



# Article

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## ***Rectoris longibarbus*, a new styglophic labeonine species (Teleostei: Cyprinidae) from South China, with a note on the taxonomy of *R. mutabilis* (Lin 1933)**

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### Abstract

*Rectoris longibarbus*, new species, is here described from the Zuo–Jiang of the Pearl River drainage at Jinxi County, Guangxi Province, China. It is distinct from all other congeners in the rostral barbel length and the structure of the gas-bladder. *Rectoris longibarbus* is further distinguished from *R. posehensis* by having a slightly papillated posteromedian patch on the median plate of the lower lip, and from *R. mutabilis*, as here understood, by having a longitudinal black stripe running along the lateral line on the flank. Taxonomic problems with *R. mutabilis* are also addressed; it is regarded to be a senior synonym of *R. luxiensis*. The type locality of *R. mutabilis* is likely in the Yuan–Jiang (a tributary of the middle Yangtze River drainage) in Guizhou Province. The species currently recognized as *R. mutabilis* is previously unnamed, and possibly represents an undescribed genus.

**Key words:** *Rectoris*, new species, Cyprinidae, taxonomy, China

### Introduction

The labeonine cyprinid genus *Rectoris* was originally established by Lin (1935) as a monotypic genus for *Rectoris posehensis* on the basis of two 109 and 72 mm SL specimens from Poseh (presently Baise), Kwangxi (presently Guangxi Province). A taxonomic revision of *Rectoris* was subsequently presented by Wu *et al.* (1977) in their monograph on Chinese cyprinids in which two other species were referred to this genus: *R. mutabilis*, a species originally described in *Epalzeorhynchus* by Lin (1933) based on four specimens from the Yunkiang, Kweichow (presently Guizhou), and *R. luxiensis*, which was then described by Wu *et al.* as a new species from the Yuan–Jiang of the Lake Dongting system in Hunan Province. The classification of this genus by Wu *et al.* has since been accepted widely by subsequent authors (Li 1989; Zhang *et al.* 2000). Recently, Li *et al.* (2002) described *R. longifinus* as a new species from Yunnan, but without a precise type locality. Our photographic examination of the type material demonstrated that this species does not belong to *Rectoris*. Its generic classification needs further investigation, but that is beyond the scope of the present paper.

Although Kottelat (2001) addressed several taxonomic issues with *R. mutabilis*, but the taxonomy of this species is still poorly understood. The type locality of *R. mutabilis* is in Kweichow (presently Guizhou) Province where no specimens of this species other than the types have been caught until now. Its original description reads: “Chin provided with more or less triangular patch of small, roundish papillae, rudimentary, or absent in young specimens.” Two specimens of 166 and 175 mm SL from the Yuan–Jiang (= Red River) drainage in Yunnan, southern China, on which the description of *R. mutabilis* by Wu *et al.* (1977) was based, did not fit the original description of this species in this regard.

*Rectoris luxiensis* is known from the Xiang–Jiang and Yuan–Jiang in Hunan Province, and Daling–He in Chongqing City (Zhang *et al.* 2000). Careful examination demonstrates that a triangular, slightly papillated patch on the chin is present in the specimens of *R. luxiensis* from its known distributions. Comparison of the other data given in the original description of *R. mutabilis* with those obtained from the type material and available materials

of *R. luxiensis* reveals that there are no differences between the two nominal species. This implies that *R. luxiensis* is possibly a junior synonym of *Epalzeorhynchus mutabilis* (Lin 1933).

In August, 2008, the third author of this study conducted a field fish survey in a tributary (flowing to the Zuo–Jiang of the Pearl River drainage) at Biaoliang Village, about 3 km from Lutong Town, Jingxi County, Guangxi Province. In a temporary pool of water spilled from a karst cave connected to this tributary, he secured one nemacheiline loach species of the genus *Yunnanilus*, which was described by Zhu *et al.* (2009) as a new species *Y. jingxiensis*, and four garrain species, three of which are new to science. The first garrain was described by Zheng *et al.* (2010) as *Pseudogyриноcheilus longisulcus*. The second one, unidentifiable to any presently recognized Asian garrain species, was placed by Zhu *et al.* (2011) in a new genus *Cophecheilus* and described as *C. bamen*. The third one belong to the genus *Rectoris*; eight specimens were originally recognized as *R. posehensis*, but comparison with other specimens revealed that four of them were not conspecific with *R. posehensis*, and thus represent an unnamed species. In order to obtain additional specimens of this unnamed species, we visited the pool where it was initially captured twice during the rainy seasons of the following 2009 and 2010. Unfortunately, no specimens of this unnamed species were collected there. Clearly, the paucity of available specimens is a primary obstacle for a formal description of this species. However, its occurrence in a subterranean stream, a quite specialized habitat, makes it of interest to both the scientists and conservationist. Anthropogenic activities and climate change pose a potential threat to survival of this unnamed species, and no scientific name given to it will hamper its conservation. Therefore, a formal description of this unnamed species should not be postponed until additional specimens become available. Describing this species will bring attention to it from those investigators who are interested in the taxonomy and biospeleology of the Labeonini.

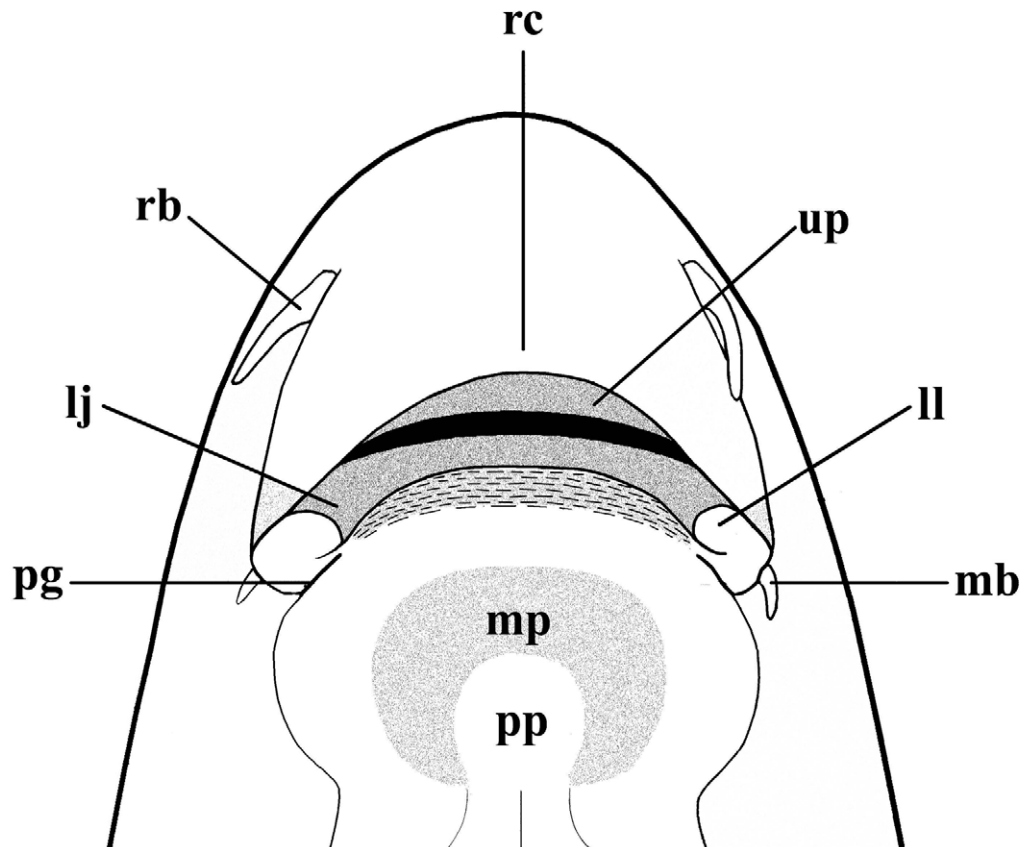
The objectives of the present paper are twofold: (1) to provide a detailed description of the unnamed species; and (2) to clear up the taxonomic confusions surrounding *Rectoris mutabilis* (Lin 1933).

## Material and methods

Measurements were taken point to point with digital calipers directly connected to a data recording computer and data recorded to the nearest 0.1 mm. Measurements and counts, made on the left side of individuals whenever possible, followed those of Kottelat (2001). Predorsal, prepectoral, prepelvic and preanal lengths were taken from the anteriormost tip of the snout to the dorsal, pectoral, pelvic and anal-fin origins, respectively. Interorbital width was measured between the dorsomedial margins of the eyes. The pharyngeal teeth were counted and given in a formula utilizing Hubbs & Lagler's (1947) method, and the formula 3, 5–5, 3 indicates that the pharyngeal bones of both left and right sides bear two rows, with five teeth in the inner and three in the outer. Specimens were dissected to examine the gas bladder. Measurements of parts of the head are presented as proportions of the head length (HL). Head length and measurements of other parts of the body are given as proportion of the standard length (SL).

Oromandibular structures of the Labeonini are of great taxonomic significance at the generic level. The terms for oromandibular structures used here follow those of Siebert & Tjakrawidjaia (1998). *Rectoris* has a unique morphology of the lower lip comprised of many components. To provide an adequate description of the lower lip, some new terms are here applied and defined in details as follows: (1) the *lateral lobe* is a small, oval, fleshy lobe of skin with discrete margins, placed at the corners of the mouth, or between the median lobe and the base of the maxillary barbel; (2) the *median plate* is a large, nearly round, centrally slightly sunken, fleshy pad of skin which is positioned between the two lateral lobes, anteriorly separated from the lower jaw by an arched groove, and posteriorly continuous with the mental region; (3) the posteromedian patch is a papillose, slightly protruded, tongue-like area placed posteromedially on the median plate of the lower lip (Fig. 1).

The data for the latitude and longitude of each locality were not provided in the original collection data and were inferred by the authors based on the best information available. The descriptions are based on alcohol-preserved specimens stored in the collection of the Museum of Aquatic Organisms at the Institute of Hydrobiology (IHB), Chinese Academy of Sciences.



**FIGURE 1.** Diagrammatic illustrations of oromandibular structures in *Rectoris*. lj = lower jaw; ll = lateral lobe of lower lip; mb = maxillary barbel; mp = median plate of lower lip; pg = postlabial groove; pp = papillated posteromedian patch of lower lip; rb = rostral barbel; rc = rostral cap; uj = upper jaw.

### *Rectoris* Lin 1935

**Type species:** *Rectoris posehensis* Lin 1935

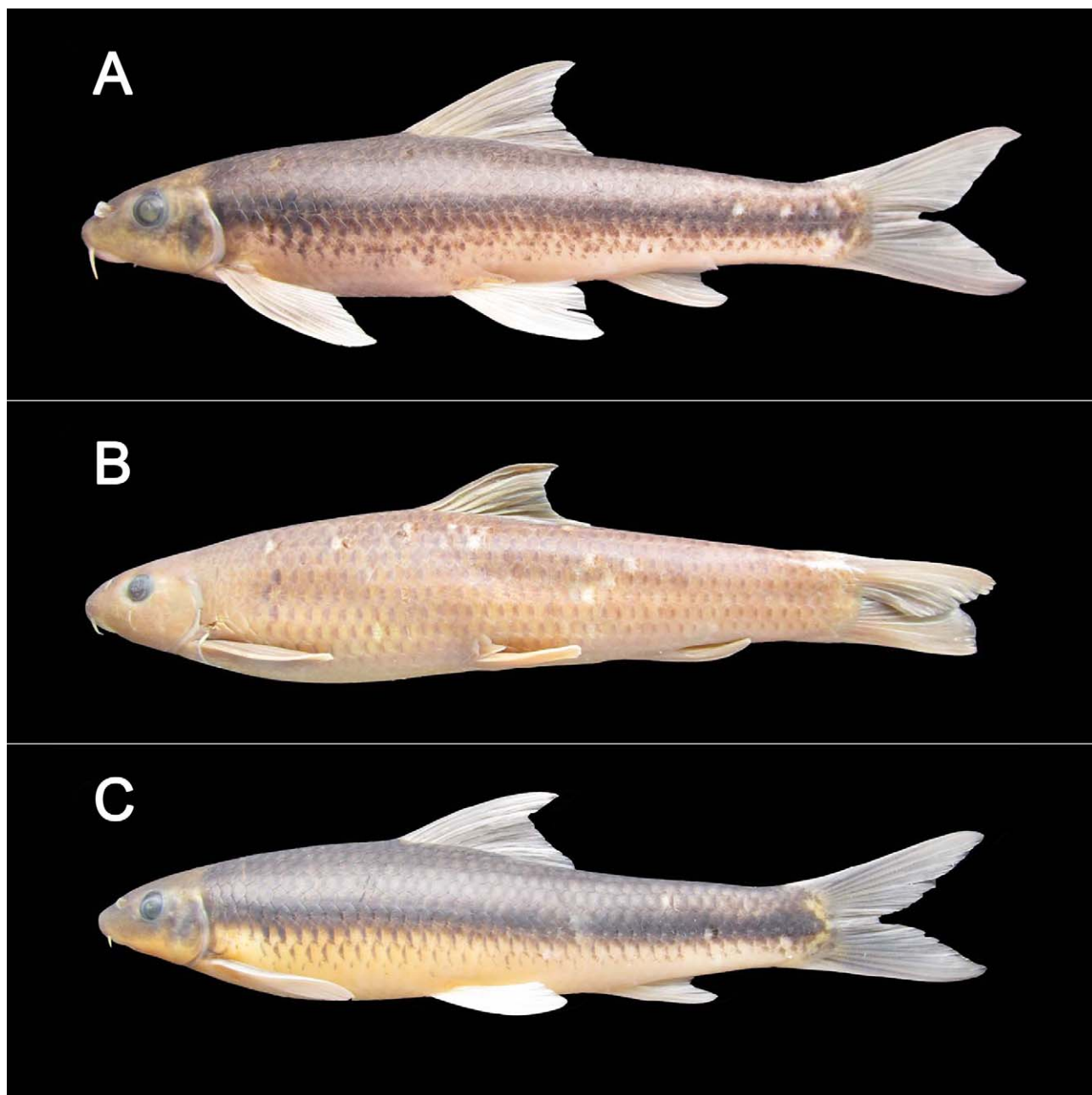
**Diagnosis.** *Rectoris* is similar to *Pseudocrossocheilus* (*sensu* Zhang & Chen 1997) and *Akrokolioplax* (*sensu* Zhang & Kottelat 2006) in having a frenum connecting the upper jaw and lower lip at the corner of the mouth, a character readily distinguishing them from all other Chinese garra genera. *Rectoris* differs from *Akrokolioplax* in having a rostral cap connected with (vs. disconnected from) the lower lip around the corners of mouth, well-developed (vs. minute) maxillary barbels and more lateral line scales (40–46 vs. 36–37) and lacking (vs. having) pair of moveable rostral flaps on the snout tip. It is distinct from *Pseudocrossocheilus* in possessing tiny (vs. prominent) papillae scattered over the lower lip and regularly arranged in many transverse rows (vs. irregularly arranged) and a pair of tiny (vs. well-developed) maxillary barbels and in lacking (vs. having) a pair of mental grooves on the chin.

***Rectoris longibarbus* sp. nov. (Figs. 2A and 3A)**

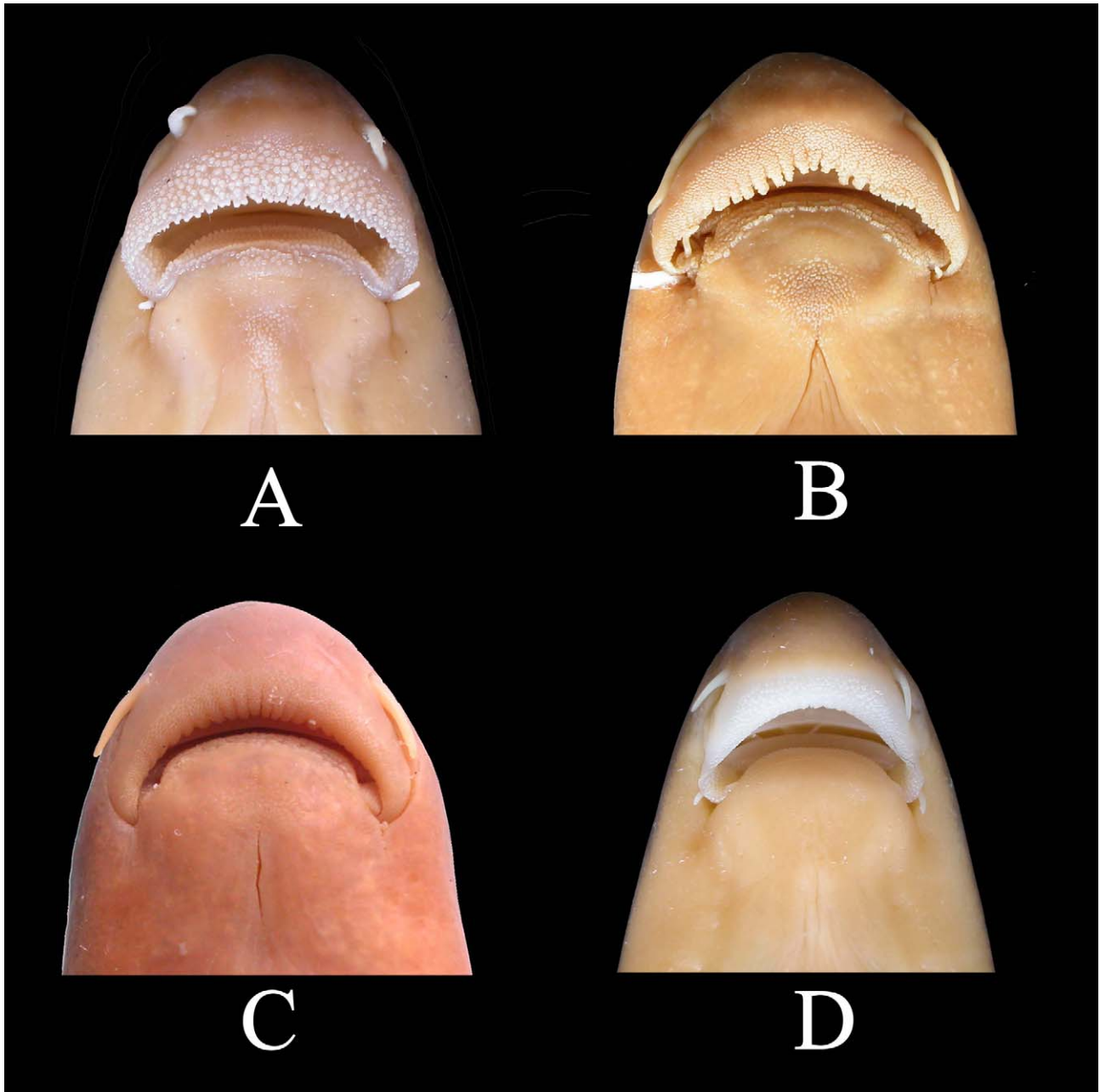
**Holotype.** IHB 200808006, 129.6 mm SL, a stream tributary flowing into Zuo–Jiang of Zhu–Jiang (Pearl River) drainage at Jingxi County, Guangxi, South China; J. H. Lan, Aug., 2008.

**Paratypes.** IHB 200808002, 200808004–5, 3 ex., 65.3–84.5 mm SL, same data as holotype.

**Diagnosis.** *Rectoris longibarbus* is distinguished from two other congeneric species, i.e. *R. mutabilis* and *R. posehensis*, by the presence of a dumbbell-like (vs. slender) posterior chamber of the gas bladder, almost equal to (vs. twice as long as) the anterior chamber (Fig. 4), and rostral barbels longer (vs. shorter) than eye diameter, with their lengths 21.0–24.7% of HL (vs. 10.2–18.8). It is similar to *R. posehensis* in having a longitudinal black stripe running along the lateral line on the flank, but further differs from this species in having a slightly papillated posteromedian patch on the median plate of the lower lip (vs. no patch). It is similar to *R. mutabilis* in the shared presence of a papillated posteromedian patch on the median plate of the lower lip, but further differs from this species in having a longitudinal black stripe running along the lateral line on the flank (vs. stripe absent).

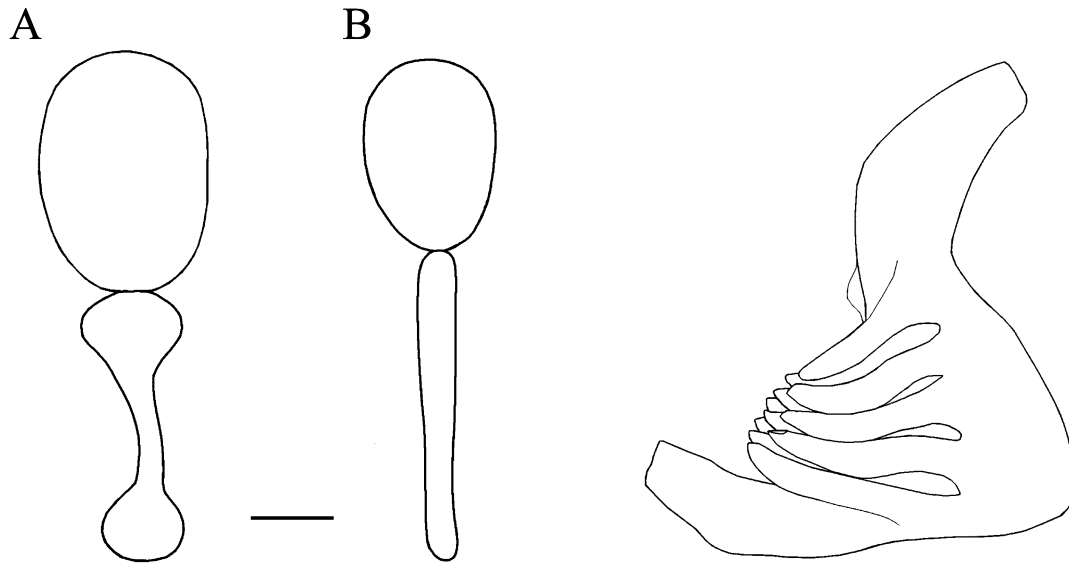


**FIGURE 2.** Lateral view of: (A) *R. longibarbus*, IHB 200808006, holotype, 129.6 mm SL; Guangxi Province: Jinxi County: Zuo–Jiang. (B) *R. mutabilis*, IHB 8840955, 131.6 mm SL; Guizhou Province: Tongyun County: Yang–Jiang; (C) *R. posehensis*, IHB 200808001, 121.9 mm SL; Guangxi Province: Jinxi County: Zuo–Jiang.



**FIGURE 3.** Ventral view of oromandibular structures in: (A) *R. longibarbus*, IHB 200808006, holotype, 129.6 mm SL; Guangxi Province: Jinxi County: Zuo-Jiang. (B) *R. mutabilis*, IHB 8840955, 131.6 mm SL; Guizhou Province: Tongyun County: Yuang-Jiang; (C) *R. mutabilis*, IHB 81X0335, 76.6 mm SL; Guizhou Province: Yinjiang County: Yuang-Jiang; (D) *R. posehensis*, IHB 200808001, 121.9 mm SL; Guangxi Province: Jinxi County: Zuo-Jiang.

**Description.** Morphometric data for the four type specimens are summarized in Table 1. Body elongate, slightly compressed, more so toward caudal-fin base, with greatest body depth immediately anterior to dorsal-fin origin, and least caudal-peduncle depth closer to caudal-fin base than to posterior end of anal-fin base. Dorsal head profile slightly convex; ventral head profile straight. Dorsal body profile slightly convex anterior to dorsal-fin origin; straight or slightly convex from dorsal-fin origin to origin of dorsal procurrent caudal-fin rays. Ventral profile of body rounded anterior to anal-fin origin; somewhat concave from anal-fin origin to origin of ventral procurrent caudal-fin rays.



**FIGURE 4.** Ventral view of gas bladder in: (A) *R. longibarbus*, IHB 200808002, paratype, 127.4 mm SL; and (B) *R. mutabilis*, IHB 85051839, 98.2 mm SL. Scale bar = 5 mm.

**FIGURE 5.** Left side of pharyngeal tooth plate in ventromedial view of *R. longibarbus*, IHB 200808002, paratype, 127.4 mm SL.

Head relatively small, longer and deeper than width. Eyes small, dorsolaterally placed in posterior half of head; interorbital space wide, somewhat convex. Snout blunt when viewed dorsally, with many tiny tubercles on snout tip and anterior part of lachrymal. Lateral portion of snout with a shallow, oblique furrow running from base of rostral barbel to lateral extremity of rostral fold along anteroventral border of lachrymal. Rostral barbels positioned at anterior end of shallow furrow on lateral portion of snout, longer than eye diameter; maxillary barbels minute, rooted in corners of mouth. Mouth slightly arch-shaped.

Rostral fold or cap crenulated, covered densely with papillae, laterally connected with lower lip at corners of mouth. Upper lip greatly reduced or vestigial, with many tiny papillae arranged in a longitudinal row on upper jaw. Upper jaw bearing a thick, flexible, cornified sheath entirely covered by pendulous rostral fold, and laterally connected with lower lip by a frenum at corner of mouth. Lower lip anteriorly separated from lower jaw by a deep groove. Inner surface and anterior edge of free anterior part of median plate of lower lip densely covered with tiny papillae, regularly arranged in many transverse rows. Median plate of lower lip nearly round with a slightly papillose, round posteromedian patch. Lower jaw bearing a thick, cornified cutting edge.

Dorsal fin with 3 simple and 8\* (4) branched rays, last one split to base; last simple ray longer than HL; distal margin slightly concave; origin closer to snout tip than to caudal-fin base. Pectoral fin with 1 simple and 12\*(1) or 14 (3) branched rays, equal to or slightly longer than HL; tip of depressed fin extending slightly beyond three-fourths to pelvic-fin origin. Pelvic fin with 1 simple and 8\*(4) branched rays, slightly shorter than HL; origin posterior to vertical of third dorsal-fin branched ray; tip of depressed fin surpassing anus, not reaching anal-fin origin; pelvic axillary scale long, extending beyond base of last ray. Anal fin with 3 simple and 5\*(4) branched rays, last one split to base; origin closer to pelvic-fin insertion than to caudal-fin base; distal margin concave. Anus anterior to anal-fin origin, separated from it by one scale. Caudal with 9 + 9 branched rays, deeply forked, upper and lower lobes equal in shape and length.

Scales moderately large; lateral line complete, horizontal, 41\*(2), 42 (1) or 43 (1) plus 3 scales on caudal-fin base; 11 predorsal midline scales regularly arranged, smaller than those on flank;  $\frac{1}{2}5/1/4\frac{1}{2}$ \*(4) scales in transverse row anterior to pelvic-fin insertion; circumpeduncular scales 16\*(4). Chest and belly scaled; scales along mid-ventral region smaller than those of its nearby regions; scales on chest embedded beneath skin. Gas bladder bipartite, anterior chamber elliptical or round and posterior chamber stick-like, with both ends slightly enlarged, as long as anterior one (Fig. 4A). Pharyngeal teeth triserial, tooth pattern 2,4,5–5,4,2 (IHB 200808002, 127.4 mm SL), with compressed and pointed tips (Fig. 5). Gill rakers sparse, short and small.

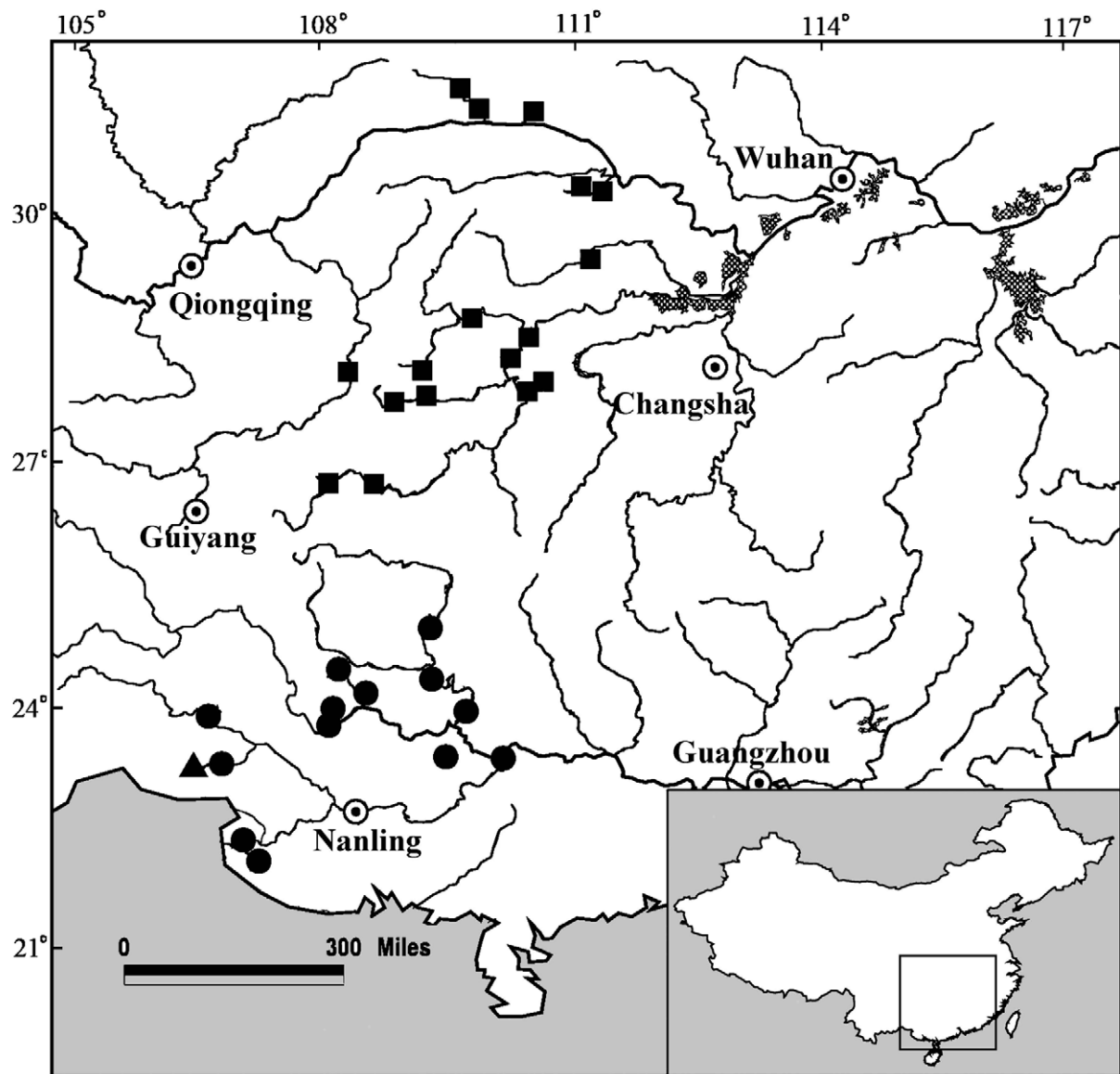
**TABLE 1.** Morphometric data for three species of the labonin cyprinid genus *Rectoris* from South China

Characters	<i>R. longibarbus</i>				<i>R. poseheensis</i> (n=15)			<i>R. mutabilis</i> (n=20)				
	Holotype		Paratypes		Mean	SD	range	Mean	SD	range	Mean	SD
	200808006	200808002	200808004	200808005								
% of SL												
Body depth	20.3	21.3	22.8	21.4	21.5	1.01	21.0–24.4	22.6	1.00	18.8–25.4	21.5	1.7
Head length	21.6	23.7	23.0	22.8	22.8	0.87	19.3–23.1	21.9	1.07	20.2–22.6	21.2	0.62
Caudal-pectuncle length	21.7	21.0	20.3	19.9	20.7	0.79	17.1–21.5	19.6	1.46	17.2–21.2	19.1	1.05
Caudal-pectuncle depth	10.8	11.2	11.5	10.6	11.0	0.39	10.0–11.7	10.6	0.54	11.2–13.0	12.1	0.51
Dorsal-fin length	23.2	24.8	24.9	23.9	24.2	0.82	20.1–23.4	21.6	1.12	19.3–21.6	20.4	0.72
Pectoral-fin length	21.3	22.6	22.5	21.1	21.9	0.78	16.4–21.9	19.2	1.79	17.3–20.0	18.9	0.76
Pelvic-fin length	19.7	21.1	19.9	19.5	20.0	0.72	14.7–19.9	17.3	1.73	15.3–18.2	16.9	0.81
Anal-fin length	16.5	17.0	16.5	15.3	16.3	0.70	14.3–16.8	15.3	0.71	14.2–17.9	15.6	0.83
Predorsal length	43.1	44.9	43.1	44.2	43.8	0.91	43.8–46.7	45.5	1.00	45.9–52.0	47.9	1.46
Prepectoral length	20.3	20.4	20.8	20.2	20.4	0.25	19.1–22.8	20.6	1.35	18.9–23.1	20.3	1.07
Prepelvic length	48.7	50.7	50.5	51.1	50.3	1.05	50.2–53.5	51.8	0.92	50.8–55.3	53.3	1.23
Prenal length	68.3	71.2	71.9	72.7	71.0	1.92	71.7–75.2	73.6	1.26	71.3–78.4	74.4	1.72
% of HL												
Snout length	50.7	48.3	43.2	47.9	47.5	3.12	41.6–53.9	48.4	3.43	45.4–58.0	50.8	2.61
Eye diameter	19.6	20.5	22.7	17.3	20.0	2.22	18.8–24.1	20.6	1.75	15.7–22.4	18.6	1.57
Interorbital width	43.5	40.6	42.1	43.5	42.4	1.38	43.0–55.5	46.8	3.77	45.4–53.8	50.0	2.06
Mouth opening	30.7	31.6	29.9	32.4	31.2	1.10	28.2–49.9	33.5	6.60	29.9–42.0	38.1	2.66
Rostral-barbel length	24.7	22.1	22.8	21.0	22.7	1.53	10.2–17.8	13.8	2.40	13.5–19.6	16.0	1.77

**Coloration.** Top of head grayish; snout, cheek, opercle and subopercle grayish; venter of head yellowish-white. Ground color of body grayish dorsally and laterally, yellowish-white ventrally. An indistinct longitudinal black stripe, roughly two scales in width, originating at upper extremity of gill opening, extending along lateral line on flank, and ending at middle of caudal-fin base. Each scale on flank with dark chromatophores along exposed portion of its posterior margin forming a dark, crescentic, vertically-elongate mark; marks on scales above longitudinal black stripe more prominent. Dorsal and caudal fins dusky, and dorsal surface of pectoral fins with dark chromatophores on fin rays, more dense on leading ray and posterior part of subsequent anterior fin rays, giving it a dusky appearance. Pelvic and anal fins hyaline.

**Sexual dimorphism.** No differences were found between males and females

**Distribution.** Known only from a tributary of the Zuo-Jiang of the Zhu-Jiang drainage at Biaoliang village, Lutong town, Jingxi County, Guangxi Province, South China (Fig. 6).



**FIGURE 6.** Map showing distributions of three species of *Rectoris* from South China: *R. longibarbus* (▲); *R. mutabilis* (●); *R. posehensis* (■).





**FIGURE 7.** (A) Temporary pool of water spilled from a karst cave where *R. longibarbus* was collected and (B) the mouth of this cave.

**Habitat and biology.** *Rectoris longibarbus* was collected at a temporary pool of water spilled from a karst cave during the annual rainy season (late June to August) (Fig. 7A–B). After the rainy season, this pool dries up until the onset of the next rainy season. Four other species that occur with this species are: *Rectoris posehensis* (Lin 1935) *Yunnanilus jingxiensis* (Zhu *et al.* 2009), *Pseudogyrinocheilus longisulcus* (Zheng *et al.* 2010), and *Cophecheilus bamen* (Zhu *et al.* 2011). These species were also found in the other temporary pool of water spilled from a karst cave in Pingjiang Village, Lutong Town during the third author’s 2009 and 2010 field surveys in another tributary of the Zuo–Jiang in Jingxi County, where no specimens of *R. longibarbus* were collected. Some morphological adaptations of this species to the cave environment are the longer rostral barbels, and longer dorsal, pectoral and pelvic fins compared with those of the two congeneric species (Table 2).

**Etymology.** The specific epithet, used as a noun in apposition, is made from the Latin word “*longus*” (= long) and “*barbus*” (= barbel), in allusion to the presence of a pair of well-developed maxillary barbels.

**TABLE 2.** Comparisons of morphometric and meristic characters for the type materials given in the original description for *R. mutabilis* and *R. luxiensis* and made in this study for *R. luxiensis*.

Characters	<i>R. mutabilis</i>	<i>R. luxiensis</i>	
		original description	this study
<b>% of SL</b>			
Body depth	4.4 (22.7 <sup>a</sup> )	4.0–4.8 (20.8–25.0 <sup>a</sup> )	3.9–4.5 (22.1–25.4)
Head length	4.7 (21.3 <sup>a</sup> )	4.8–5.2 (19.2–20.8 <sup>a</sup> )	4.6–4.9 (20.3–21.5)
Caudal-peduncle length	5.2 <sup>b</sup> (19.2 <sup>a</sup> )	5.9–6.9 (14.5–17.0 <sup>a</sup> )	5.0–5.8 (17.2–19.7)
Caudal-peduncle depth	8.4 <sup>b</sup> (11.9 <sup>a</sup> )	7.8–8.2 (12.2–12.8 <sup>a</sup> )	7.7–8.2 (12.1–12.8)
Predorsal length	(46.8)	–	1.9–2.2 (46.3–52.0)
<b>% of HL</b>			
Snout length	2.0 (50.0 <sup>a</sup> )	1.9–2.1 (47.6–52.6 <sup>a</sup> )	1.7–1.9 (51.5–58.0)
Eye diameter	5.8 (17.2 <sup>a</sup> )	5.0–6.0 (16.7–20.0 <sup>a</sup> )	5.3–6.3 (15.6–18.7)
Interorbital width	2.3 (43.5 <sup>a</sup> )	1.7–1.9 (52.6–58.8 <sup>a</sup> )	1.9–2.2 (48.5–53.7)
Mouth opening	2.6 (38.5 <sup>a</sup> )	–	2.5–2.6 (38.2–40.6)
Dorsal rays	3/8	3/8	3/8
Anal rays	3/5	3/5	3/5
Pectoral rays		1/14–15	3/14
Pelvic rays	1/8	1/8	1/8
Lateral-line scales	44	39–42	42–43
Circumpeduncular scales	16	16–18	16

a: value calculated from data in original description.

b: index adapted from original description.

## Discussion

**Comparison of *Rectoris* with its related genera.** The genus can be placed in the Garraina (*sensu* Stiassny & Getahun 2007) by having the following characters: mediation of contact of neural complex with neurocranium, fimbriate ventral margin on rostral cap, papillae densely scattered over ventral margin of both rostral cap and lower lip, antero-rostral position of rostral barbels, and upper lip completely regressed and absent medially. It was formerly regarded as related to different genera among the Labeonini. When *Rectoris* was initially erected, it was compared to *Epalzeorhynchus* (= *Epalzeorhynchos*) and *Pseudogyrinocheilus*. It was later allied to *Epalzeorhynchos*, *Mekongia*, *Parasinilabeo*, *Ptychidio*, *Semilabeo*, and *Sinocrossocheilus* based on their shared oromandibular structures (Wu *et al.* 1977; Zhang 1998). However, molecular phylogenetic studies of cyprinine

fishes clustered *Rectoris* with *Ptychidio*, *Semilabeo*, *Pseudogyriinocheilus*, *Parasinilabeo*, and *Pseudocrossocheilus* (Li *et al.* 2008). In a molecular phylogenetic analysis of the Labeonini, *Rectoris* formed a monophyletic lineage with *Ptychidio* and *Pseudocrossocheilus* (Yang & Mayden 2010). Evidently, the more closely related genera of *Rectoris* are: *Parasinilabeo*, *Pseudogyriinocheilus*, *Ptychidio*, *Semilabeo*, and *Pseudocrossocheilus*.

Three genera (i.e. *Pseudogyriinocheilus*, *Parasinilabeo* and *Semilabeo*) are distinct from *Rectoris* in having a non-crenulated (vs. crenulated) rostral cap and a lower lip anteriorly separated from, but confluent with the lower jaw (vs. anteriorly separated from the lower jaw by a deep groove), and in lacking a frenum that connects the upper jaw and the lower lip (vs. presence). *Ptychidio* is uniquely characterized by having the ventral margin of the rostral cap split into fimbriae with branched twigs. This character, together with well-developed mental grooves on the chin and well-developed maxillary barbels, separates this genus from *Rectoris*, which lacks mental grooves on the chin and with tiny maxillary barbels. *Pseudogyriinocheilus*, like *Akrokolioplax*, is similar to *Rectoris* in having a frenum connecting the upper jaw and the lower lip; this characteristic separates these three genera from all other garrains.

**Identity and type locality of *R. mutabilis*.** There are two reasons for poor taxonomic understanding of *R. mutabilis*. The first one is that the precise location of the type locality of the species in Guizhou Province remains uncertain. The type locality was given as ‘Yunkiang’ in the original description by Lin (1933), but no present river in Kweichow (= Guizhou) has been known by this name. Lin’s ‘Yunkiang’ means the ‘Yun–Jiang’ in Chinese, and the present Yun–Jiang is a tributary draining to the Liu–Jiang of the Pearl River drainage in Guangxi Province. Wu (1989) ever maintained that the ‘Yunkiang’ was the Rong–Jiang in Guizhou Province, but without further elaboration. Despite the current treatment of *R. mutabilis* as a valid species, it has not been recorded from Guizhou Province since its original description. The second, and more important, reason is that little is known about the whereabouts of the type specimens of *Epalzeorhynchus mutabilis* (Lin 1933). Its original description stated that the type material was stored in the museum of Sun Yat-Sen University, but it can not be traced. In Böhlke’s (1953) catalogue of the type specimens of recent fishes in the Natural History Museum of Stanford University, the holotype of this species was given as CAS-SU 35261 (122.5 mm SL), which was said to have been received from Lingnan University Natural History Museum (see Kottelat 2001). On the basis of this specimen, Bănărescu (1986) provided a redescription of *E. mutabilis*, but placed it in *Crossocheilus*. From Kottelat’s (2001) point of view, there is no evidence that the holotype of *R. mutabilis* is CAS-SU 35261.

Useful information about *R. mutabilis* can be obtained from Lin’s (1933) original description, despite inaccuracies in the accompanying figure pointed by Kottelat (2001). Based on this information, in combination with our current understanding of the taxonomy of *Rectoris* and its allies, the problems with the generic classification, identity and type locality of this species are here addressed. The type specimen (No.35, 128 mm SL) of *R. mutabilis*, in terms of Lin’s text and illustration, has the following characters: fimbriate ventral margin of rostral cap, papillae densely scattered over ventral margin of rostral cap and lower lip, antero-rostral position of rostral barbels, no movable lateral rostral lobes, a frenum connecting the upper jaw and lower lip at the corner of the mouth, and maxillary barbels tiny or absent. These characters, as here understood, place this specimen in *Rectoris* instead of any other garrain genus (see the generic diagnosis for details). Bănărescu (1986) commented that the putative holotype of this species is similar to *Crossocheilus horai*, which was placed in *Cirrhinus* by Roberts (1997); given this, we fully agree with Kottelat (2001) that the specimen labelled as the holotype of *E. mutabilis* in CAS-SU is not the type of *R. mutabilis*.

A papillated, triangular patch on the chin was clearly shown in Lin’s figure (p. 85: Fig. 4). Judged from our experience gained from studies on the taxonomy of Chinese labeonins, this character is unshared with any other Chinese species of garrains, so is truly diagnostic for *R. mutabilis*. Two other diagnostic characters, not unique to this species, are the absence of a longitudinal stripe running along the lateral line on the flank, and rostral barbels shorter than the eye diameter. The former can distinguish it from *R. posehensis*, and the latter from *R. longibarbus*. *Rectoris mutabilis* is similar to *R. luxiensis* in the shared presence of these two characters, but they differ in the presence or absence of a papillated, triangular patch on the chin. Examination of the type specimens of *R. luxiensis* showed that the median plate on the lower lip has a posteromedian patch covered with small densely distributed papillae, and sometimes, a few inconspicuous papillae are scarcely distributed over the slightly sunken area surrounding the posteromedian patch on the median plate of the lower lip (Fig. 3B). This slightly papillated, sunken area, along with the papillated posteromedian patch, forms a slightly papillose triangular patch on the chin,

as shown in Lin's figure of *R. mutabilis*. Examination of the specimens from throughout its the known distributions showed that this posteromedian patch is rudimentary or absent in small-sized specimens (Fig. 3C). This does not disagree with the original description of *R. mutabilis*. Comparison of morphometric data provided in their original descriptions indicated that *R. mutabilis* and *R. luxiensis* differ in the caudal-peduncle length and interorbital width (see Table 2), but these differences are not so surprising given only six type specimens for these two species. The index values for these two characters in the original description for the type material of *R. mutabilis* are not distinct from those calculated from measurements taken for the type material of *R. luxiensis* (see Table 2). Also, no differences are found between these two species in meristic counts except for lateral-line scales. The difference in lateral-line scales can be explained by utilizing different methods to count them. Those on the caudal-fin base were included by Lin (1933) in lateral line scales, but not included by Wu *et al.* (1977). These findings lead us to conclude that *R. luxiensis* is probably a junior synonym of *R. mutabilis* (Lin 1933).

Based on this conclusion, it is likely that the type locality of *R. mutabilis* is within the known distribution of the species currently recognized as *R. luxiensis*, i.e. in the Yuan–Jiang and Xiang–Jiang in Hunan Province, the Qingshui–Jiang and Jing–Jiang in Guizhou Province, and the Daling–He in Chongqing City, South China (Fig. 4). The Qingshui–Jiang and Jin–Jiang are two tributaries of the Yuan–Jiang in Guizhou Province. The mandarin Chinese 'Yuan' is pronounced as 'Yun' in the dialect of Guizhou Province. In fact, 'Yunkiang' means 'Yuan Jiang.' Therefore, the type locality of *R. mutabilis* is probably in the Yuan–Jiang of Guizhou.

**Generic status of the species currently identified as *R. mutabilis*.** The current identity of *R. mutabilis* follows Wu *et al.* (1977). Their description of this species was based on two 166 and 175 mm SL specimens from the Red River drainage in Yunnan Province. Bănărescu (1986) remarked that Wu *et al.* (1977)'s *R. mutabilis* was not the species described by Lin (1933), but a species of *Rectoris* based on the figure of the mouth. It is important to note that the figure of the mouth of this species in Wu *et al.* is not accurate. The postlabial grooves, in terms of Wu *et al.*'s figure (Plate 7–87), are short, medially-directed, and broadly interrupted. The second author of the present study ever examined the two specimens from the Red River drainage, on which Wu *et al.*'s account of *R. mutabilis* was based, and found that the postlabial grooves is long, extending anteromedially for half of the distance to the anterior margin of the lower lip. In this study we have no access to these two specimens as they survive misplaced in the collection of the Museum of Aquatic Organisms at IHB following this museum's moving into a new building in 2003.

The Red River drainage specimens, according to Wu *et al.*'s text, have a papillose rostral cap uncrenulated with some vertical grooves on its distal margin, and 21 or 23 predorsal scales, thus indicating that they are not conspecific with *E. mutabilis* (Lin 1933) with a papillated, crenulated rostral cap and 16 predorsal scales. This corroborates Bănărescu's (1986) conclusion that Wu *et al.*'s *R. mutabilis* is not the species described by Lin (1933). Although *R. mutabilis* of Wu *et al.* is similar to all here recognized species of *Rectoris* in the shared presence of a frenum linking the lateral end of the upper jaw with the lower lip, but distinguished from them in having: (1) mouth opening not exposed, or entirely covered by rostral cap and lower lip (vs. exposed); (2) postlabial grooves extending anteromedially for half of the distance to the anterior margin of the lower lip (vs. only restricted to the corner of the mouth); (3) rostral cap uncrenulated with some vertical grooves on its distal margin (vs. crenulated); and (4) predorsal scales 21–23 (vs. no more than 16). These four characters do not allow the placement of this species in *Rectoris* or any other currently identified garra genus. The species currently recognized as *R. mutabilis* is unnamed and possibly represents an undescribed genus.

## Comparative materials

*Akrokolioplax bicornis*: IHB 64.8.1 (holotype), 108.8 mm SL; China, Yunnan Province, Salween River drainage at Baoshan County.

*Epalzeorhynchus kalopterus*: CMK 11613, 3 ex., 30.5–75.2 mm SL; Indonesia Borneo, Kapuas drainage.

*Parasinilabeo assimilis*. IHB 75IV29–32, 75IV626–7, 6 ex., 78.0–93.0 mm SL, China: Guangxi Province, Pearl River drainage.

*Parasinilabeo longibarbus*. IHB 20024051387 (holotype), 2002051405–7, 2002051413, 2002051410, 2002051424–5, 8 ex., 43.9–53.3 mm SL; China: Guangxi Province, Gui–Jiang of Pearl River drainage at Fuchuan County.

*Pseudocrossocheilus bamaensis*: IHB 73422, 76092, 743119, 743136, 4 ex., 100.0–108.0 mm SL; China, Guangxi Province, Pearl River drainage at Bama County.

*Pseudocrossocheilus liuchengensis*: IHB 82VII1521–3, 82VII1528, 4 ex., 68.0–81.0 mm SL; China: Guangxi Province, Pearl River drainage at Liucheng County.

*Pseudocrossocheilus longibulla*: KIZ 9907002 (holotype), 91.0 mm SL; China: Guizhou Province, Xi–Jiang of Pearl River drainage at Libo County.

*Pseudocrossocheilus nigrovittata*: KIZ 99052020 (holotype), 97.0 mm SL; China: Guizhou Province, Dagou–He flowing to Pearl River drainage at Libo County.

*Pseudocrossocheilus papillolabra*: KIZ 8811693 (holotype), 128.5 mm SL; China: Guizhou Province, Beipan–Jiang of Pearl River drainage at Zhenfeng County.

*Pseudocrossocheilus tridentis*: KIZ 774079 (holotype), 118.0 mm SL; China: Yunnan Province, Nanpan–Jiang of Pearl River drainage at Yiliang County.

*Ptychidio jordani*: IHB 861206–7, 861210, 3 ex., 143.2–151.1 mm SL; China: Guangxi Province, Hongshui–He of Pearl River drainage at Heshan City.

*Rectoris posehenis*: All specimens from Guangxi Province, South China. -IHB 85051842–4, 850518431, 850518421, 85111313, 6 ex., 93.7–108.1 mm SL; a tributary flowing to Hongshui–He of Pearl River drainage at Duan County. -IHB 85051839, 85051836–7, 3 ex., 88.6–109.9 mm SL; Hongshui–He of Pearl River drainage at Dahua County. -IHB 85051810, 85051828, 2, ex., 73.4–85.8 mm SL; Diao–Jiang, a tributary flowing to Liu–Jiang of Pearl River drainage at Baiwang County. -IHB 87057405, 1 ex., 91.18 mm SL; Diao–Jiang at Linlang County. -IHB 2000808001, 2000808003, 2000808007, 3 ex., 96.61–126.5 mm SL; a tributary flowing to Zuo–Jiang of Pearl River drainage at Jingxi County.

*Rectoris mutabilis*. IHB 3840957, 3840952–3, 3 ex., 100.5–101.3 mm SL; China: Guizhou Province: Tongren County: Yuan–Jiang. -IHB 81X0327, 81X0323, 2 ex., 98.5–105.7 mm SL; China: Guizhou Province: Yinjiang County, Wu–Jiang. -IHB 81X0497, 81X0478–9, 3 ex., 80.8–101.0 mm SL; China: Hubei Province: Yidu County, Qing–Jiang of Yangtze River drainage. -IHB 8840429–30, 2 ex., 105.0–108.7 mm SL; China: Hunan Province: Baojing County, Yuan–Jiang. -IHB 87VI0023, 87VI032, 87VI018, 3 ex., 105.4–110.1 mm SL; China: Chongqing City: Dachang County, Daling–He, a tributary flowing to Yangtze River drainage. -IHB 83IX1825, 83X1837, 2 ex., 89.3–94.7 mm SL; China: Hunan Province: Cili County, Li–Shui, a tributary of Dongting Lake system connected to middle Yangtze River drainage. IHB 3.730, 3.856, 3.751, 3.901, 4 ex., 126.8–155.4 mm SL; China: Hunan Province: Luxi County, Yuan–Jiang. -IHB 7.269, 130 mm SL; China: Hunan Province: Jiangkou County, Yuan–Jiang.

*Semilabeo notabilis*. IHB 75IV1050, 81XII0204, 81XII 0281, 4 ex., 101.9–144.1 mm SL, China: Guangxi Province, Zuo Jiang of Pearl River drainage at Longzhou County

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