

**TWO NEW SPECIES OF *GASTROMYZON*
(TELEOSTEI: BALITORIDAE) FROM THE KUAMUT
HEADWATERS, KINABATANGAN BASIN, SABAH, MALAYSIA**

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ABSTRACT. - Two new species of *Gastromyzon* are described from the Kuamut headwaters of the Kinabatangan basin, about 60 km north of northwest of Danum Valley Field Centre, Lahad Datu District, Sabah. *Gastromyzon pariclavis* attains ca. 60 mm SL and is distinguished from its congeners in having 11-16 distinct equidistant alternating light and dark grey vertical bands on body, a strongly angular gill slit and an elongate rounded dorsal head profile. *Gastromyzon ornatICAUDA* reaches ca. 70 mm SL and is distinguished from its congeners in having a postoral pouch and an elongate truncate dorsal head profile. In life, its caudal-fin has reddish dorsal and ventral longitudinal margins and an iridescent bluish-green patch in the middle.

KEYWORDS. - Taxonomy, new species, Balitoridae, Sabah, biodiversity.

INTRODUCTION

The balitorid subfamily Gastromyzontinae is represented by at least seven genera and 23 species (Inger & Chin, 1961, 1962; Roberts, 1982a, 1989; Kottelat et al., 1993) and Borneo represents the centre of diversity for this group. The family Balitoridae is most common in headwater streams, and can constitute up to 50 % of total species of ichthyofauna in that habitat. Most species have enlarged pectoral and pelvic fins, some with fused pairs of pectoral and pelvic fins. The enlarged fins enable balitorids to cling onto rocks in fast flowing water. Unicellular horny projections or uncini on the ventral surfaces of the fish apparently serve to increase grip on smooth rock surfaces (Roberts, 1982b). Ecological and life history notes of balitorids are poorly known, e.g. no known specimens of *Gastromyzon* less than 10 mm SL or larval forms have been observed. Even the feeding ecology of *Gastromyzon* is poorly studied. From their clinging habit, inferior mouth and hyper-coiled guts, they feed primarily

on algae (from preliminary studies). However, specimens of three unidentified *Gastromyzon* spp. from Sarawak have been observed to feed on larvae of Chironomid midge in captivity.

The Kuamut headwater streams in the Danum Valley Conservation Area of Sabah, Malaysia, are characterised by swift-flowing water and rocky substrates. They flow into the Kinabatangan River to the north, the largest drainage system in Sabah. Recently these streams were made accessible by logging roads, and were sampled for fish in October, 1996 (Martin-Smith & Tan, 1998). Forty-seven species were recorded from the upper Segama area, including five species of *Gastromyzon*. With reference to the latest works on this genus (Inger & Chin, 1961; Roberts, 1982a; Chin & Inger, 1989; Kottelat et al., 1993), three can be keyed out as *G. punctulatus*, *G. lepidogaster* and *G. danumensis*. The other two, however, cannot be identified as any of the presently-known taxa. They are hereby described as new species. Lim & Wong (1994) last reviewed the fish fauna of the Kinabatangan basin. *Gastromyzon lepidogaster* is the only species listed in their compilation. *Gastromyzon danumensis* and the present two species should be included.

MATERIAL AND METHODS

Qualitative samples of fishes were taken from six streams in the upper Kuamut catchment. For more details on the localities, refer to Martin-Smith & Tan (1998). The fishes were caught using an electrofisher, scoop net and kick net. All preserved specimens were initially fixed in 10 % formalin for one to two weeks and later transferred to 75 % ethanol for long term storage.

Specimens are deposited in the Danum Valley Field Centre, Lahad Datu, Sabah (DVFC); Sabah Museum, Kota Kinabalu, Sabah (SBM); the National Museum of Natural History, Washington (USNM); the Zoological Reference Collection, the National University of Singapore (ZRC); and the collection of Maurice Kottelat, Cornol (CMK). Standard length (SL) was measured from the tip of the upper jaw to the caudal peduncle. Meristics and terminology follow that of Roberts (1982a). Morphometrics was measured from point to point using dial calipers (to nearest 0.05 mm). Vertebral counts were taken from radiographs using the method and terminology of Roberts (1989: 22). Abbreviations used: SL - standard length; HL - head length.

TAXONOMY

Gastromyzon pariclavis, new species

(Figs. 1-2)

Material examined. - Holotype - SBM uncat., 50.8 mm SL; Sabah: Lahad Datu: Kuamut, unnamed stream at km 111 on Main Line West logging track (5°01'05"N 117°32'40"E); H. H. Tan et al., 3 Oct.1996.

Paratypes - ZRC 41567, 4 ex., 36.8-57.0 mm SL, SBM uncat., 5 ex., 39.2-48.6 mm SL, CMK 14363, 3 ex., 36.8-51.0 mm SL; same locality as holotype. — ZRC 41568, 3 ex., 21.7-40.5 mm SL, SBM uncat., 3 ex., 23.9-39.8 mm SL; Sabah: Lahad Datu: Kuamut, unnamed stream at km 113 on Main Line West logging track (5°00'40"N 117°31'40"E); H. H. Tan et al., 3 Oct.1996.

Diagnosis. - *Gastromyzon pariclavis* differs from its congeners in having the following combination of characters: 11-16 distinct equidistant alternating light and dark grey bars on body (Fig. 1); gill slit strongly angular; subopercular groove pronounced and continuous to origin of pectoral fin base; a relatively elongate and rounded snout (Figs. 1-2) which is covered relatively densely on the anterior end with tubercles, and strongly sloping downward in front of eyes; absence of secondary rostrum; 65-67 scales on lateral line.

Description. - General body shape and appearance as in Fig. 1; dorsal, ventral and lateral head views as in Fig. 2. Meristics and morphometrics of five specimens provided in Table 1. Head rounded and elongate in dorsal profile, relatively short (26.9-29.2 % SL) and wide (22.2-24.7 % SL, 76.0-85.9 % HL), head relatively deep (head depth 13.5-15.5 % SL, 50.0-53.9 % HL); snout relatively elongated (snout length 18.2-20.3 % SL), anterior covered relatively densely with tubercles; eye relatively small (orbit diameter 3.7-4.7 % SL, 12.6-17.6 % HL); gill slit strongly angular, subopercular groove pronounced and continuous to origin of pectoral fin base, length of gill slit about two to three times eye diameter; postoral pouch absent; scales absent from belly; pectoral fin reaching first fifth of pelvic fin, pectoral fin folded against body covering 14-24th scales of lateral scale series when preserved; pelvic fin not reaching anal fin origin; pectoral and pelvic fins with dorsal serrae; dorsal fin situated

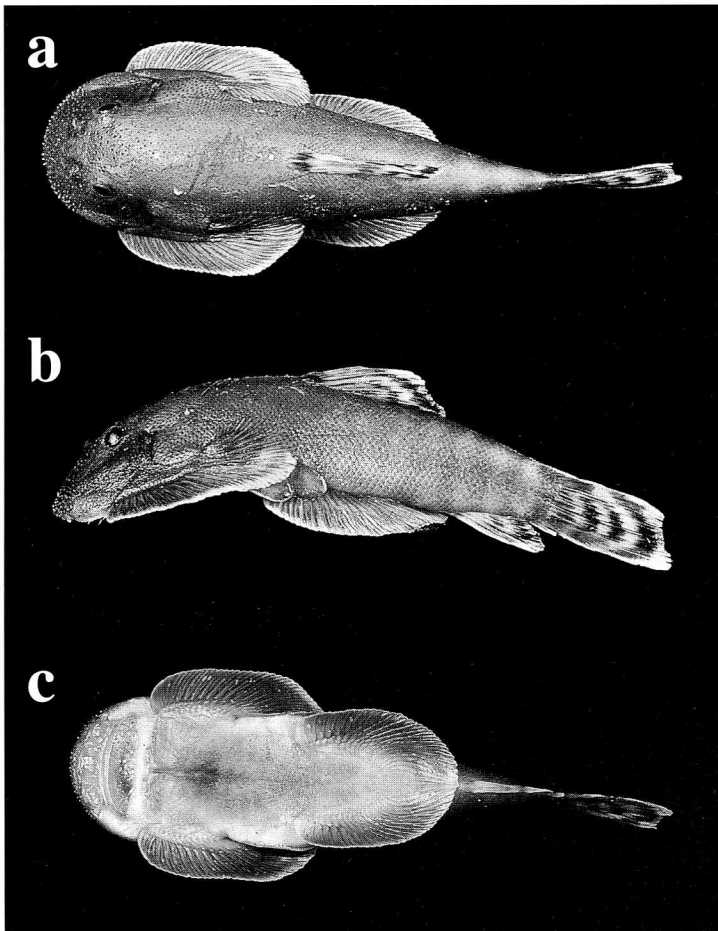


Fig. 1. *Gastromyzon pariclavis*, new species - (a) dorsal, (b) lateral and (c) ventral views (ZRC 41568, 40.1 mm SL).

Tan & Martin-Smith: New species of *Gastromyzon* from Sabah

Table 1. Meristic and morphometric data of *Gastromyzon pariclavis* and *G. ornatICAUDA*.

	<i>G. pariclavis</i>	<i>G. ornatICAUDA</i>
sample size (n)	5	5
SL (mm)	39.3-57.2	37.0-52.4
MERISTICS (mode)		
vertebrae	22-23 + 7-9 = 29-31 (30, n=14)	23-24 + 8-9 = 30-32 (32, n=14)
branched dorsal fin rays	8-10 (9)	7
branched anal fin rays	5	5
principal caudal fin rays	16	15-16 (15)
pelvic fin rays	19-20 (20)	17-18 (18)
pectoral fin rays	25	26-27 (26)
lateral line scales	65-67 (65, 67)	60-64 (64)
predorsal scales	34-38	33-36 (35)
transverse scales	15-18.1.14-15	15-17.1.12-13
caudal peduncle scales	7-8.1.7-8	6.1.6-7
scale rows above lateral line	19-21 (19, 20)	17-19 (18)
MORPHOMETRICS - %SL		
total length	125.7-130.3	124.4-128.9
trunk length	76.0-79.9	77.4-78.4
predorsal length	52.1-54.9	54.4-57.0
preanal length	78.3-81.9	81.0-86.6
prepelvic length	44.4-46.0	49.5-52.2
head length	26.9-29.2	26.0-28.4
body depth at dorsal fin origin	19.2-21.7	17.3-18.8
body depth	15.6-18.4	14.5-15.8
caudal peduncle depth	9.9-11.9	9.5-10.5
caudal peduncle length	9.2-11.9	8.0-9.7
dorsal fin base	20.1-22.4	15.8-17.2
anal fin base	8.0-9.7	6.7-7.6
pelvic fin length	32.2-36.3	35.1-36.2
pectoral fin length	33.4-39.4	41.4-43.7
head depth	13.5-15.5	12.2-13.8
head width	22.2-24.7	23.4-25.9
snout length	18.2-20.3	16.9-18.5
orbit diameter	3.7-4.7	4.4-5.1
interorbital width	10.7-12.2	10.1-11.3
%HL		
head depth	50.0-53.9	44.4-50.4
head width	76.0-85.9	86.7-94.3
snout length	64.7-71.9	62.9-67.4
orbit diameter	12.6-17.6	16.0-19.4
interorbital width	39.8-44.5	36.8-41.1
% head width		
head depth	60.0-66.9	48.9-56.0

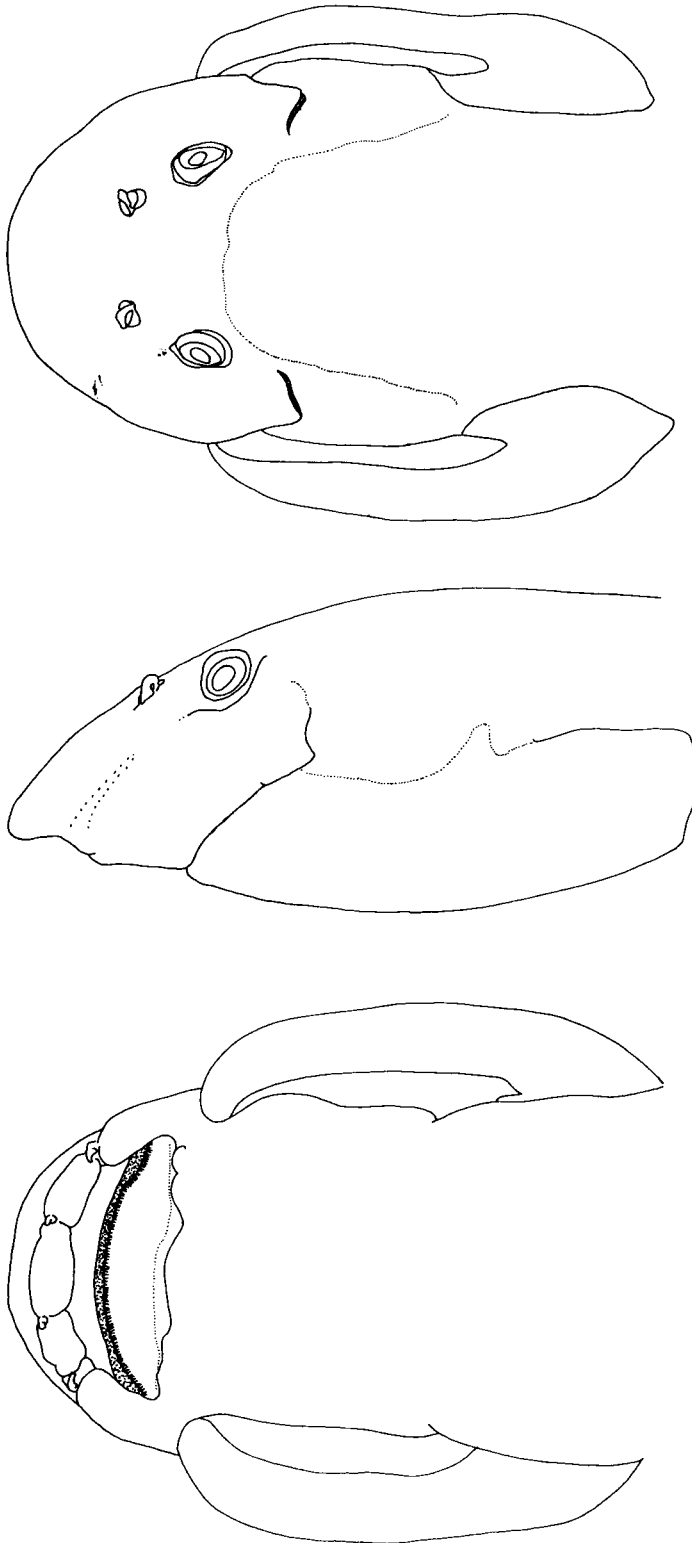


Fig. 2. Schematic drawing of *Gastromyzon pariclavis*, new species - lateral, dorsal and ventral head profiles (ZRC 41567, 49.4 mm SL).

about mid body (predorsal length 52.1-54.9 % SL), adpressed dorsal fin falling short of level of anal fin origin; deepest part of body at dorsal fin origin (body depth at dorsal fin origin 19.2-21.7 % SL); anus situated just posterior to base of (fused) pelvic fins; caudal peduncle depth relatively deep (9.9-11.9 % SL); caudal peduncle length relatively long (9.2-11.9 % SL).

Coloration. - Colour pattern of preserved specimens shown in Fig. 1. Body with evenly spaced 11-16 light and dark grey bars from behind the head to the caudal, which may be faint in some specimens; ventral of body cream. Dorsal surface of head uniformly dark grey with faint whitish rounded blotches. Anterior portion of dorsal-fin origin with black spot; dorsal fin with three black stripes, leaving a clear distal border; black pigment mainly on rays and diffuses onto interradial membranes. Caudal fin with four to five black curved bars, leaving a clear distal border; anal fin with two bars and a clear distal margin. Paired

Table 2. Comparative data of *Gastromyzon* species.

	Lateral scales	Predorsal scales	Scale rows above lateral line	Circum-peduncular scales	Gill slit
<i>G. borneensis</i>	51-62	up to 40	16-20	28-32	straight
<i>G. punctulatus</i>	58-59	40-42	21-22	33	angular
<i>G. fasciatus</i>	55-68	40-55	20-23	30-43	angular
<i>G. monticola</i>	55-58	40	20	30-32	straight
<i>G. contractus</i>	52-63	36-44	16-20	25-30	angular
<i>G. ctenocephalus</i>	50-60	32-36	15-20	28-30	angular
<i>G. lepidogaster</i>	54-62	39-42	16-20	30-32	straight
<i>G. megalepis</i>	44-48	24-28	11-12	20-21	straight
<i>G. ridens</i>	56-78	32-52	15-26	30-40	straight
<i>G. danumensis</i>	48-58	20-30	14-18	20-26	straight
<i>G. pariclavis</i>	65-67	34-38	19-21	30-34	angular
<i>G. ornatICAUDA</i>	60-64	33-36	17-19	26-28	straight

	Postoral pouch	Subopercular groove	Secondary rostrum	Belly scales	Body pattern
<i>G. borneensis</i>	present	absent	present	absent	pentagonal to hexagonal blotches
<i>G. punctulatus</i>	absent	interrupted	absent	absent	numerous pale spots
<i>G. fasciatus</i>	absent	present	absent	absent	several narrow bars, interrupted or complete
<i>G. monticola</i>	present	absent	absent	absent	uniform, plain
<i>G. contractus</i>	absent	present	absent	absent	pentagonal to hexagonal blotches
<i>G. ctenocephalus</i>	absent	present	absent	absent	uniform, plain
<i>G. lepidogaster</i>	absent	absent	absent	present	pentagonal to hexagonal blotches
<i>G. megalepis</i>	absent	absent	absent	present	uniform, caudal with mottled pattern
<i>G. ridens</i>	absent	absent	absent	absent	small pale round spots
<i>G. danumensis</i>	absent	shallow	present	present	uniform, faint light cross-streaks
<i>G. pariclavis</i>	absent	present	absent	absent	evenly-spaced bars
<i>G. ornatICAUDA</i>	present	absent	absent	absent	uniform, few narrow pale bars

Data from Inger & Chin (1961), Roberts (1982) and Chin & Inger (1989).

fins with two faint whitish stripes dorsally, slight black pigments at pectoral fin base; pectoral and pelvic fins with a hyaline distal margin.

Distribution. - *Gastromyzon pariclavis* is currently known only from the Kuamut headwaters.

Etymology. - From the Latin *par* meaning even and *clavis* meaning bar, in reference to the evenly-spaced bars on the body.

Remarks. - *Gastromyzon pariclavis* is most common only in the riffle zone. See Martin-Smith & Tan (1998) for a list of syntopic fishes. *Gastromyzon pariclavis* is similar to *G. lepidogaster*, but differs in having a rounder and longer snout with more tubercles present on the snout (vs. less rounded and less tuberculation), an angular gill slit (vs. straight slit), having evenly spaced bars of light and dark grey pattern on body (vs. pentagonal dark grey pattern on a lighter grey body), and having a naked (unscaled) belly (vs. scaled belly). *Gastromyzon pariclavis* differs from the other two syntopic species in the following characters: absence of secondary rostrum (vs. presence in *G. danumensis*); absence of postoral pouch (vs. presence in *G. ornaticauda*); presence of subopercular groove (vs. absence in *G. danumensis* and *G. ornaticauda*). For a comparison of the 12 species, refer to Table 2.

Gastromyzon ornaticauda, new species

(Figs. 3-5)

Material examined. - Holotype - SBM uncat., 44.4 mm SL; Sabah: Lahad Datu: Kuamut, unnamed stream at km 113 on Main Line West logging track (5°00'40"N 117°31'40"E); H. H. Tan et al., 3 Oct.1996.

Paratypes - ZRC 41569, 12 ex., 17.1-53.7 mm SL, SBM uncat., 13 ex., 19.7-42.7 mm SL, USNM uncat., 3 ex., 22.3-44.0 mm SL, CMK 13028, 3 ex., 31.9-39.8 mm SL; same locality as holotype. — ZRC 41570, 9 ex., 17.8-55.4 mm SL, SBM uncat., 8 ex., 24.4-52.0 mm SL; Sabah: Lahad Datu: Kuamut, unnamed stream at km 111 on Main Line West logging track (5°01'05"N 117°32'40"E); H. H. Tan et al., 3 Oct.1996. — ZRC 41571, 5 ex., 26.8-70.5 mm SL, SBM uncat., 5 ex., 31.3-55.6 mm SL, USNM uncat., 4 ex., 30.9-56.8 mm SL; Sabah: Lahad Datu: Kuamut, Sungai Sangitan on Main Line West logging track (4°59'55"N 117°28'20"E); K. M. Martin-Smith et al., 7 Nov.1996.

Diagnosis. - *Gastromyzon ornaticauda* differs from its congeners in having the following unique combination of characters: a caudal fin pattern consisting of dorsal and ventral reddish stripes, with an iridescent bluish-green mid-section when life; caudal fin dark gray only on the rays with interradiial membranes clear, except for the clear dorsal and ventral borders when preserved; presence of postoral pouch; anterior tip of snout with conical tubercles concentrated in slight concavity when viewed from the front; a truncate snout when viewed dorsally (Fig. 4-5); and gill slit vertical; subopercular groove absent; 60-64 scales on lateral line.

Description. - General body shape and appearance as in Figs. 3-4; dorsal, ventral and lateral head views as in Fig. 5. Meristics and morphometrics of five specimens provided in Table 1. Head truncate in dorsal profile, relatively short (26.0-28.4 % SL) and wide (23.4-25.9 % SL, 86.7-94.3 % HL), head relatively flattened (head depth 12.2-13.8 % SL, 44.4-50.4 % HL); snout relatively short (snout length 16.9-18.5 % SL), anterior tip of snout with slight concavity covered with tubercles; gill slit straight and vertical; length of gill slit about same as eye diameter; subopercular groove absent; postoral pouch present; belly naked; pectoral fin overlapping anterior fifth of pelvic fin; pelvic fin not reaching anal fin origin; pectoral



Fig. 3. *Gastromyzon ornaticeuda* - ca. 55 mm SL, not preserved, Sungai Sangitan.

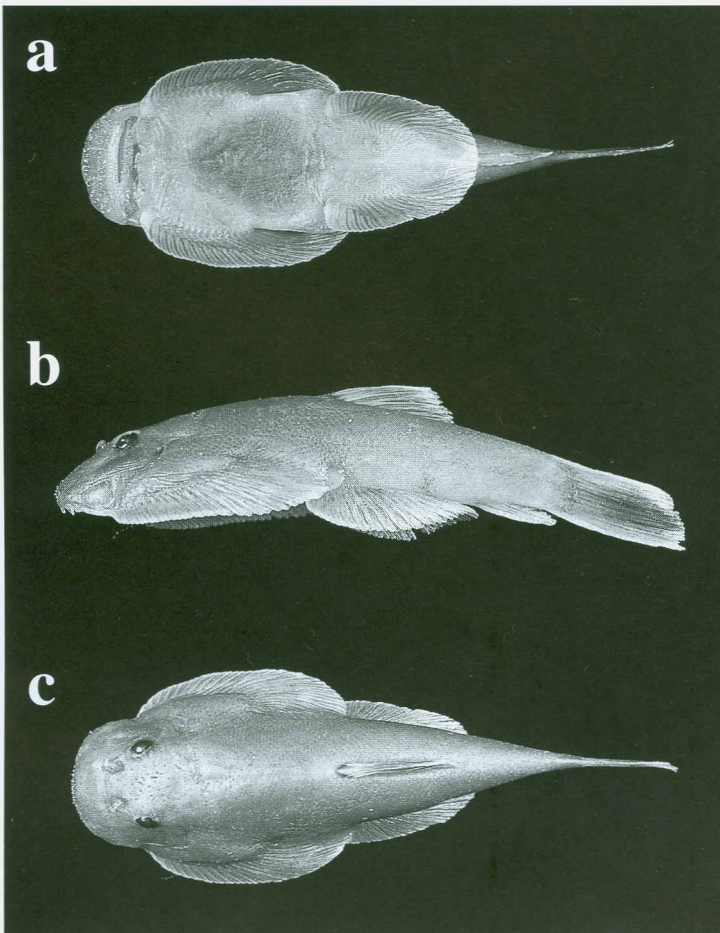


Fig. 4. *Gastromyzon ornaticeuda*, new species - (a) dorsal, (b) lateral and (c) ventral views (ZRC 41569, 44.5 mm SL).



Fig. 5. Schematic drawing of *Gastromyzon ornaticauda*, new species - lateral, dorsal and ventral head profiles (ZRC 41571, 63.6 mm SL).

and pelvic fins with dorsal serrae; dorsal fin situated about mid body (predorsal length 54.4-57.0 % SL), adpressed dorsal fin falling short of level of anal-fin origin; deepest part of body at dorsal-fin origin (body depth at dorsal-fin origin 17.3-18.8 % SL); anus situated between posterior base of fused pelvic fins and anal-fin origin; some specimens with up to 10 tubercles on distal half of first anal-fin ray; caudal peduncle depth relatively deep (9.5-10.5 % SL); caudal peduncle length relatively short (8.0-9.7 % SL).

Coloration. - Preserved colour pattern as in Fig. 4. In life, the caudal fin is bordered at the dorsal and ventral of fin by reddish stripes and an area of faint iridescent bluish-green in the mid-section (Fig. 3). In preserved specimens, the caudal fin is darkly pigmented only on the rays with interradiation membranes clear, except for the clear top and bottom margins (colour lost during preservation). Anterior base of dorsal-fin origin with black blotch, dorsal fin darkly pigmented on the rays with interradiation membranes clear, with a distal yellowish margin; anal fin uniformly dark pigmented on rays and interradiation membranes, with distal yellowish margin; pectoral fin with a very thin distal margin, ventral surface near fin base with slight pigmentation (contracted chromatophores). Dorsal surface of body with three to four narrow vertical bars that vary from yellow to red when alive; uniformly dark brown dorsal of body with a whitish ventral and with or without three to four thin lighter vertical bars when preserved. Head and pectoral fin region with or without four to five light streaks (on each side of body), a short stripe maybe present on the middle of the snout.

Distribution. - *Gastromyzon ornaticauda* is currently known only from the Kuamut headwaters.

Etymology. - From the Latin *ornatus*, embellished, and *cauda*, tail. This is in reference to the unique coloration pattern of the caudal fin.

Remarks. - *Gastromyzon ornaticauda* is the most common species of *Gastromyzon* in the Kuamut headwater streams and is occurs mainly in the riffle zone. See Martin-Smith & Tan (1998) for a list of syntopic fishes. *Gastromyzon ornaticauda* differs from the other three syntopic species (viz. *G. danumensis*, *G. lepidogaster* and *G. pariclavis*) in having a postoral pouch (vs. absence in the other three species); absence of secondary rostrum (vs. presence in *G. danumensis*); absence of scales on the belly (vs. presence in *G. lepidogaster*); gill slit straight (vs. angular slit in *G. pariclavis*). For a comparison of the 12 species, refer to Table 2.

Syntopic congeneric material examined. - *Gastromyzon danumensis* - ZRC 41572, 5 ex., 34.3-37.8 mm SL; Sabah: Lahad Datu: Kuamut, unnamed stream at km 111 on Main Line West (5°01'05"N 117°32'40"E); H. H. Tan et al., 3 Oct.1996. — ZRC 41573, 1 ex., 28.0 mm SL; Sabah: Lahad Datu: Kuamut, Sungai Malua at ca. km 90 on Main Line West (5°05'40"N 117°37'30"E); H. H. Tan et al., 3 Oct.1996.

Gastromyzon lepidogaster - ZRC 41574, 1 ex., 40.6 mm SL; Sabah: Lahad Datu: Kuamut, unnamed stream at km 113 on Main Line West (5°00'40"N 117°31'40"E); H. H. Tan et al., 3 Oct.1996. — ZRC 41575, 3 ex., 50.0-63.3 mm SL; Sabah: Lahad Datu: Kuamut, unnamed hill stream along Main Line West (5°00'20"N 117°30'10"E).

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