preservative. Ethanol preserved fish pale brownish above midline of body and yellowish below it. A distinct longitudinal black stripe along body midline from snout tip to caudal-fin base. Stripe composed by many small black dots. All fins hyaline.

Distribution and ecological notes. The new species is known only from the type locality, a stream of the Chengjiang River, a small northern branch of the Hongshuihe River, being itself a tributary of the Xijiang drainage, the longest tributary of the Pearl River (Fig. 2).

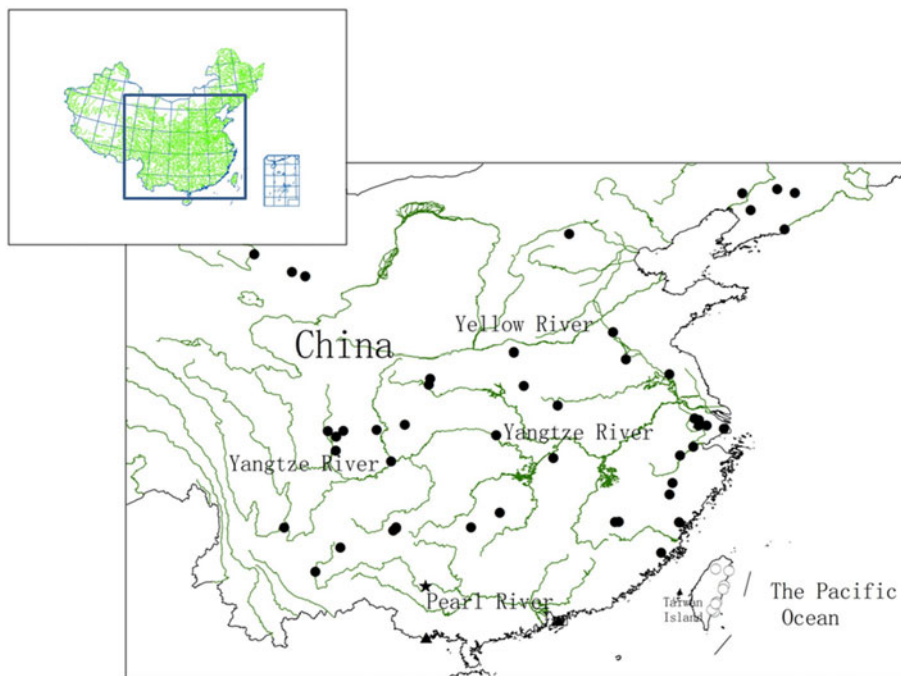
Specimens were collected in a small, canalized stream, which is located very close to the county town. The general landform around is typical karst. The stream was shallow and turbid, with a low flow rate. Aquatic plants grow in the stream, covering almost half of the water. Both shore sides are corn fields. Fish community of the type locality was not surveyed. The stream is disturbed by locals frequently. Ducks are usually found in the water. Meanwhile, the collection site is near a water treatment plant.

Etymology. The Latin adjective *pulchilineata* is a mention of the beautiful (*pulcher*, -ra, -rum) lines (*linea*, hence *lineata*, “bearer of lines”).

Discussion

Many minute cyprinids were placed in the subfamily Danioninae (Chen 1998) (e.g., *Tanichthys* Lin 1932, *Yaoshanicus* Lin 1931, and *Aphyocypris*), but the taxonomy and phylogeny of those small fish taxa are still ambiguous (Tang et al. 2010). Recently, Liao et al. (2011) suggested to synonymize *Pararasbora* Regan 1908, *Yaoshanicus* and *Nicholsicypris* Chu 1935 with *Aphyocypris*. Although we believed these synonymies need further studies with more evidences from both morphology and molecular

Fig. 2 The distribution of the species of the genus *Aphyocypris* in China. *Solid circle* *A. chinensis*, *hollow circle* *A. kikuchii*, *solid star* *A. pulchrilineata* sp. nov., *solid triangle* *A. lini*



phylogeny, this new species still can be distinguished from these fishes morphologically. The all known species in *Yaoshanicus*, *Nicholsicypris*, *Pararasbora* and *Aphyocypris amnis* Liao, Kullander and Lin 2011 (separated from *Pararasbora moltrechti* Regan 1908 by Liao et al. 2011) have a complete lateral line, which is very different from the new species.

The new species has some characters in common with the species of *Xenocyprionides* Chen 1982, which was established and designated into the subfamily Xenocyprioninae by Chen (1982). The taxonomical position of *Xenocyprionides* has not been well solved. It is highly possible to be one of members of the subfamily Danioninae (Zhao et al. 2009). This genus includes two miniature species, *Xenocyprionides carinatus* Chen and Huang in Luo et al. 1985 and *Xenocyprionides parvulus* Chen 1982, which are similar to the new species in having three rows of pharyngeal teeth, ventral keel and sub-superior mouth. However, *Aphyocypris pulchrilineata* is clearly different from the two species of *Xenocyprionides* by the dorsal-fin insertion 3–4 scales vertically behind the pelvic-fin insertion (vs. almost opposite to the pelvic-fin insertion).

Tanichthys albonubes used to be confused with *A. lini*. In fact, all the species of *Aphyocypris* can be easily distinguished from *T. albonubes* by the presence of the ventral keel, which the latter lacks.

Aphyocypris pulchrilineata is also easily distinguished from *A. chinensis* and *A. kikuchii* by the lack of a lateral line (vs. incomplete lateral line present).

Aphyocypris pulchrilineata is most similar to *A. lini* morphologically, especially by the lack of the lateral line

and three rows of pharyngeal teeth. *Aphyocypris lini* was originally placed in the genus *Hemigrammocypripis* by Weitzman and Chan (1966). Type species, *Hemigrammocypripis rasborella* Fowler 1910, is distributed only in Japan. It has an incomplete lateral line, being different from *A. lini* and *A. pulchrilineata* lacking it.

The most distinct differentiation between the new species and *Aphyocypris lini* is the absence/presence of a large black spot on the caudal-fin base. *Aphyocypris lini* is the sole species having a large black spot on the caudal-fin base in the genus, while such a spot is absent in all other species including the new one. Besides, although it was difficult to compare the proportional measurements between *A. lini* (data from original descriptions) and *A. pulchrilineata* by the same criteria, we still can find clues for the differentiations among them by the following characteristics. The new species has smaller eyes (23.9–32.8 vs. 34–38 % SL) and shorter snout length (17.6–29.6 vs. 33.3 %) than *A. lini*. The dorsal fin in the new species is situated closer to the snout than *A. lini* (predorsal length: 44.2–58.7 vs. 55–62 % SL).

Population status of the new species was unable to be evaluated. It still needs further studies.

Key to the species of *Aphyocypris*

- 1a. Lateral line absent.....2
- 1b. Lateral line present, but incomplete.....3
- 2a. A large black spot on base of caudal fin.....*A. lini*

- 2b. No black spot on base of caudal fin.....
.....*A. pulchrilineata* sp. nov.
- 3a. Lateral line extending to above pelvic-fin base.....
.....*A. kikuchii*
- 3b. Lateral line short, not extending to above pelvic-fin
base.....*A. chinensis*

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