Zootaxa 5738 (1): 183–189
https://www.mapress.com/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.5738.1.22
http://zoobank.org/urn:lsid:zoobank.org:pub:26C66FC8-3C1C-4C04-A84D-13ADE27695ED

A new species of *Pseudogastromyzon* Nichols (Teleostei: Balitoridae) from Fujian Province, southeastern China

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Abstract

In this study, a new species of balitorid loach from Fujian Province was collected and described herein, namely *Pseudogastromyzon putienensis*. The new species can be identified by having dorsal fin iii, 7, anal fin ii, 5, pectoral fin i, 17–18, pelvic fin i, 9, lateral line scales 65–71 and vertebrae counts 38–39. For body and fin colourations, male possess greyish brown with metallic sheen, straight pale bars, and conspicuous rows of large dorsal-fin spots while females with ivory base color and distinct Y-shaped or curved bars, and transparent paired and caudal fins with striped rows. The new species was collected from the Mulan River system and is closely related to *Pseudogastromyzon fasciatus*; comparisons of the two species are provided herein with comments upon the taxonomy of related congeners in southeastern China.

Key words: *Pseudogastromyzon*, Balitoridae, new species, Fujian Province, China

Introduction

The sucker loach genus *Pseudogastromyzon* was erected by Nichols (1925), with *Hemimyzon zebroidus* (=*Pseudogastromyzon fasciatus*) as the generic type, and a total of 4 nominal species have been described to date, *viz. P. fasciatus* (Sauvage, 1878); *P. myersi* Herre, 1932; *P. cheni* Liang, 1942 and *P. laticeps* Chen & Zheng, 1980, all species are distributed in southeastern China (Chen *et al.* 2024).

To achieve full understanding of the megadiverse freshwater ichthyofauna of East Asia, we had embarked on numerous collection trips with fruitful results accumulated. Our collections from Mulan River of Fujian Province (southeastern China) had revealed a *Pseudogastromyzon* that was identified as an undescribed species by external colorations and mitogenomic analyses (Li *et al.* in prep.). In this study, the two new species are described in detail herein, with their phylogenetic relationships reconstructed based on selected gene markers. Furthermore, some additional comments are also given on the validity and taxonomical status of closely related congeners of the two new species.

Materials and Methods

Specimens examined in this study were obtained by direct capture with kick nets (Figs. 1–2). Fin clips were sampled from the specimens collected and preserved in 95% EtOH, while the whole fish was fixed in 10% formalin for a few days after photo record of the fresh colorations, then transferred to 70% EtOH for long term preservation and future examinations. Methods for morphometry measurements generally follow Kottelat (1984), all measurements were measured with digital callipers to the nearest of 0.01 mm. Determination of lower lip adhesive apparatus generally refer to Chen *et al.* (2024). Methods for meristic counts follow Kottelat (2001) except for vertebral counts following Randall *et al.* (2022), given as abdominal vertebrae+caudal vertebrae, counts of abdominal vertebrae also include the Weberian apparatus (first rib-bearing vertebra is the fifth). All counts were made from the left side of specimens.

Accepted by M.-F. Yeh: 26 Nov. 2025; published: 30 Dec. 2025

Terms “origin” and “insertion” refer to the anterior and posterior ends of fin bases for both paired and unpaired fins, respectively. Fin ray counts were given as unbranched rays + branched rays. All specimens were given an NTOUP accession number and deposited at the Pisces collection of NTOU. Abbreviations for meristic characters shown as follows: D, dorsal fin rays; A, anal fin rays; P1, pectoral fin rays; P2, pelvic fin rays; LL, lateral line scales, V, vertebral counts.

FIGURE 1. Locality for the collections of the type materials in Nanxi village, Xianyou County, Putien PrefCity, Fujian Province, PRC.

Systematics

Pseudogastromyzon Nichols, 1925

Pseudogastromyzon putienensis sp. nov.

(莆田擬腹吸鰍)
(Figs. 2–5)

Materials Examined

Holotype. NTOUP-2023-09-001, 66.7 mm SL, Nanxi village, Xianyou County, Putien PrefCity, Fujian Province, PRC; coll. Kuang-Yao Chen & Hsien-En Li, 25 September 2023.

Paratypes.

NTOUP-2023-09-002, 2 specimens, 48.7–49.1 mm SL; Da-Ji bridge, Xianyou County, Putien PrefCity, Fujian Province, PRC; coll. Jian-Chin Liu *et al.*, 20 December 2009. NTOUP-2023-09-003, 40.3 mm SL, Jinxi bridge, Xianyou County, Putien PrefCity, Fujian Province, PRC; coll. Kuang-Yao Chen & Hsien-En Li, 25 September 2023.

NTOUP-2023-09-004, 2 specimens, 43.2–58.0 mm SL; Nanxi village, Xianyou County, Putien PrefCity, Fujian Province, PRC; coll. Kuang-Yao Chen & Hsien-En Li, 25 September 2023.

Diagnosis

D. iii, 7; A. ii, 5; P1. i, 17–18; P2. i, 9. LL. 65–71, V. 38–39.

Males greyish brown with metallic sheen, straight pale bars, and conspicuous rows of large dorsal-fin spots; females ivory with distinct Y-shaped or curved bars and transparent paired and caudal fins with striped rows.

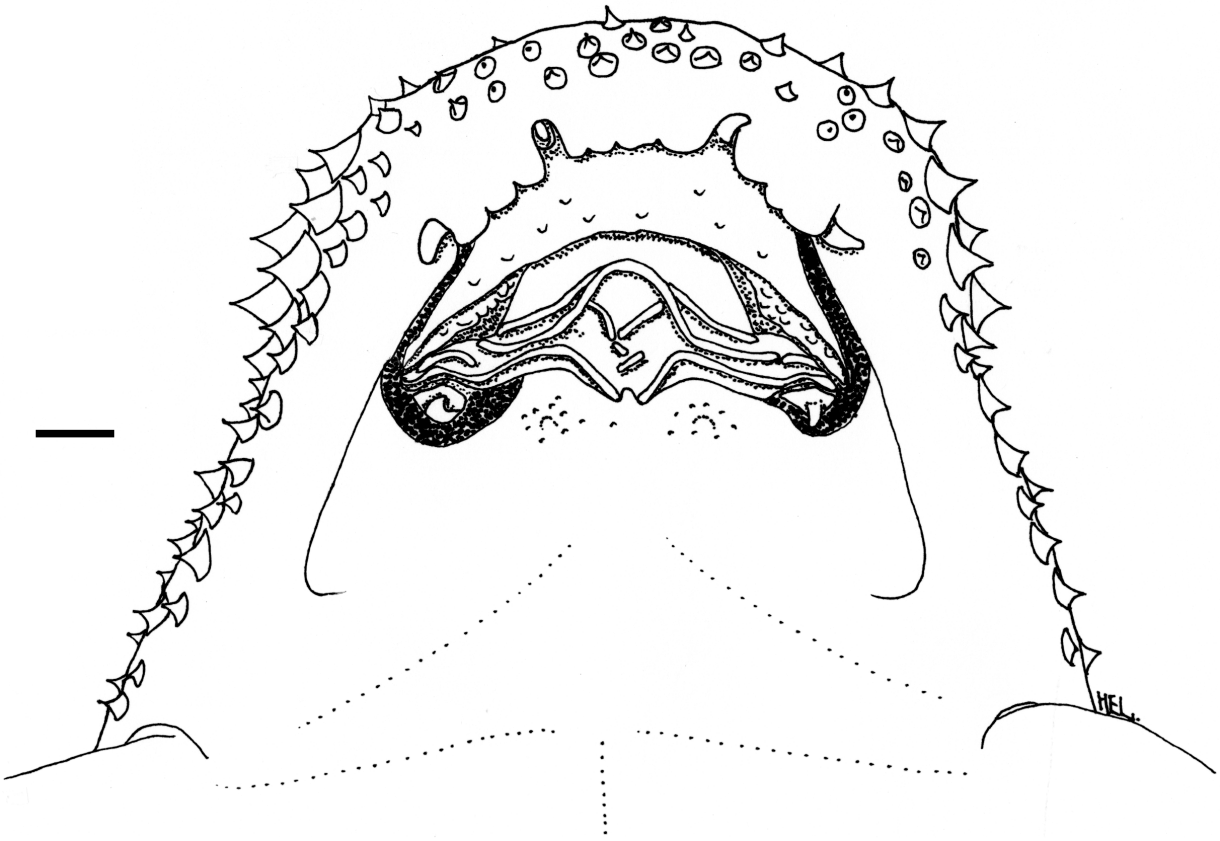

FIGURE 2. Ventral view of head of *Pseudogastromyzon putienensis* **sp. nov.** (NTOUP-2023-09-001, holotype, 66.7 mm SL).

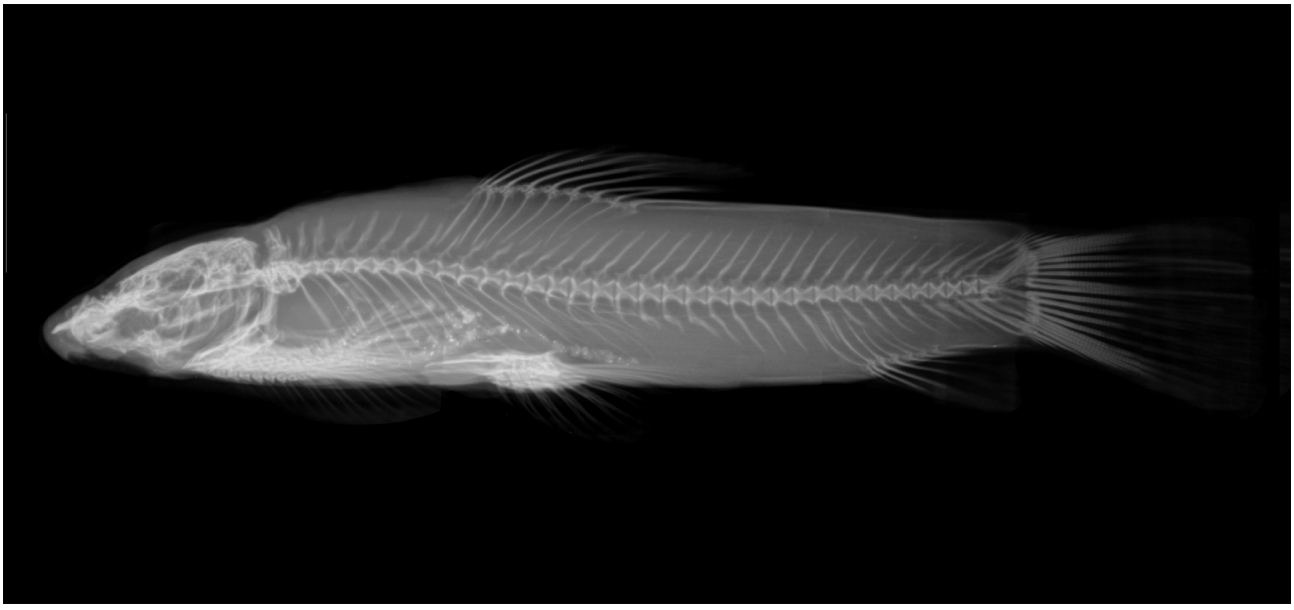

FIGURE 3. Radiograph of *Pseudogastromyzon putienensis* **sp. nov.** (NTOUP-2023-09-001, holotype, 66.7 mm SL).

Description

Body proportions as shown in Table 1, meristic counts of holotype marked with asterisk. Body depressed anteriorly, deepest at dorsal fin origin; cross section merely oblate to elliptical; anterior end tapered, snout gently sloped anterior to eye. Body stout, depth of caudal peduncle greater than length. Head width greater than head depth; nostrils with short flap; gill opening slit-like, located below lateral line with lower edge not extending to ventral side

of head; numerous large cone-shaped nuptial tubercles located upon snout and below eye in male individuals. Mouth inferior; rostral lobe covering 1/3 of upper lip, with 4 short barbels interspaced between, forming 3 major portions with pedal-like edges. Upper lip with papillose or granular surface. Lower lip possesses a pad with cutaneous ridges lined upon (Fig. 2), median posterior edge with a notch and two pointy protrusions; 1st lower lip ridge lined along the posterior edge of the lower lip pad, interrupted medially; 2nd ridge interrupted near mouth corner at both ends while forming an arch medially, with a blunt median hump; 3rd ridge lies anterior to the arch of 2nd ridge, not fusing with the 2nd ridge hump. Centre of the lower lip pad with short, extra proliferated ridges which varies in position, numbers and length. Both mouth corners with one short barble (Fig. 2).

Fins. D. iii, 7*; A. ii, 5*; P1. i, 17*(4)–18(3); P2. i, 9*. Dorsal fin without any inflexible spines; lateral profile convexed; fin origin anterior to pelvic fin origin. P1 length greater than head length; fin origin anterior to gill opening, posterior end exceeds pelvic fin origin and reaches to the vertical position of 2nd or 3rd branched dorsal ray. Axillary pelvic lobe present; both P2 unfused, with its posterior tip just reaching anus. Anal fin with a convex posterior margin. Caudal fin obliquely truncate; lower lobe slightly longer than the upper one. Numerous minute nuptial tubercles can be seen lined along fin rays in male individuals, with tubercles on dorsal, pectoral, and pelvic fins largest.

TABLE 1. Morphometric percentages of the two new *Pseudogastromyzon* species described in this study. All values were rounded to the first decimal.

	Pseudogastromyzon putienensis **sp. nov.**		
Sex	**Holotype**	♂	♀
n	1	5	1
SL (cm)	66.7	40.3–58.0	49.1
Percent in standard length (%)			
Head length (HL)	20.2	20.5 (16.8–23.2)	18.4
Dorsal head length	22.5	23.9 (22.6–26.4)	18.4
Body depth	20.1	20.1 (17.3–22.5)	16.3
Caudal peduncle length	11.2	11.0 (10.3–12.6)	10.9
Caudal peduncle depth	12.9	12.5 (12.1–13.1)	11.6
Pre-dorsal length	45.4	47.8 (45.9–49.9)	43.2
Pre-pelvic length	42.9	43.7 (41.8–45.9)	41.1
Preanal length	68.5	71.3 (68.3–80.2)	80.0
Pectoral-pelvic fin insertion	27.3	29.5 (28.6–31.2)	28.3
Pelvic-anal fin insertion	37.4	37.7 (37.1–39.3)	40.3
Dorsal fin base	16.2	15.2 (13.3–16.7)	15.1
Anal fin base	7.4	7.5 (6.6–8.3)	6.6
Pectoral fin length	36.3	37.8 (36.0–39.6)	38.1
Length between pectoral fins	17.1	18.9 (16.6–20.9)	16.9
Pelvic fin length	27.1	28.2 (26.6–30.5)	27.4
Length between pelvic fins	17.5	18.4 (16.1–20.0)	17.3
Upper caudal lobe length	19.1	22.1 (20.8–24.3)	23.0
Lower caudal lobe length	22.8	24.9 (23.7–26.2)	26.6
caudal peduncle depth/length	115.2	114.8 (97.6–124.9)	106.2
Percent in head length (%)			
Head width	96.2	107.4 (90.2–126.9)	109.5
Head depth	67.6	70.4 (58.5–84.0)	72.1
Snout length	62.3	62.7 (56.1–70.8)	66.5
Interorbital width	60.7	63.2 (56.8–78.3)	66.4
Eye diameter	13.8	16.6 (13.2–20.7)	17.3
Mouth width	22.7	22.3 (19.9–23.7)	20.6

Scales. LL. 65(1), 67(1), 68*(2), 69(1), 70(1), 71(1). Scales all cycloid, size uniform throughout body. Lateral line with pored scales, extends anteriorly until pectoral fin base. Head, pectoral fin base and the ventral side of body naked.

Axial osteology. Vertebrae 38*(4)–39(3) (Fig. 3).

Colouration while fresh. (Fig. 4-5)

In life, body overall in a greyish shade and head appears to be greenish. In fresh postmortem specimens, body greyish brown with a metallic shade in males, while in females and juveniles the body color is rather ivory. Mid-body marked with a series of transverse white stripes, in males the stripes tend to be fainter in the anterior portion of body and always vertically straight, in females and juveniles the bars are always distinct and sometimes become Y-shaped or curvy. Head uniformly dusky in males, dark brownish with reticulated patterns in females. For dorsal fin, male with a broad margin and rather large spots lined in 4–5 rows, while in females and juveniles there are no distinctly coloured margin and with 3–4 rows of moderately sized spots. For P1 and P2, is male uniformly dusky with darker spotted stripes, female and juveniles transparent with 4–5 spotted rows, and pectoral fin base only dark brownish with white reticulated patterns in female and juveniles. Anal fin uniformly dusky with a dark posterior margin in male, while in females and juveniles there are no significant colourations. Caudal fin dusky with fainted rows of spots in males, in females and juveniles it's transparent and with 5 rows of stripes.

Colouration in preservatives. In alcohol preservation, all colourations or shade faded to greyish black, all metallic colours faded.

FIGURE 4. An algae-grazing *Pseudogastromyzon putienensis* (not collected) spotted from the type locality.

Etymology

The specific name, *putienensis*, refers to Putien PrefCity of Fujian Province, PRC, where is the type locality of the new species.

Distribution and habitat

Pseudogastromyzon putienensis **sp. nov.** has so far only known from its type locality.

Remarks

Compared to other *Pseudogastromyzon* species, the morphology of the 2nd lower lip dermal ridge can be employed to differentiate it from its congeners including *P. myersi* (2nd ridge exceeding the 4th ridge *vs.* not exceeding), *P. laticeps* (2nd ridge unimodal *vs.* bimodal) and *P. cheni* (body with numerous stripes *vs.* with circular spots).

FIGURE 5. Fresh coloration of adult male (A, NTOUP-2023-09-001, holotype, 66.7 mm SL), and juvenile (B, NTOUP-2023-09-003, paratype, 40.3 mm SL) of *Pseudogastromyzon putienensis* **sp. nov.**

Pseudogastromyzon putienensis **sp. nov.** is most similar with *P. fasciatus* including dorsal fin elements (both iii, 7), anal fin elements (both ii, 5), overlapping lateral line scale counts (65–71, modally 68 *vs.* 67–80) and the patterns of numerous vertical stripes along body (9–10 stripes *vs.* 10–19 stripes). However, *P. putienensis* can be differentiated from the latter by having a metallic greenish body colour (*vs.* gradient from pale yellow to deep brown) and greyish fin coloration (*vs*. translucent or semi-transparent white).

Discussions

Loaches of *Pseudogastromyzon* were widely distributed along river systems of southeastern China, hence they are an ideal model to study diversification of balitorid loaches (Chen *et al.* 2024; Zhang *et al.* 2024). They had previously concluded, *P. zebriodus*, *P. fasciatus jiulongjiangensis* and *P. meihuashanensis* should be synonymized with *P. fasciatus*. In this study for the *Pseudogastromyzon* species counts, we tentatively follow the decision of Chen *et al.* (2024), and compared our new species based on the redescription of *P. fasciatus* given by Chen *et al.* (2024).

However, we've found *Pseudogastromyzon* specimens in our previous collections with blotching patterns that doesn't agree with the typical "*Pseudogastromyzon fasciatus* complex", which showed the body blotches in irregular spots like those of *P. cheni*, and the specimens of *P. fasciatus jiulongjiangensis* and *P. meihuashanensis* were shown

to have slightly different dorsal fin pigmentations and nuptial colours in their original descriptions (Chen 1980; Li 1998). Hence, we suggest that a detailed systematics revision of the genus should be conducted as possibilities of sympatric species and species represented by different colour morphs resides.

Acknowledgements

The authors would like to express gratitude to Mr. Kwang-Yao Chen, Mr. Jhih-Wen Weng and Mrs. Kwen Yen for their effortless help upon collection of the type specimens. The second author would also like to thank Mr. Kuan-Jie Huang for his opinion upon newly described species. We are also very grateful for partial grant support from CEO, NTOU.

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