

## REVISION OF THE CYPRINID FISH GENUS *EIRMOTUS*, WITH DESCRIPTION OF THREE NEW SPECIES FROM SUMATRA AND BORNEO

**Tan Heok Hui**

Department of Biological Sciences, National University of Singapore, Kent Ridge,  
Singapore 119260, Republic of Singapore  
Email: heokhui@nus.edu.sg

**Maurice Kottelat**

Route de la Baroche 12, Case postale 57, 2952 Cornol, Switzerland.  
Department of Biological Sciences, National University of Singapore, Kent Ridge,  
Singapore 119260, Republic of Singapore  
Email: mkottelat@dplanet.ch

**ABSTRACT.** – *Eirmotus octozona* is redescribed and three new species are described: *E. isthmus* from the Batang Hari drainage (Sumatra) and the Mentaya drainage (Central Kalimantan, Borneo), *E. furvus* from the Batang Hari drainage (Sumatra), and *E. insignis* from the Kapuas basin (West Kalimantan, Borneo). The four species are distinguished by details of the colour pattern, serration on last simple dorsal-fin ray, shape of snout and lower jaw.

**KEY WORDS.** – *Eirmotus*, new species, taxonomy, biodiversity, Southeast Asia.

### INTRODUCTION

The cyprinid genus *Eirmotus* and its then only included species *E. octozona* was first described by Schultz (1959) on the basis of aquarium specimens reportedly from central Thailand. It remained known only from the type series until Kottelat (1982) recorded it from the Mentaya basin, an area about 250 km northwest of Banjarmasin in southeastern Borneo. Later, Roberts (1989) recorded it from the Kapuas basin in southwestern Borneo. We have since collected *Eirmotus* in several river basins of Borneo and Sumatra, but *E. octozona* has not been reported again from Thailand and it now seems likely that the original type locality was erroneous, as was already hypothesised by Kottelat (1982, 1989).

The genus *Eirmotus* includes cyprinid fishes of the Sundaic area characterised by a small size (less than 36 mm SL), a colour pattern consisting of 8 dark brown to black bars on a yellow to reddish-brown background, a conspicuous pattern of sensory papillae on the head (Fig. 1), large scales ( $1\frac{1}{2}$  rows on caudal peduncle), a lateral line perforating only 2-6 scales, a serrated last simple dorsal-fin ray, and the absence of barbels. They inhabit slow flowing streams and standing waters (lakes, swamps, swamp forests, peat swamps) in the flood plain, usually in forest-covered areas, and they seem to be quickly affected by habitat damages, especially removal of the tree cover.

Comparison of the material we collected in Borneo and Sumatra with the types and other material from Malay Peninsula suggests that *E. octozona* is restricted to the Malay Peninsula and shows that the Borneo and Sumatra material represents three additional species, described below.



Fig. 1. Head of *Eirmotus isthmus*, showing distribution of papillae.

**MATERIALS AND METHODS**

**TAXONOMY**

Methods for taking counts and measurements follow Kottelat et al. (1993). Body length (BL) is measured from posterior edge of opercle to end of caudal peduncle. The black bars, which make the main element of the colour pattern, are numbered from 1 to 8, starting with the anteriormost one (Fig. 2). They are as follows: bar 1 is the transverse bar across anterior part of snout; bar 2 is the bar extending from nape downwards through middle of eye; bar 3 is the vertical bar extending from above middle of opercle across the opercle to the ventral midline; bar 4 is on the flank just behind pectoral-fin base; bar 5 extends from dorsal-fin origin (where it is continuous with black marks on simple dorsal-fin rays) downwards; bar 6 extends from below posterior extremity of dorsal fin to immediately behind anal-fin origin; bar 7 extends vertically from above posterior extremity of anal-fin; bar 8 is immediately in front of caudal-fin base. We have not observed interspecific difference in the organisation of the cephalic sensory papillae.

Abbreviations: SL, standard length; TL, total length; HL, head length; BL, body length. Examined material is deposited in the following collections: CMK, collection of second author; MHNG, Muséum d'Histoire Naturelle, Genève; MZB, Research and Development Centre for Biology (ex Museum Zoologicum Bogoriense), The Indonesian Institute of Sciences, Cibinong; USNM, National Museum of Natural History, Smithsonian Institution, Washington; and ZRC, Raffles Museum of Biodiversity Research, National University of Singapore.

**Key to the species of *Eirmotus***

- 1a. Black pigmentation along simple dorsal rays restricted to anterior two rays and proximal half of third ray, fainter grey distally; a row of faint black spots at about 2/3 of branched dorsal rays, sometimes extending on membranes ..... *E. insignis*
- 1b. Black pigmentation along simple dorsal rays extending on entire length of rays; no black marks on middle of dorsal fin ..... 2
- 2a. Mouth subinferior, upper lip entirely distinct in ventral view; lower jaw pointed anteriorly; bars narrow (width of bar 5 equal to half of lateral row scale) ..... *E. isthmus*
- 2b. Mouth terminal, upper lip not entirely distinct in ventral view; lower jaw wide, anteriorly rounded; bars wide (width of bar 5 equal to one to two lateral row scales) ..... 3
- 3a. Black marks on body wide, very conspicuous and contrasted; all fins dusky with scattered chromatophores on all rays; distinct black mark situated at posterior tip of dorsal fin, appearing as part of bar 6; in adults, all simple rays of anal fin black on entire length; 17–21 serrae along posterior edge of last simple dorsal ray ..... *E. furvus*
- 3b. Black marks on body narrow and not sharply contrasted; fins hyaline; dorsal fin hyaline, in a few specimens with diffuse chromatophores on last ray, adjacent to bar 6; in adults, anterior rays of anal fin black at base only; 25–31 serrae along posterior edge of last simple dorsal ray ..... *E. octozona*

***Eirmotus octozona* Schultz, 1959**

(Figs. 3a–b, 7a)

*Eirmotus octozona* Schultz, 1959: 11; Kottelat, 1989: 7; Kottelat et al., 1993: 35 (part).

**Material examined.** – USNM 177521, holotype, 32.1 mm SL, Thailand: Bung Borapet (aquarium trade); H. Axelrod, 1957.

Non-type material: ZRC 8385–8397, 13 ex., CMK 17456, 3 ex., 28.4–35.6 mm SL, Malaysia: from aquarium fish collectors in Johor; H. K. Lim, 1989.

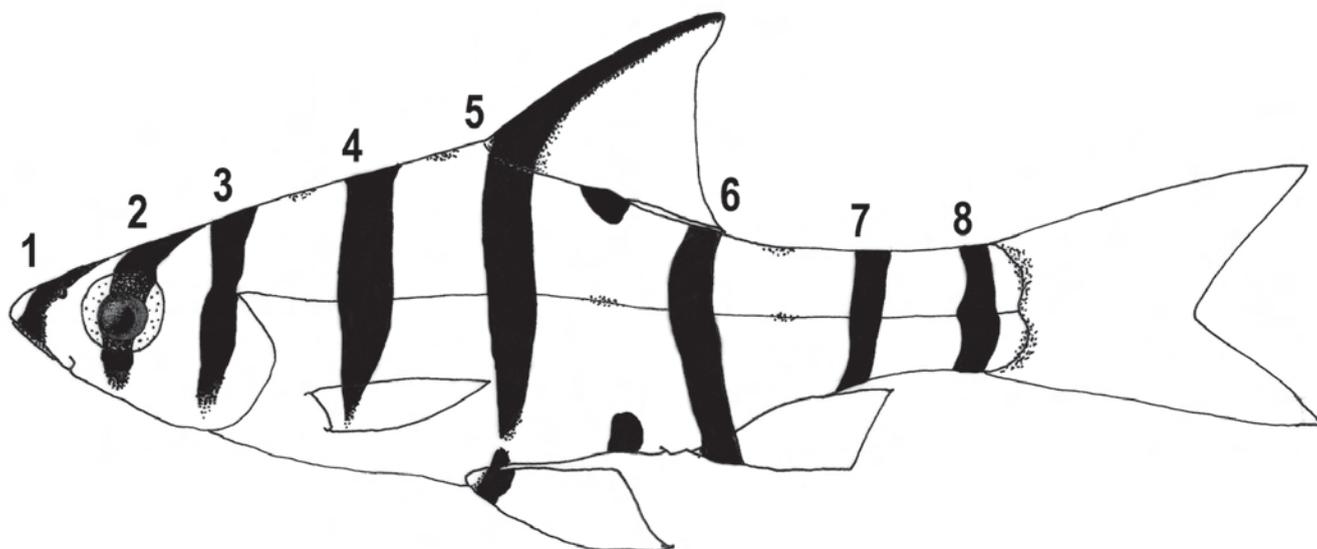


Fig. 2. Schematised *Eirmotus* to show position and numbering of black bars.

**Diagnosis.** – *Eirmotus octozona* is distinguished from the other species of *Eirmotus* by the following unique combination of characters: bar 1 present; a large and distinct black mark just anterior to anus, visible in lateral (Fig. 7a) and ventral views; simple dorsal-fin rays black, black pigment patch in some specimens extending onto first branched ray, other rays hyaline or in some specimens with diffused chromatophores on last dorsal-fin ray, adjacent to upper extremity of bar 6 (Fig. 7a); serrae on last simple dorsal-fin ray 25-31; pectoral fin with faint black margin along uppermost ray; width of bar 5 equal to 1-1½ lateral row scales; mouth terminal, lower jaw wide, anteriorly rounded.

**Description.** – See Fig. 3a–b for general body shape and Table 1 for meristics and morphometrics. Size up to 35.6 mm SL. Dorsal fin with 3 simple and 8-9½ branched rays; origin over lateral scale 5-7. Anal fin with 3 simple and 5-6½ branched rays; origin under lateral row scale 10-12. Pelvic fin with 1 simple and 8-9 branched rays; origin under lateral row scale 4-6. Lateral row scales 19-21; predorsal scales 6-7; transverse scales ½6-7½ between dorsal-fin and anal-fin origins, ½3½ on caudal peduncle.

Mouth terminal, upper lip not entirely visible in ventral view; lower jaw relatively wide, rounded anteriorly. No marked angle at articulation of lower jaw.



Fig. 3. *Eirmotus octozona*: a, USNM 177521, holotype, 32.1 mm SL, Thailand: Bung Borapet (?); b, ZRC 8385, 33.1 mm SL, Malaysia: Johor (?).

**Colouration.** – Preserved: Body yellowish-brown; markings dark brown to black. Bar 3 not reaching ventral midline, or only faint below opercle. One dot along dorsal midline between each bars 3 to 8; most prominent one between bars 5 and 6, at posterior extremity of dorsal-fin base. Bar 4 not reaching ventral mid-line but usually a spot on ventral midline at level of bar. Bar 5 usually not reaching pelvic-fin base, but a mark at base of pectoral fins, on proximal part of fins and between them. A conspicuous spot on ventral midline and extending upwards immediately in front of anus, about halfway between bars 5 and 6, aligned with spot at posterior extremity of dorsal-fin base. One faint dot along ventral midline between each bars 6 to 8. Axial streak distinct between bars 6 and 8. A longitudinal mark present in some specimens along lateral midline between bars 5 and 7, apparently more obvious in smallest specimens.

Fins hyaline. Dorsal fin with simple rays black, pigment patch in some specimens extending onto first branched ray, other rays hyaline or with diffused chromatophores on last one, adjacent to upper extremity of bar 6. Anterior rays of anal fin black at base, continuing bar 6. Base of pelvic-fin rays black.

In life, body translucent, light yellow-brown, marks black.

**Distribution.** – Schultz (1959) originally described *E. octozona* on the basis of aquarium specimens reportedly collected in Bung Borapet, a lake in an extensive swampy area about 300 km north of Bangkok, Thailand. The species has not been collected again in Thailand, despite the central plain of Thailand and especially Bung Borapet having been quite well sampled (e.g., Kaw-anantakul et al., 2003). Although it cannot be excluded that the species and/or its habitat have been overlooked, or that it became extirpated since, this locality seems erroneous (Kottelat, 1982). We have examined specimens labelled as obtained by the aquarium trade in Johor, for which we could not obtain accurate locality data but which seem effectively to have been collected in western Malaysia; this could suggest that, if the types have really been obtained in Thailand, the type locality is more likely in peninsular Thailand. The absence of other records for the species is possibly due to lack of sampling in the correct habitat, or the destruction of the suitable habitat.

In 2006, we obtained information from an aquarium fish collector in Johor that the species was earlier collected in peat swamp forests of the area of Ayer Hitam. We had not asked about the presence of the species, but he spontaneously described a number of species previously collected for the aquarium trade in this area and which have not been collected since, despite numerous efforts. These species also included *Gymnochanda filamentosa* (Ambassidae), another species described from the Malay Peninsula but for which there is no precise locality data. Our search in that area did not yield any *Eirmotus* specimen. The peat swamp forests of this area have been severely impacted and are now much reduced in extent and in the diversity of existing microhabitats.

**Comparative notes.** – *Eirmotus octozona* is distinguished

from *E. isthmus* by the following characters: a larger and more distinct black mark just anterior to anus (vs. small and diffused chromatophores); more serrae along posterior edge of last simple dorsal ray (25–31, vs. 22–26); higher mode of lateral scales (21 vs. 19); broader bars (width of bar 5 equal to 1–1½ lateral row scales, vs. ½ or less); shorter head (length 27.8–29.4 % SL, vs. 29.1–31.4); stouter caudal peduncle (depth 12.5–14.8 % SL, vs. 11.0–12.7); mouth terminal, lower jaw wide, anteriorly rounded (vs. subinferior, upper lip entirely distinct in ventral view, lower jaw pointed anteriorly).

*Eirmotus octozona* is distinguished from *E. furvus* in having: less distinct black mark on posterior tip of dorsal fin and rest of dorsal fin hyaline (vs. more distinct black mark and diffused chromatophores scattered on all rays); anterior rays of anal fin black at base (vs. simple rays entirely black, in adults); more serrae on last simple dorsal ray (25–31, vs. 17–21); bars narrower (width of bar 5 equal to 1–1½ lateral row scales, vs. 1½–2); shorter head (length 27.8–29.4 % SL, vs. 29.5–32.8); slightly greater prepelvic length (45.0–51.1 % SL, vs. 43.7–45.7).

*Eirmotus octozona* is distinguished from *E. insignis* in having: anterior part of simple dorsal rays pigmented black along their entire length (vs. pigmentation restricted to anterior two rays and proximal quarter of third simple ray); less distinct black mark at posterior tip of dorsal fin and rest of dorsal fin hyaline (vs. black mark distinct and a dense patch of chromatophores at about 2/3 of each ray); more serrae on last simple dorsal ray (25–31, vs. 16–21); smaller predorsal length (48.5–51.2 % SL, vs. 51.6–53.7; 66.8–70.9 % BL, vs. 76.4–78.8); smaller head length (27.8–29.4 % SL, vs. 32.3–33.5; 37.8–40.6 % BL, vs. 47.4–50.0; 54.7–60.2 % predorsal length, vs. 60.2–64.9); and greater interorbital width (26–33 % HL, vs. 22–25).

### *Eirmotus isthmus*, new species

(Figs. 4, 7b, 8a)

*Eirmotus octozona* (non Schultz, 1959): Kottelat, 1982: 431.

**Material examined.** – MZB 10720, holotype, 29.2 mm SL, Sumatra, Jambi: Danau Arang Arang, Muara Kompeh area, brown water lake (1°37'32.0"S 103°47'19.0"E); H. H. Tan & H. H. Ng, 25 Jul.1997; ZRC 50991, 81 paratypes, CMK 17457, 5 paratypes, MZB 10970, 5 paratypes, USNM, 5 paratypes, 16.2–29.8 mm SL, same locality data as holotype.

Non-type material: ZRC 50992, 8 ex., 14.2–32.5 mm SL, Sumatra, Jambi: Pijoan, Danau Souak Padang (1°36'34.4"S 103°26'55.1"E); H. H. Tan et al., 8 Jun.1996; CMK 11271, 5 ex., 17.5–24.6 mm SL, Sumatra: Jambi: Pijoan, from aquarium fish collectors; M. Kottelat, 8 Jun.1994; MHNG 2056.27, 1 ex., Kalimantan Tengah: Mentaya basin, about 250 km northwest of Banjarmasin; A. Hanrieder, Jun.–Jul.1979.

**Diagnosis.** – *Eirmotus isthmus* is distinguished from all other species of *Eirmotus* by its subinferior mouth, with a narrow lower jaw whose tip is angulous in ventral view. It is further distinguished by the following combination of characters: a

small black mark immediately in front of anus with scattered chromatophores near it, visible in lateral view (Fig. 7b); bar 1 absent or very faintly marked; simple dorsal-fin rays black on their entire length, black mark not extending onto first branched ray, rest of fin hyaline (Fig. 7b); 22–26 serrae on posterior margin of last simple dorsal-fin ray; bars narrow (width of bar 5 equal to  $\frac{1}{2}$  or less lateral row scale).

**Description.** – See Figure 4 for general body shape and Table 1 for meristics and morphometrics. Size up to 32.5 mm SL. Dorsal with 3 simple and  $8\frac{1}{2}$  branched rays; origin above lateral row scale 6–8. Anal fin with 3 simple and  $5\frac{1}{2}$  branched rays; origin under lateral row scale 10–12. Pelvic fin with 1 simple and 8 branched rays, origin under lateral row scale 5–6. Lateral row scales 19–21; predorsal scales 7–8; transverse scales  $\frac{1}{2}6$ – $7\frac{1}{2}$  between dorsal-fin and anal-fin origins,  $\frac{1}{2}3\frac{1}{2}$  on caudal peduncle.

Mouth subinferior, upper lip visible in ventral view; lower jaw narrow, tip angulous in ventral view (Fig. 8a). No marked angle at articulation of lower jaw.

**Colouration.** – Preserved: Body yellowish brown; markings dark grey to black, all very narrow (width of bar 5 equal to  $\frac{1}{2}$  or less lateral row scale). Scales between bars with a crescent-shaped patch of pigments centred on each scale, some of them forming faint dots along dorsal midline; very distinct on upper half of body but may also be present on flank and on caudal peduncle. Bar 1 absent or very faintly marked. Bars 2–4 not reaching ventral midline. In some specimens, one very poorly defined spot between bars 5 and 6, at posterior extremity of dorsal-fin base. Bar 5 not reaching pelvic-fin base in smaller individuals, reaching it in larger ones. A small and faint dot on ventral midline immediately in front of anus, with scattered chromatophore near it, about

halfway between bars 5 and 6. Axial streak distinct between bars 5 and 8. In some specimens, a dot on lateral midline between bars 5 and 6, and 6 and 7.

Fins hyaline. Dorsal fin with simple rays black on their entire length, black mark not extending onto first branched ray, rest of fin hyaline. Anterior rays of anal fin black at base, continuing bar 6. Base of pelvic-fin rays black.

In life, body translucent with slight yellowish tinge, belly silvery, bars black.

**Distribution.** – *Eirmotus isthmus* is known from the flood plains and lakes in Pijoan and Muara Kompeh areas in central Jambi (Sumatra) and from the Mentaya drainage (Borneo: Kalimantan Tengah).

**Life history notes.** – *Eirmotus isthmus* is found in the water column in lakes and large permanent water bodies in the floodplain. Species caught together in the water column include *Pectenocypris* cf. *korthausae* (Cyprinidae), *Hyalobagrus flavus* (Bagridae), *Pseudeutropius brachypterus*, *P. moolenburghae* (Schilbeidae) and *Gymnochanda filamentosa* (Ambassidae).

**Etymology.** – From the Latin *isthmus*, meaning a narrow passage or neck of land, alluding to the narrow black bars on the body. A noun in apposition.

**Comparative notes.** – *Eirmotus isthmus* is distinguished from all other species of *Eirmotus* by its subinferior mouth, with the upper lip entirely distinct in ventral view (vs. terminal, upper lip not entirely distinct); the lower jaw angulous anteriorly (vs. broadly rounded; Fig. 8). See under *E. octozona* for additional characters distinguishing it from *E.*



Fig. 4. *Eirmotus isthmus*, MZB 10720, holotype, 29.2 mm SL, Sumatra: Jambi.

*isthmus*. *Eirmotus isthmus* is distinguished from *E. furvus* by: the absence of a distinct black mark on the posterior tip of the dorsal fin adjacent to the upper extremity of bar 6 (vs. black mark present, chromatophores scattered on all dorsal-fin rays); no black upper margin on pectoral fin, no black anterior margin on anal fin (vs. both present); more serrae along the posterior edge of the last simple dorsal-fin ray (22–26, vs. 17–21); mode of lateral scales lower (19 vs. 20); bars narrower (width of bar 5 equal to or less than one lateral row scale, vs. 1½–2); and slightly greater eye diameter (8.2–9.5 % SL, vs. 7.3–8.6).

*Eirmotus isthmus* is distinguished from *E. insignis* by: simple dorsal rays black along their entire length (vs. pigmentation restricted to anterior two rays and proximal quarter of third ray); no black mark along the posterior edge of the dorsal fin and the rest of the dorsal fin hyaline (vs. presence of a distinct black mark along the posterior edge, and a patch of chromatophores in centre of fin); more serrae along the posterior edge of the last simple dorsal-fin ray (22–26, vs. 16–21); fewer modal lateral scales (19, vs. 20); smaller predorsal length (49.1–51.7 % SL, vs. 51.6–53.7; 67.3–76.1 % BL, vs. 76.4–78.8); shorter head (length 29.1–31.4 % SL, vs. 32.3–33.5; 39.7–45.7 % BL, vs. 47.4–50.0); and greater interorbital width (26–31 % HL, vs. 22–25).

***Eirmotus furvus*, new species**

(Figs. 5, 7c)

**Material examined.** – MZB 10971, holotype, 25.8 mm SL, Sumatra, Jambi: Berbak Nature Reserve, Sungai Air Hitam Dalam (1°17'54.8"S 104°08'30.4"E); aquarium fish collectors, 16–17 Jun.1995; ZRC 39152, 15 paratypes, CMK 11906, 5 paratypes, MZB 10972, 2 paratypes, USNM, 3 paratypes, 17.1–27.3 mm SL,

same locality as holotype; ZRC 50993, 17 paratypes, CMK 11138, 17 paratypes; 18.6–34.4 mm SL, Sumatra, Jambi, Danau Rasau, a black water lake draining to Batang Hari, opposite Kampung Rantau Panjang; M. Kottelat & H. H. Tan, 1 Jun.1994.

Non-type material: ZRC 50994, 10 ex., 18.3–22.1 mm SL, Sumatra, Jambi: from aquarium trade; P. K. L. Ng et al., Jun.1995; ZRC 50995, 4 ex., 9.0–11.9 mm SL, Sumatra, Jambi: stream adjacent to swamp forest and rubber plantation, km 32 into turnoff (westwards) to Pematang Lumut before turnoff to Kuala Tungkal (1°06'06.4"S 103°24'02.1"E); H. H. Tan & S. H. Tan, 22 Nov.1996.

**Diagnosis.** – *Eirmotus furvus* is distinguished from all other species of *Eirmotus* by its wider, very conspicuous and contrasted black bars on the body (width of bar 5 equal to 1½ to 2 lateral row scales, vs. ½ to 1½ in the other species). It is further distinguished by the following combination of characters: bar 1 (on snout) conspicuous; simple dorsal-fin rays black on their entire length, black pigmentation sometimes extending onto interradial membrane before first branched ray; a distinct black mark at posterior tip of dorsal fin, appearing as part of 6 (Fig. 7c); pectoral fin with black upper margin; simple anal-fin rays black on their entire length in adults; all fins dusky with scattered chromatophores on all rays; serrae along posterior edge of last simple dorsal-fin ray 17–21; a small and distinct black mark immediately anterior to anus, visible in lateral view (Fig. 7c); mouth terminal, lower jaw wide, anteriorly rounded.

**Description.** – See Fig. 5 for general body shape and Table 1 for meristics and morphometrics. Size up to 34.4 mm SL. Dorsal with 3 simple and 8½ branched rays; origin above lateral row scale 5–6. Anal fin with 3 simple and 5½ branched rays; origin under lateral row scale 10–11. Pelvic fin with 1 simple and 8 branched rays, origin under lateral row scale 4–5. Lateral row scales 19–20; predorsal scales



Fig. 5. *Eirmotus furvus*, MZB 10971, holotype, 25.8 mm SL, Sumatra: Berbak.

Table 1. Meristics and morphometrics of *Eirmotus octozona*, *E. isihmus*, *E. furvus* and *E. insignis*. Numbers in parentheses are modes.

	<i>E. octozona</i>		<i>E. isihmus</i>		<i>E. furvus</i>		<i>E. insignis</i>	
	holotype	ZRC 8385–8397	holotype	ZRC 50991	holotype	ZRC 39152	CMK 10298, ZRC 38786	
Sample size	1	8	1	7	1	7	8	
SL (mm)	32.1	29.1–35.6	29.2	28.6–29.5	25.8	23.2–27.3	18.2–23.2	
<b>Meristics</b>								
Vertebrae	4 + 11-12 + 13-15 = 29-31 (30, n = 14)		4 + 11-12 + 13-15 = 29-31 (30, n = 20)	29-31	4 + 12 + 14-15 = 30 (30, n = 20)		4 + 12 + 14-15 = 30-31 (30, n = 20)	
Serrae on last simple dorsal ray	21 (incomplete)	25-31	23	22-26	20	17-21	16-21	
Dorsal fin rays	3, 8½	3, 8-9½ (2, 8½)	3, 8½	3, 8½	3, 8½	3, 8½	3, 8½	
Anal fin rays	3, 5½	3, 5-6½ (3, 5½)	3, 5½	3, 5½	3, 5½	3, 5½	3, 5½	
Lateral row scales	19	19-21 (21)	19	19-21 (19)	19	19-20 (20)	19-21 (20)	
Predorsal scales	6	7	8	7-8 (8)	7	7-8 (7)	7	
Transverse scales	½7½	½7½	½6½	½6-7½(½7½)	½7½	½7½	½7½	
Width of bar 5	1	1-1½ (1)	½	½ or less (½)	2	1½-2 (2)	1-1½ (1)	
<b>Morphometrics in percents of SL</b>								
Total length	–	133.3–135.3	137.7	134.4–139.0	131.4	131.5–137.8	131.9–138.8	
Body length	70.7	69.7–73.6	69.9	66.8–73.4	70.9	69.0–73.6	66.3–68.4	
Predorsal length	48.9	48.5–51.2	51.7	49.1–51.4	50.4	48.7–52.9	51.6–53.7	
Preadanal length	68.5	65.0–71.4	67.8	65.5–69.8	67.1	66.4–69.0	65.3–69.7	
Prepelvic length	46.4	45.0–51.1	46.2	44.2–47.4	45.7	43.7–45.7	45.5–47.2	
Head length	28.7	27.8–29.4	29.8	29.1–31.4	29.5	29.7–32.8	32.3–33.5	
Body depth	23.4	24.2–28.8	22.9	22.7–25.3	22.5	20.7–24.8	20.2–26.0	
Depth of caudal peduncle	12.5	13.3–14.8	11.0	11.9–12.7	12.4	11.9–14.3	11.4–13.1	
Length of caudal peduncle	20.6	20.0–23.6	21.2	19.7–25.2	22.9	21.4–25.6	19.2–22.5	
Dorsal-fin base length	20.2	17.4–20.8	18.5	17.2–20.2	20.5	18.1–21.7	16.8–21.2	
Anal-fin base length	13.7	11.1–12.5	12.7	10.3–14.0	11.6	11.5–13.5	11.3–13.5	
Pelvic-fin length	–	23.4–25.4	24.0	24.0–27.8	24.8	23.8–25.4	21.8–25.3	

7–8; transverse scales  $\frac{1}{2}7\frac{1}{2}$  between dorsal-fin and anal-fin origins,  $\frac{1}{2}3\frac{1}{2}$  on caudal peduncle.

Mouth terminal, upper lip not entirely visible in ventral view; lower jaw relatively wide, rounded anteriorly. No marked angle at articulation of lower jaw.

**Colouration.** – Preserved: Body reddish-brown; markings bold, dark brown to intense black. All bars reaching ventral midline. Bar 1 conspicuous. A large conspicuous spot on ventral midline immediately in front of anus, about halfway between bars 5 and 6. Axial streak distinct between bars 5 and 8, sometimes on whole flank. Usually no spots between bars in middle of flank.

Fins dusky with scattered chromatophores. Dorsal fin with simple rays black on their entire length, black pigments sometimes extending onto interradial membrane before first branched ray; distinct black mark situated at posterior tip of dorsal fin, appearing as part of bar 6. Anterior rays of anal fin black at basis in smaller individuals, along entire simple rays in larger ones, continuing bar 6. Base of pelvic-fin rays black. Pectoral fin with black upper margin. In life, body reddish-brown, marks black.

**Distribution.** – *Eirmotus furvus* is known from the coastal peat swamp forests, near Rantau Panjang, Sabak and Bernam, along the coast east of Jambi (Sumatra). We have seen photographs of material collected by aquarists, possibly in peat swamp forests in the area of Kumai (Borneo: Kalimantan Tengah) that may belong to this species.

**Life history notes.** – *Eirmotus furvus* is the only species of *Eirmotus* found in the black waters of peat swamp forests. We have observed it only deep inside the forested area, in the less disturbed sections.

**Etymology.** – From the Latin *furvus*, meaning dark black, dusky; alluding to the dusky overall appearance of the fish. An adjective.

**Comparative notes.** – See under *E. octozona* and *E. isthmus* for characters distinguishing them from *E. furvus*. *Eirmotus furvus* is distinguished from *E. insignis* by: simple dorsal-fin rays black along their entire length (vs. pigmentation restricted to anterior two rays and proximal quarter of third ray); chromatophores on dorsal fin scattered on entire branched rays (vs. concentrated at about 2/3 of their length, sometimes extending on the adjacent membranes); a black upper margin on pectoral (vs. missing); simple anal-fin rays black on their entire length in adults (vs. only at base); bars broader (width of bar 5 equal to  $1\frac{1}{2}$ –2 lateral row scales, vs. 1– $1\frac{1}{2}$ ); longer body (BL 69.0–73.6 % SL, vs. 66.3–68.4); smaller predorsal length (66.2–73.7 % BL, vs. 76.4–78.8); smaller prepelvic length (43.7–45.7 % SL, vs. 45.5–47.2; 60.1–66.3 % BL, vs. 67.3–70.1); shorter head (length 29.7–32.8 % SL, vs. 32.3–33.5; 40.3–46.9 % BL, vs. 47.4–50.0); narrower head (width 12.5–13.9 % SL, vs. 13.8–14.8); and greater interorbital width (27–30 % HL, vs. 22–25).

### *Eirmotus insignis*, new species

(Figs. 6a–b, 7d, 8b)

*Eirmotus octozona* (non Schultz, 1959): Roberts, 1989: 38, Fig. 23 (MZB 3121); Kottelat et al., 1993: 35 (part), Pl. 8 (CMK 6816).

**Material examined.** – MZB 3121, holotype, 31.2 mm SL, Kalimantan Barat: several small forest streams flowing into Kapuas mainstream within 10 km upstream from Sanggau (0°06'07"N 110°35'38"E), T. R. Roberts, 16–17 Jul.1976; MZB 3120, 2 paratypes, 16.8–17.6 mm SL, Kalimantan Barat: Sungai Tekam, small forest stream joining right side of Kapuas mainstream ca. 2 km upstream from Sanggau (0°07.5'N 110°36'E), T. R. Roberts, 16 Jul.1976; MZB 3122, paratype, 18.8 mm SL, Kalimantan Barat: swampy stream ca. 30 km west of Sintang on road from Sanggau to Sintang (ca. 0°00'N 111°14'E); T. R. Roberts, 18 Jul.1976; MZB 3123, paratype, 24.5 mm SL, Kalimantan Barat: forest stream ca. 1 km up Sungai Tajan from Tajan, 87 km east of Pontianak (0°02'S 110°07'E), T. R. Roberts, 22 Aug.1976; CMK 10298, 18 paratypes, 11.8–23.1 mm SL, Kalimantan Barat: Kapuas basin, several small tributaries of Sungai Embaluh Leboyan and Sungai Semalah (Nanga Semalah: 0°52'16"N 112°17'37"E), M. Kottelat et al., 9 Sep.1993; ZRC 38786, 3 paratypes, 19.3–23.2 mm SL, CMK 11573, 4 paratypes, 12.9–22.9 mm SL, Kalimantan Barat: Kapuas basin, Sungai Letang near Kampung Kandung Suli (0°37'42"N 112°15'15"E), M. Kottelat et al., 8 Jun.1995; CMK 6816, 1 paratype, 28.2 mm SL, Kalimantan Barat: Sungai Melawi basin: Sungai Taok at Terusan (Kec. Dedai), km 22 on road from Sintang to Putussibau: 0°02'55"N 111°42'12"E, M. Kottelat et al., 24 Apr.1990.

Non-type material: ZRC 46315, 35 ex., 16.3–29.5 mm SL, Kalimantan Barat: Pontianak, trade material, F. Yuwono, 1 Oct.1999; ZRC 46307 (tentative identification), 2 ex., 23.7–30.4 mm SL, Belitung Island; T. Sim, Feb.2000.

**Diagnosis.** – *Eirmotus insignis* is distinguished from all other species of *Eirmotus* by having the black pigmentation along the simple dorsal-fin rays restricted to the anterior two rays and the proximal half of the third one, fainter grey distally (vs. extending on entire length of rays); and a row of faint black spots at about 2/3 of the branched dorsal-fin rays (extending on the membranes in some specimens) (Fig. 7d). It is further distinguished by the following combination of characters: bar 1 present but faintly marked; serrae along posterior edge of last simple dorsal-fin ray 16–21; width of bar 5 equal to 1– $1\frac{1}{2}$  lateral row scales; a small and distinct black mark immediately in front of anus, visible in lateral view (Fig. 7d); head length 32.3–33.5 % SL, 47.4–50.0 % BL; predorsal length 76.4–78.8 % BL; interorbital width 22–25 % HL; snout slightly upturned, mouth terminal, lower jaw wide, anteriorly rounded (Fig. 8b).

**Description.** – See Fig. 6a–b for general body shape and Table 1 for meristics and morphometrics. Size up to 32.1 mm SL. Dorsal with 3 simple and  $8\frac{1}{2}$  branched rays; origin above lateral row scale 6–7. Anal fin with 3 simple and  $5\frac{1}{2}$  branched rays; origin under lateral row scale 11–12. Pelvic fin with 1 simple and 8 branched rays, origin under lateral row scale 4–5. Lateral row scales 19–21; predorsal scales 7; transverse scales  $\frac{1}{2}7\frac{1}{2}$  between dorsal-fin and anal-fin origins,  $\frac{1}{2}3\frac{1}{2}$  on caudal peduncle.

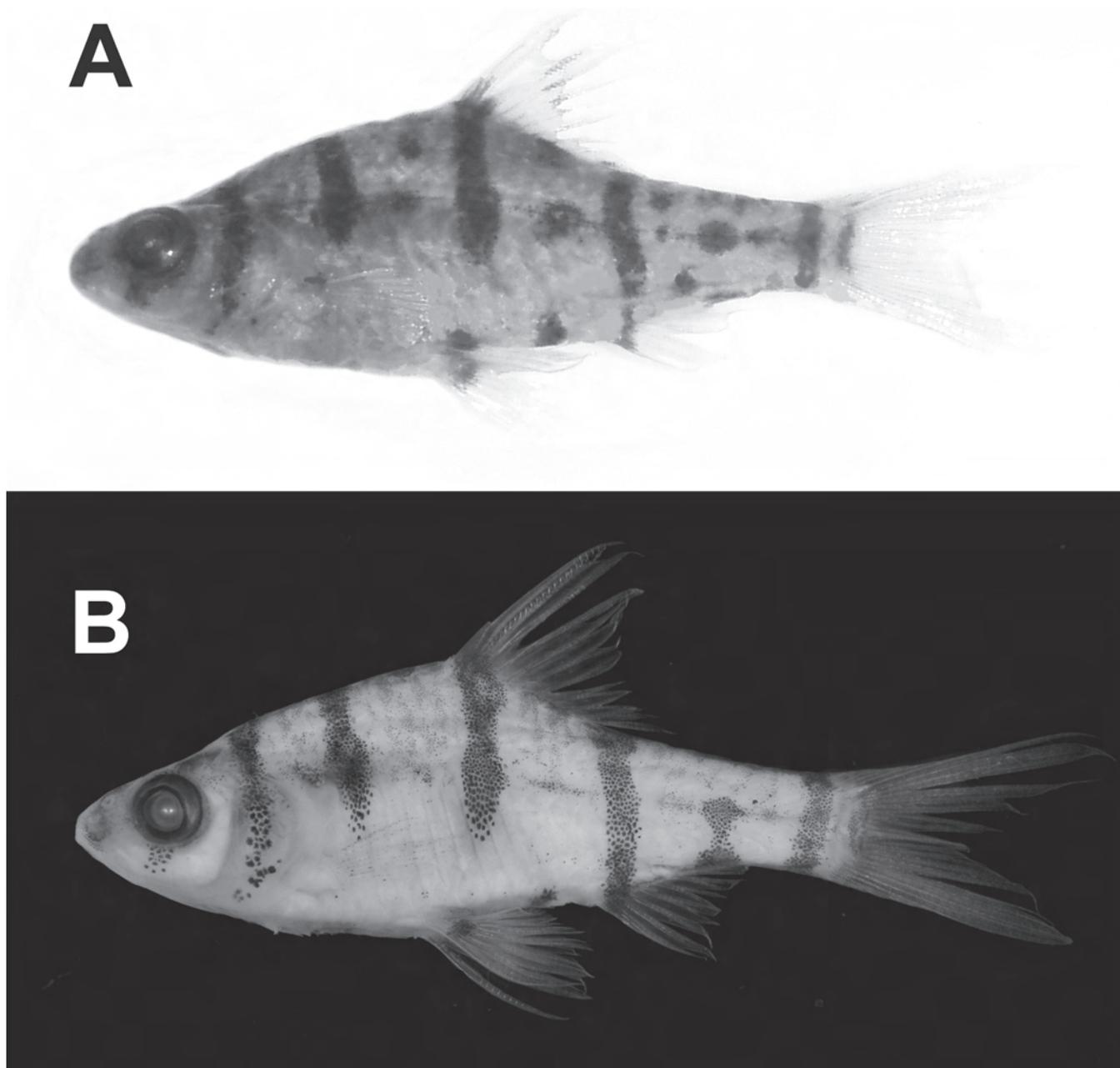


Fig. 6. *Eirmotus insignis*: a, MZB 3121, holotype, 31.2 mm SL; b, ZRC 38786, paratype, 23.2 mm SL, Borneo: Kalimantan Barat, Kapuas.

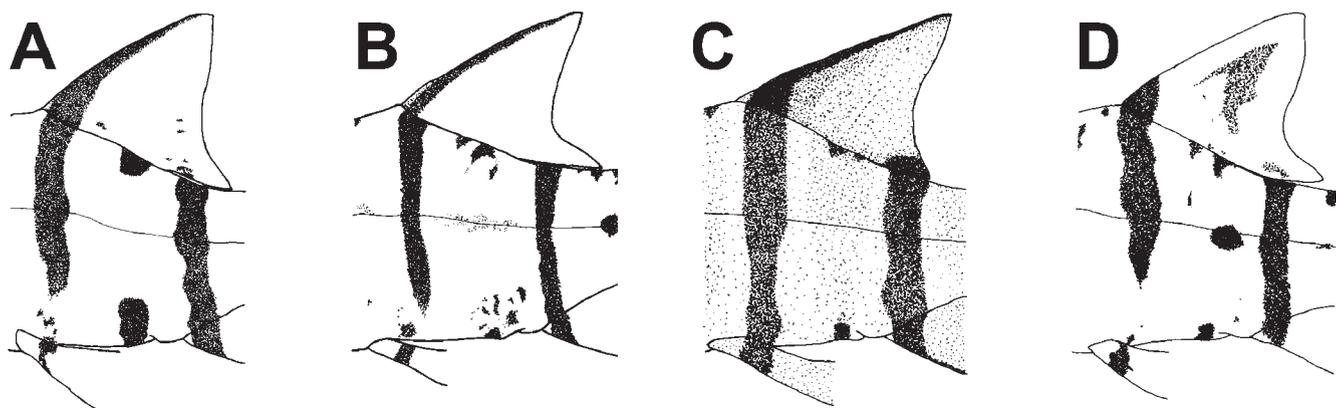


Fig. 7. Flank of *Eirmotus* species, showing dorsal fin and pre-anus patterns in: a, *E. octozona*, ZRC 8385, 35.6 mm SL; b, *E. isthmus*, ZRC 50992, 32.0 mm SL; c, *E. furvus*, ZRC 39152, 27.3 mm SL; and d, *E. insignis*, ZRC 38786, 23.2 mm SL.

Snout slightly upturned, often with a marked angle at articulation of lower jaw. Mouth terminal, upper lip not entirely distinct in ventral view; lower jaw relatively wide, rounded anteriorly (Fig. 8b).

**Colouration.** – Preserved: Body yellowish-brown; markings dark grey to black. Bar 1 absent or very faintly marked. Bars 2 and 3 usually not reaching ventral midline. Bar 4 reaching or not ventral mid-line. A spot between bars 5 and 6, at posterior extremity of dorsal-fin base. Bar 5 usually not reaching pelvic-fin base and ventral midline. A spot on ventral midline immediately in front of anus, about halfway between bars 5 and 6. Axial streak distinct between bars 5 and 8. In some specimens, one dark spot on lateral midline between bars 5 and 6.

Fins hyaline. Dorsal fin with black pigmentation along simple rays restricted to anterior two rays and proximal half of third one, fainter grey distally; a row of faint black spots at about 2/3 of branched rays, sometimes extending on membranes; and a black mark at posterior tip of dorsal fin, adjacent to upper extremity of bar 6. Anterior rays of anal fin black at base, continuing bar 6. Base of pelvic-fin rays black.

In life, body yellowish, translucent, bars greyish to black.

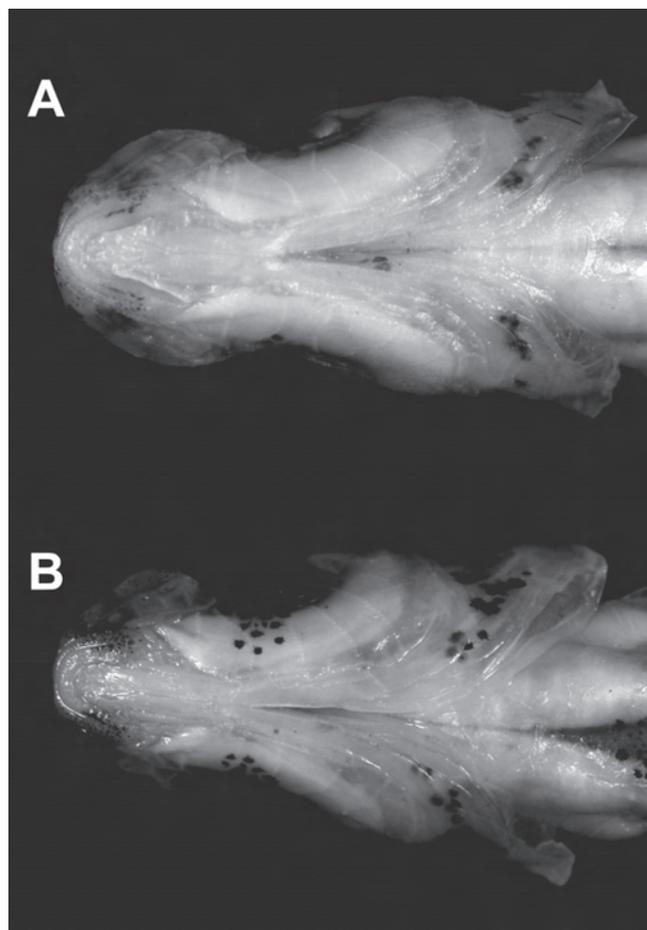


Fig. 8. Head of *Eirmotus* species, showing ventral view of snout and lower jaw of: a, *E. isthmus*, MZB 10720, 29.2 mm SL; and b, *E. insignis*, ZRC 38786, 23.2 mm SL.

**Distribution.** – *Eirmotus insignis* is currently known only from the Kapuas drainage in Kalimantan Barat (Borneo) and from Belitung Island.

**Life history notes.** – *Eirmotus insignis* was most frequently observed in small streams with slowly flowing water, backwaters, among overhanging roots along shores, occasionally in swampy areas among dense vegetation. The water was generally quite murky, slightly acid; the bottom was usually muddy or covered by leaf litter.

**Etymology.** – From the Latin *insignis*, meaning worth distinction, with distinctive signs, brilliant, referring to the unique black marks on the dorsal fin. An adjective.

**Comparative notes.** – See *E. octozona*, *E. isthmus* and *E. furvus* for characters distinguishing them from *E. insignis*.

## DISCUSSION

*Eirmotus* is characterized by the presence of several rows of papillae (Fig. 1) on the sides of the snout, the cheeks, the opercle, the interorbital area and the throat, a character shared with *Cyclocheilichthys*, *Neobarynotus*, *Oreochthys*, ‘*Puntius*’ *oligolepis* and ‘*P.*’ *lineatus* in Southeast Asia, ‘*P.*’ *dorsalis* in Sri Lanka and possibly other genera in Asia. This character is also observed in various lineages of African cyprinids traditionally referred to the genus *Barbus* (a totally inappropriate name as these fishes are notoriously not related with *Barbus sensu stricto*). In *Cyclocheilichthys* and *Neobarynotus*, the rows of papillae are numerous, and very closely set (see, e.g., Weber & de Beaufort, 1916: 153, fig. 64).

In *Eirmotus*, *Oreochthys* and ‘*P.*’ *oligolepis*, the rows of papillae are less numerous and more widely spaced than in the other above-mentioned taxa. *Eirmotus* also shares with ‘*P.*’ *oligolepis* and *Oreochthys* the small size, the large scales (19–24 in lateral row,  $\frac{1}{2}3\frac{1}{2}$  [ $\frac{1}{2}5\frac{1}{2}$  in *Oreochthys*] in transverse row on the caudal peduncle), and the incomplete lateral line (with up to 7 perforated scales). *Oreochthys* and ‘*P.*’ *oligolepis* share the feeble and smooth last simple dorsal-fin ray; they have similar (but probably not homologous) colour patterns consisting of conspicuous black crescentic marks on all scales. *Oreochthys* is distinguished from ‘*P.*’ *oligolepis* and *Eirmotus* in having the 2<sup>nd</sup> simple dorsal-fin ray not adnate to the 3<sup>rd</sup> one but separated by a membrane (vs. adnate). *Eirmotus* is immediately distinguished from *Oreochthys* by the colour pattern with eight black bars, the last two simple dorsal-fin rays closely adnate and the last dorsal-fin ray serrated posteriorly. ‘*Puntius*’ *oligolepis* is further distinguished from *Eirmotus* and *Oreochthys* by the presence of mandibular barbels.

## ACKNOWLEDGEMENTS

We thank Lynne Parenti (USNM) for the loan of the holotype of *E. octozona*; Enis Widjanarti, Thomas Sim, H. H. Ng, S.

H. Tan, Darren C. J. Yeo for assistance in the field; Renny Hadiaty, Ike Rachmatika and Daisy Wowor (MZB) and Kelvin Lim (ZRC) for access to material; Peter Ng (RMBR) for providing facilities for MK during his visits; Frank Yuwono and Patrick Yap for donation of material. Funding for the various collection trips for THH came from the Raffles Museum and Peter Ng's various academic research grants over the years 1994–1999.

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