

**THE IDENTITY OF *PUNTIUS EUGRAMMUS*
AND DIAGNOSES OF TWO NEW SPECIES OF STRIPED BARBS
(TELEOSTEI: CYPRINIDAE) FROM SOUTHEAST ASIA**

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ABSTRACT. - The synonymy of *Puntius eugrammus* and *P. johorensis* is confirmed. Four species of barbs of the genus *Puntius* with longitudinal stripes occur in Southeast Asia: *P. lineatus* with 0 or 2 barbels and fleshy lips with a continuous postlabial groove, from the Malay Peninsula, Sumatra and western Borneo; *P. johorensis* with four barbels and a juvenile colour pattern of 4 vertical bars changing into 5-6 stripes at about 20-30 mm SL, from the Malay Peninsula, Sumatra, and Borneo; *P. trifasciatus*, new species, with four barbels and a juvenile colour pattern of 4 vertical bars changing into 3(-4) stripes at about 30-40 mm SL, from western and southern Borneo; and *P. gemellus*, new species, with four barbels and juveniles with 4-5 irregular vertical bars changing into 5-6 narrow stripes at about 18-20 mm SL, from southern Sumatra, Bangka and southern Borneo.

INTRODUCTION

Two species of striped barbs are presently recognised in Southeast Asia (Roberts, 1989; Zakaria-Ismail, 1991; Kottelat et al., 1993). *Puntius lineatus* (Duncker, 1904) has 0-2 barbels (short when present), 18-19 gill-rakers on first gill arch and 4-5 stripes on the body in both juveniles and adults. *Puntius johorensis* (Duncker, 1904) has four long barbels, 7-11 gill rakers and the juveniles have a barred colour pattern which transforms into a pattern of longitudinal stripes at about 25-30 mm SL. *Puntius johorensis* has long been known as *P. fasciatus* (Bleeker, 1853) or *P. eugrammus* Silas, 1956.

Barbus fasciatus was originally described by Bleeker (1853: 190); but this name is a secondary junior homonym of *Cirrhinus fasciatus* Jerdon (1849: 305) in the genus *Puntius* and has been replaced by *P. eugrammus* by Silas (1956: 194). Bleeker (1853: 190) described the species on the basis of two specimens, one 95 mm TL from Bangka and one 120 mm TL from Moara Kompeh, East Sumatra. In 1863 (p. 103, pl. 139 fig. 1) he redescribed it from four specimens 93-120 mm TL from Sumatra (Moara Kompeh), Bangka and Borneo

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(Kahajan) and illustrated a specimen 85 mm SL, 110 mm TL from an unspecified locality. Bleeker (1853, 1863) described and figured his specimens as having 6 stripes. Weber & de Beaufort (1916: 184) describe the species as having 5-6 stripes.

Since Taki et al. (1978), it has been generally accepted that one of the striped barbs passes through a juvenile stage with bars to an adult stage with stripes and this species has been called *P. eugrammus* (see Roberts, 1989; Kottelat et al., 1993). Kottelat (1992) showed that the correct name for this particular species is *P. johorensis*, and considered *P. eugrammus* to be a junior subjective synonym of *P. johorensis*; the lectotype of *P. johorensis* being the juvenile of this species and not, as earlier admitted, a species with a barred pattern in both juveniles and adults (i.e. *P. hexazona* Weber & de Beaufort, 1912). Although never explicitly stated, the general consensus was that the number of stripes increases from three immediately after the transformation of the colour pattern to up to six in large adults. The examination of large series from western Borneo showing that the number of stripes actually does not increase with age and the discovery in Sumatra and Bangka of a species with 5-6 stripes at a size where *B. johorensis* specimens still exhibit the barred patterns casted doubts concerning the synonymy of *P. eugrammus* and *P. johorensis*.

Material has now become available which shows that the situation is more complex than previously recognised. I now conclude that there are four species of striped barbs in the Malay Peninsula and Indonesia: *Puntius johorensis* (with *P. eugrammus* as a synonym), *P. lineatus*, and two new species diagnosed here (*P. trifasciatus*, *P. gemellus*).

MATERIALS AND METHODS

Material used for or mentioned in this work is preserved in: BMNH, Natural History Museum, London; MHNG, Musèum d'Histoire Naturelle, Genève; MZB, Museum Zoologicum Bogoriense, Bogor; RMNH, Nationaal Natuurhistorisch Museum, Leiden; ZMH, Zoologisches Museum Hamburg; ZRC, Zoological Reference Collection, Department of Zoology, National University of Singapore; and CMK, the author's collection. In the list of material examined, complete locality data have been omitted (except for holotypes of the new species), as they do not contribute to the argument.

Problems and needs of systematics in the frame of biodiversity research and the species concept adopted here are discussed elsewhere (Kottelat, 1995b). Attempts to find differences between *P. johorensis*, *P. trifasciatus* and *P. gemellus* in morphometry or meristics were not successful and therefore the following discussion concentrates on colour pattern which allows a confident identification of the three species. Morphometry of only some specimens of the new species are provided in Table 1 for information; although Table 1 may suggest that morphometric differences may exist in head length, pre-anal length, snout length and interorbital width, examination of additional specimens shows that these differences are useless for species identification. A stripe is a longitudinal dark mark and a bar is a vertical dark mark. Scale rows are numbered as follow: row 0 is the row bearing the lateral line canals, row +1 is the row immediately above it, row -1 is the row immediately below it; the next rows are +2 and 2 respectively, etc. Stripes are numbered the same way.

The Malay Peninsula is used as a zoogeographic unit including southern Thailand, peninsular Malaysia and Singapore. Locality names appear with the spelling used on the labels or in the original publications; if different, current spellings are given in brackets.

Table 1. Selected morphotric and meristic data of *Puntius johorensis*, *P. trifasciatus* and *P. gemellus*. H, holotype.

	<i>P. johorensis</i>		<i>P. trifasciatus</i>			<i>P. gemellus</i>	
	CMK 11141		MZB	CMK	60.0	MZB	CMK
			5940	10228			5939
Standard length [mm]	73.9	43.7	74.0	66.2		65.0	59.8
			H			H	
Percentage of standard length							
Total length	133.3	133.2	130.0	133.5	131.8	131.8	129.1
Head length	31.8	32.0	29.5	31.1	29.8	26.9	27.1
Predorsal length	55.3	54.0	53.1	54.2	51.5	52.3	51.7
Prepelvic length	53.5	52.9	51.4	53.3	52.0	51.8	53.0
Pre-anal length	76.0	72.3	74.6	74.6	75.0	78.2	78.3
Head depth	22.7	22.2	19.9	21.3	19.8	18.6	20.4
Body depth	37.2	32.3	31.1	32.8	29.7	35.1	33.3
Depth of caudal peduncle	14.3	13.3	12.8	11.9	12.5	12.2	12.9
Length of caudal peduncle	20.4	18.5	21.1	18.9	19.2	20.6	20.2
Snout length	9.2	8.9	8.4	8.9	8.7	7.4	7.0
Body width	19.4	15.6	15.8	16.6	16.7	15.2	13.4
Eye diameter	8.0	9.8	7.7	8.6	8.3	7.7	8.4
Interorbital width	11.2	10.8	9.6	10.1	10.3	9.2	8.7
Length of dorsal-fin base	15.6	16.0	14.1	14.7	15.3	14.8	13.9
Length of anal-fin base	9.7	9.4	7.8	8.2	8.7	8.5	8.5
Length of pelvic fin	20.0	19.7	19.5	19.3	19.7	17.7	18.1
Length of pectoral fin	21.0	20.8	20.8	21.0	22.0	19.4	18.4
Length of upper caudal lobe	32.5	34.8	30.0	32.0	32.8	30.9	30.6
Length of middle caudal rays	15.2	14.6	12.0	13.9	13.0	15.2	14.7
Length of lower caudal lobe	31.4	34.1	31.5	31.7	30.3	31.7	-
Percentage of head length							
Snout length	28.9	27.9	28.4	29.1	29.1	27.4	25.9
Eye diameter	25.1	30.7	27.7	27.9	27.9	28.6	30.9
Interorbital width	35.3	33.6	32.5	34.6	34.6	34.3	32.1
Pectoral rays	16	17	17	17	16	15	15
Lateral line scales	26+2	27+2	25+2	26+2	27+2	26+2	27+2
Predorsal scales	10	11	10	10	11	11	10

KEY TO THE STRIPED PUNTIUS OF SOUTHEAST ASIA

1. 0-1 pair of barbels, much shorter than eye; 1/25/1/4 scales in transverse row between dorsal origin and pelvic origin; 17-20 gill rakers on anterior gill arch; mouth subinferior; lower lip fleshy, forming a continuous postlabial groove in specimens larger than about 20 mm SL (Fig. 1); Malay Peninsula, Kalimantan Barat, Jambi *P. lineatus*
- 2 pairs of barbels, posterior ones usually reaching much beyond posterior margin of eye; 1/24/1/3 scales in transverse row between dorsal origin and pelvic origin; 7-11 gill rakers on anterior gill arch; mouth terminal; lower lip thin and postlabial groove interrupted medially at all sizes 2
2. Interaxial streak present on row +1 below dorsal fin base (Fig. 2); stripes thin, usually less than half the width of a scale row; specimens larger than about 20 mm SL with 5-6 stripes on body; specimens smaller than about 18 mm SL with about 4-5 irregular vertical marks; Jambi, Riau, Bangka *P. gemellus*
- Interaxial streak not distinct below dorsal fin base; stripes broad, usually about half to equal to the width of a scale row; specimens over 40 mm SL with 3-6 stripes on body; specimens smaller than about 30 mm SL with 4 bars 3

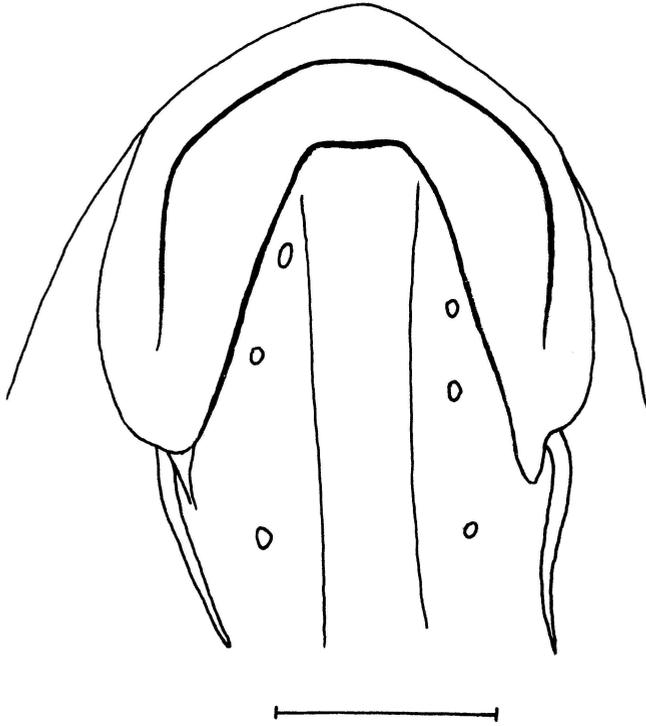


Fig. 1. Mouth of *Puntius lineatus*, CMK 10229, 46.1 mm SL, Borneo: Kapuas basin; scale bar 1 mm.

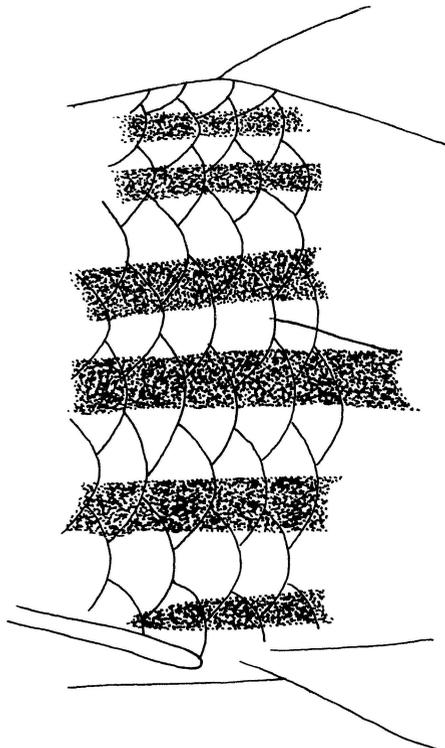


Fig. 2. Schematized position of stripes below dorsal fin base in adult *Puntius gemellus*.

3. In specimens larger than about 40 mm SL, 3-4 stripes on body; on caudal peduncle, stripes +1 and -1 are on rows +3 and -3 respectively, and constitute the upper and lower margin of the peduncle; Sarawak, Kalimantan Barat, Kalimantan Tengah, Kalimantan Selatan
P. trifasciatus
- In specimens larger than about 30 mm SL, 5-6 stripes on body; on caudal peduncle, stripes +1 and -1 are on scale rows +2 and -2 respectively and do not touch the dorsal and ventral midlines (except in some small specimens from the Malay Peninsula); Malay Peninsula, Riau, Jambi, Kalimantan Tengah, Kalimantan Timur *P. johorensis*

TAXONOMY

Puntius gemellus, new species

(Fig. 3)

Material examined. - Holotype: MZB 5939, 65.0 mm SL; Sumatra: market in Jambi; coll. P. G. Bianco & M. Kottelat, 9 Dec.1984.

Paratypes - CMK 4751, 1 ex., 59.8 mm SL; same data as holotype. - CMK 4710, 1 ex., 36.4 mm SL; Sumatra: Jambi Prov.: Sungei Landei, km 30 on road from Jambi to Palembang; coll. P. G. Bianco & M. Kottelat, 9 Dec.1984. - CMK 11041, 2 ex., ZRC 38703, 2 ex., 13.5-25.8 mm SL; Sumatra: Jambi Prov.: Sungai Pijoan; coll. M. Kottelat & Tan H. H., 28 May 1994. - CMK 9561, 6 ex., 26.2-36.8 mm SL; ZRC 30906-30910, 5 ex., 28.3-34.8 mm SL; Bangka: km 3 on road from Sungei Liat to Tanjung Persona Beach; coll. M. Kottelat et al., 2 Mar.1993. - CMK 12202, 1 ex., 40.6 mm SL; Sumatra: Riau Prov.: peat swamp forest draining into Sungei Bengkwan [Batang Kuantan, 4 hours downriver from Rengat]; coll. P. K. L. Ng et al., 14 Jun.1995.

Diagnosis. - *Puntius gemellus* is distinguished from the other striped *Puntius* in Southeast Asia by the combination of characters listed in the key above. It is unique by its colour pattern consisting of 4-5 thin, irregular bars in juveniles less than about 18 mm SL and 5-6 narrow stripes in adults. The adults are distinguished from the other three species by the distinct interaxial streak on scale row +1 below dorsal-fin base (Fig. 2).

Etymology. - From the Latin *gemellus*, meaning twin; an allusion to the similarity with *P. johorensis*. A noun in apposition.

Colour pattern (Fig. 3). - In adults, there are usually 6 narrow stripes on a pale brown background. Stripe 0 is on row 0, except on anteriormost scales where it is between rows 0 and -1. Stripe +1 is between rows +1 and +2, except on anterior scales where it is on row +1. Stripe +2 is on row +3, except anteriorly where it is between rows +2 and +3; it ends at the beginning of the caudal peduncle. Stripe +3 is on row +4, except anteriorly where it is on row +3; it extends to end of dorsal base; it is absent in small specimens (less than 26 mm SL). The stripes on the back (especially stripes +2 or +3) may be somewhat irregular or connected. Stripe -1 is between rows -1 and -2, except on caudal peduncle where it is on row -2. Stripe -2 is on row -3, between pelvic and anal origins; it is present only in some of the largest specimens examined (above about 50 mm SL). Stripes +1 and -1 are on rows +2 and -2 respectively on the caudal peduncle, whose dorsal and ventral midlines have the general background colour of the body.

In the smallest available specimen (ZRC 38703, CMK 11041, 13.5 mm SL, Fig. 3a), there are about 4-5 thin, irregular bars. In a specimen 17.5 mm SL, the bars are more or less dissociated into vertical rows of spots; the spots are also forming three horizontal rows. In a specimen 21.0 mm SL, the spots are partly fused into 4 irregular stripes. In the same series, a specimen 26.4 mm SL shows the adult pattern.

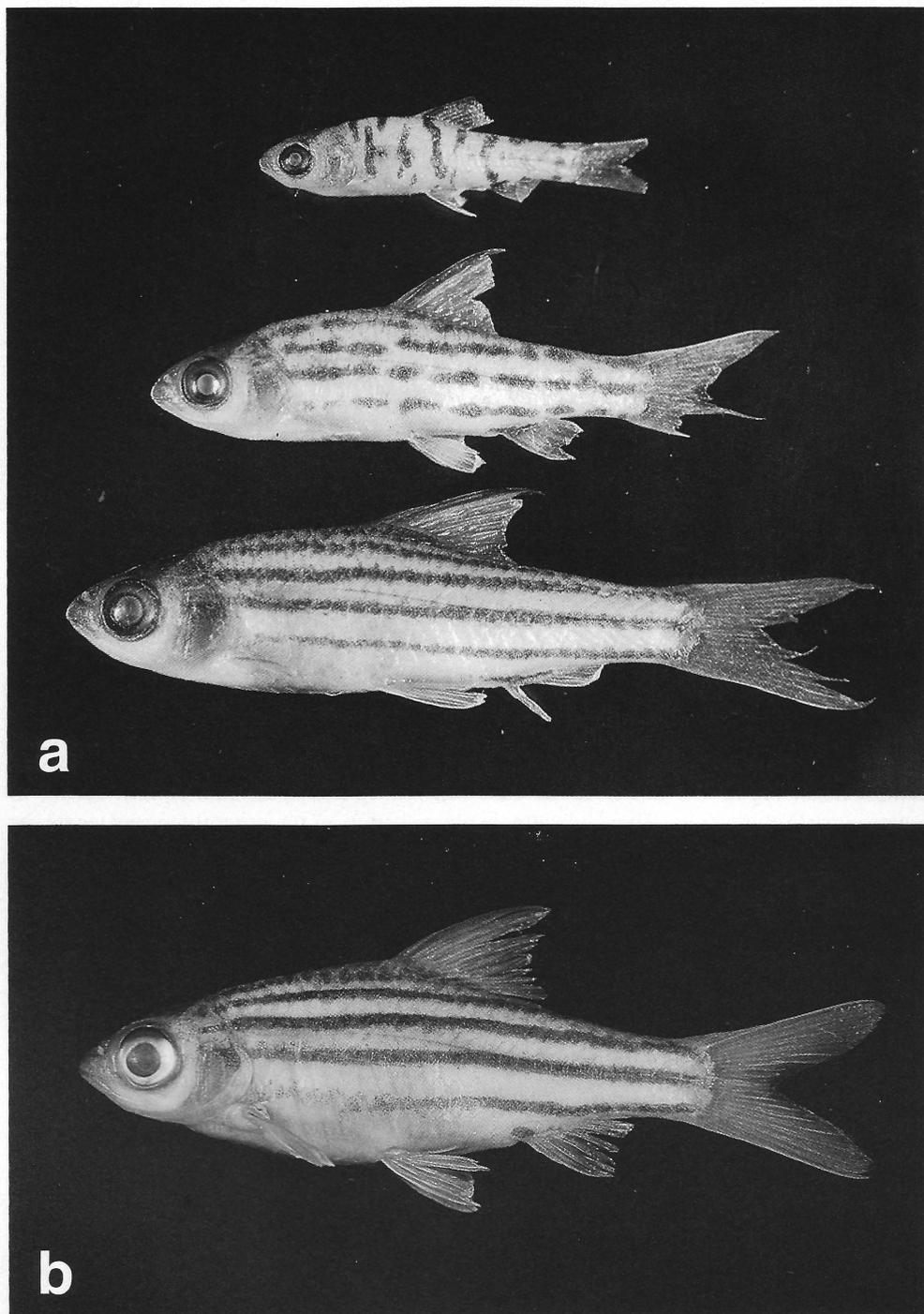


Fig. 3. *Puntius gemellus*; a, CMK 11041, ZRC 38703, 13.5, 21.3 and 25.8 mm SL; Jambi; b, CMK 9561, 34.9 mm SL; Bangka.

Distribution. - I have examined material from Sumatra (Riau and Jambi provinces) and from the island of Bangka.

Puntius johorensis (Duncker, 1904)

(Fig. 4)

Barbus fasciatus Bleeker, 1853: 190 (type locality: Marawang, Bangka [present restriction]; lectotype (present designation): RMNH 4015; secondary junior homonym of *Cirrhinus fasciatus* Jerdon, 1849: 305).

Barbus tetrazona var. *johorensis* Duncker, 1904: 178, pl. 1 fig. 3 (type locality: Muar River near Tubing Tinggi [= Tebing Tinggi], Johor, Peninsular Malaysia; lectotype: ZMH H 371 [designated by Ladiges et al., 1958: 158]; paralectotype: ZMH H 372 [2], BMNH 1905.5.6:6 [1]).

Puntius eugrammus Silas, 1956: 194 (replacement name for *Barbus fasciatus* Bleeker, 1853: 190).

Material examined. - **BORNEO:** CMK 5540, 1 ex., 72.1 mm SL; CMK 4196, 1 ex., 56.7 mm SL; ZRC 22830-22831, 2 ex., 49.2-50.5 mm SL; Kalimantan Tengah: Mentaya basin. - CMK 7800, 1 ex., 52.2 mm SL; Kalimantan Timur: Mahakam basin. - CMK 10972, 1 ex., 61.0 mm SL; Sarawak: Daro. **SUMATRA:** RMNH 4015, lectotype of *Puntius eugrammus*, 70.5; Bangka Island: Marawang. - CMK 9034, 1 ex., 39.5 mm SL; ZRC 39081, 14 ex., 44.2-68.4 mm SL; CMK 11895, 3 ex., 54.1-60.1 mm SL; Riau: Indragiri basin. - CMK 7322, 3 ex., 24.5-30.6 mm SL; Riau: Siak basin. - CMK 11027, 1 ex., 20.6 mm SL; CMK 11059, 1 ex., 19.1-19.5 mm SL; CMK 11093, 2 ex., 37.8-38.9 mm SL; CMK 11110, 1 ex., 55.0 mm SL; CMK 11141, 2 ex., 43.7-73.9 mm SL; Jambi: Batang Hari basin. **PENINSULAR MALAYSIA:** ZRC 15726-15731, 6 ex., 18.8-56.9 mm SL; ZRC 15724-15725, 2 ex., 83.1, 93.5 mm SL; ZRC 15735-15747, 13 ex., 37.3-50.3 mm SL; ZRC 15726-15731, 6 ex.; 17.6-56.4 mm SL; ZRC 17735-17747, 13 ex., 37.8-47.8 mm SL; ZRC 27708-27712, 5 ex., 42.2-76.2 mm SL; CMK 4152, 11 ex., 28.5-30.9 mm SL; ZRC 27708-27712, 5 ex., 43.1-76.1 mm SL; ZRC 28522, 1 ex., 61.1 mm; Perak. - CMK 8163, 10 ex., 25.7-34.9 mm SL; CMK 8226, 1 ex., 30.0 mm SL; ZRC 17157-17160, 4 ex., 31.3-34.7 mm SL; Terengganu. - ZMH H 371, lectotype of *Barbus tetrazona johorensis*, 25.8 mm SL; ZMH H 372, 2 ex., paralectotypes of *B. tetrazona johorensis*, 17.2-24.5 mm SL; Johor: Muar River at Tubing Tinggi [= Tebing Tinggi]. **THAILAND:** CMK 12085, 1 ex., 39.6 mm SL; Narathiwat Prov.

Diagnosis. - *Puntius johorensis* is distinguished from the other striped *Puntius* in Southeast Asia by the combination of characters listed in the key above. It is unique by its colour pattern consisting of 4 bars in juveniles less than about 20-30 mm SL and 5-6 stripes in adults.

Colour pattern (Fig. 4). - In adults, there are usually 6 narrow stripes on a reddish brown background. Stripe 0 is on row 0, except on anteriormost scales where it is between rows 0 and -1. Stripe +1 is between rows +1 and +2, except on anterior scales where it is on row +1. Stripe +2 is between rows +2 and +3; it ends at the beginning of the caudal peduncle. Stripe +3 is between rows +3 and +4; it is absent in the smallest specimens (about 40 mm SL). The stripes on the back (especially stripes +2 or +3) may be somewhat concealed by the dark background. Stripe -1 is between rows -1 and 2, except on caudal peduncle where it is on row -2. Stripe -2 is on row -3, between pectoral and anal bases. Stripes +1 and -1 are on rows +2 and -2 respectively on the caudal peduncle and the dorsal and ventral midlines have the general background colour of the body.

Juveniles have a colour pattern consisting of 4 bars. At about 20 mm SL, the bars become irregular, extending longitudinally into elongated blotches which become coalescent to form stripes (see Kottelat, 1992, for description of juvenile color pattern). Above 30 mm SL, there is usually no trace left of the bars. Juvenile description is based on material from Terengganu, Perak and Sumatra (CMK 8163, 4152, 11027, 11059).

There is some geographic variation in details of coloration and appearance in this species. In specimens less than about 40 mm SL from the Malay Peninsula, stripes +1 and -1 may be along the dorsal and ventral midlines of the caudal peduncle. In the single specimen from



Fig. 4. *Puntius johorensis*; a, CMK 7800, 52.2 mm SL, Borneo: Mahakam basin; b, CMK 11141, 43.7 and 73.9 mm SL, Sumatra: Batang Hari basin.

the Mahakam basin and one of the Kalimantan Tengah specimens, a faint interaxial streak is present below the dorsal base. Specimens from Sumatra have a deeper-bodied appearance and those from Kalimantan Tengah appear slender, although this is not supported by actual measurements of small series.

Distribution. - I have examined specimens from Sumatra (Jambi: Batang Hari basin; Riau: Siak and Indragiri basins), Bangka, Borneo (Kalimantan Tengah: Mentaya basin; Kalimantan Timur: Mahakam basin; Sarawak) and the Malay Peninsula (Malaysia: Johor, Pahang, Terengganu, Selangor, Perak; Thailand: Narathiwat). It probably occurs in

Kalimantan Selatan and southern Sumatra from where it is recorded by Weber & de Beaufort (1916: 184) but this needs confirmation. Some of the localities cited by Weber & de Beaufort (especially those in west Borneo) are possibly erroneous. In Bangka and Jambi, it has been collected in slightly tea-coloured waters, in swamps or standing waters with abundant submerged grasses.

***Puntius trifasciatus*, new species**

(Fig. 5)

Material examined. - Holotype: MZB 5940, 74.0 mm SL; Borneo: Kalimantan Barat: Kapuas basin, Danau Sentarum Wildlife Reserve, Nanga Semunak (dry season location), 0°56'37"N 112°5'31"E, coll. M. Kottelat et al., 8 Sep.1993.

Paratypes - MZB 5941, 6 ex., CMK 10228, 9 ex., 39.0-74.0 mm SL; same data as holotype. - CMK 10169, 25 ex., 16.1-35.3 mm SL; CMK 10241, 3 ex., 81.0-101.0 mm SL; CMK 10476, 1 ex., 85.8 mm SL; CMK 10782, 2 ex., 37.0-47.1 mm SL; Borneo: Kalimantan Barat: Kapuas basin. - CMK 6663, 6 ex., 29.5-46.0 mm SL; Borneo: Kalimantan Barat: Sungei Pinyuh basin. - CMK 10796, 1 ex., 50.3 mm SL; ZRC 22832-22833, 2 ex., 43.5-48.2 mm SL; MHNG 2058.95, 1 ex., 38.4 mm SL; MHNG 2058.96, 1 ex., 53.5 mm SL; MHNG 2058.97, 1 ex., 34.7 mm SL; MHNG 2155.23, 1 ex., 96.1 mm SL; Borneo: Kalimantan Tengah: Mentaya basin. - MHNG 2155.25, 1 ex., 55.2 mm SL; Borneo: Kalimantan Selatan: Pulau Laut. - CMK 8389, 5 ex., 39.1-41.5 mm SL; ZRC 26016-26020, 5 ex., 39.9-43.0 mm SL; Borneo: Sarawak: Sadong basin.

Diagnosis. - *Puntius trifasciatus* is distinguished from the other striped *Puntius* in Southeast Asia by the combination of characters listed in the key above. It is unique by its colour pattern consisting of bars in juveniles less than about 30-40 mm SL and 3-4 stripes in adults. The adults are usually immediately distinguished from the other two species by having only 3-4 conspicuous stripes, the middle one usually being wider than the other two.

Colour pattern (Fig. 5). - In adults, stripe 0 is broad, extending on the whole row 0 and part of rows -1 and +1 at the beginning and the end of lateral line; in the median area, it is over rows 0 and +1. Stripe +1 is on row +3 or between rows +3 and +4, except anteriorly where it is slightly lower, on the caudal peduncle, it is on row +3. Stripe +2 is on row +4 or between +4 and +5; it extends between the nape and the posterior extremity of dorsal base; it is usually not present in specimens less than about 60 mm SL. Stripe -1 is between rows -1 and -2 above the pelvic, on row -2 in front, and on row -3 on the caudal peduncle.

Juveniles have a colour pattern consisting of 4 bars. At about 20 mm SL, the bars becomes irregular, extending longitudinally into elongated blotches which become coalescent to form stripes (Fig. 5a). Above 40 mm SL, there is usually no trace of the bars.

There is variability in the intensity of the stripes. They are a more intense black and tend to be wider in specimens from clear blackwaters.

Distribution. - This species is known only from western Borneo (Sarawak: Sadong basin; Kalimantan Barat: Kapuas and Pinyuh basins; Kalimantan Tengah: Mentaya basin; Kalimantan Selatan: Pulau Laut island). It has been collected in very dark blackwaters, usually in slightly flowing waters under forest cover, and rarely in standing water.

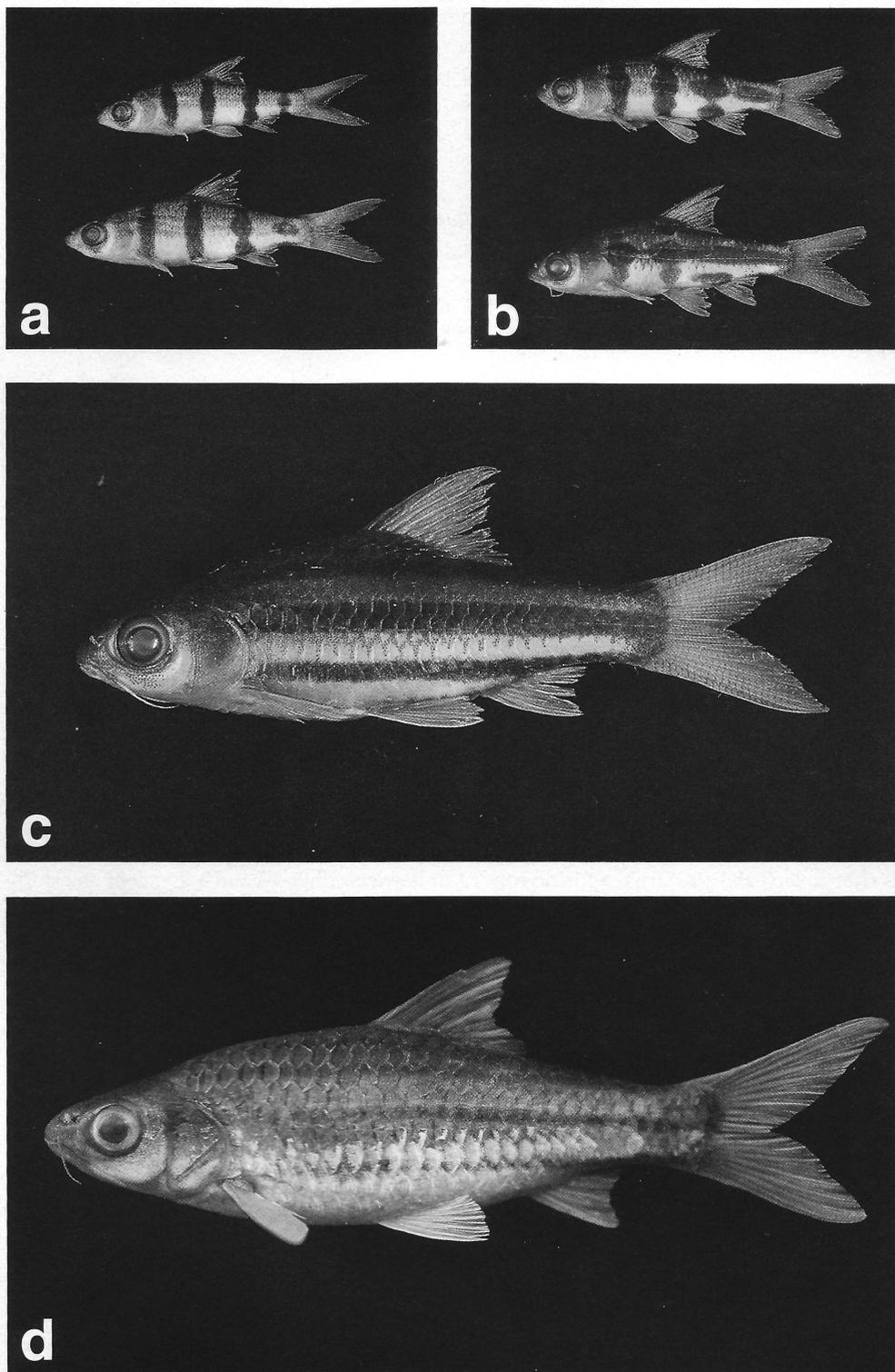


Fig. 5. *Puntius trifasciatus*; a, CMK 10169, 24.5 and 29.0 mm SL; b, CMK 6663, 29.2 and 31.0 mm SL; c, CMK 6663, 45.2 mm SL; d, CMK 10476, 85.8 mm SL. a, d: Borneo: Kapuas basin: Danau Sentarum; b, c: Borneo: Sungei Pinyuh basin.

Puntius lineatus (Duncker, 1904)

(Fig. 6)

Barbus lineatus Duncker, 1904: 180, pl. 2 fig. 14 (type locality: Muar River near Tubing Tinggi [= Tebing Tinggi], Johor, Peninsular Malaysia; lectotype ZMH H 328 [designated by Ladiges et al., 1958: 158]; paralectotypes: ZMH H 329 [3], ZMA 103.220 [1], ZRC 2311 [1], BMNH 1905.5.6:14-15 [2]).

Material examined. - CMK 6954, 19 ex., 19.5-24.0 mm SL; CMK 10150, 17 ex., 16.0-32.1 mm SL; CMK 10170, 28 ex., 20.0-43.5 mm SL; CMK 10193, 1 ex., 23.7 mm SL; CMK 10229, 44 ex., 30.6-46.1 mm SL; CMK 10242, 1 ex., 36.4 mm SL; CMK 10395, 1 ex., 22.4 mm SL; CMK 11646, 1 ex., 28.1 mm SL; Borneo: Kalimantan Barat: Kapuas basin. - CMK 4693, 5 ex., 49.0-52.7 mm SL; CMK 5103, 1 ex. 52.6 mm SL; CMK 11042, 1 ex., 21.5 mm SL; CMK 11094, 3 ex., 16.7-32.9 mm SL; CMK 11142, 6 ex., 41.8-59.5 mm SL; CMK 11122, 5 ex., 22.6-32.6 mm SL; CMK 11249, 2 ex., 34.8-46.0 mm SL; Sumatra: Jambi: Batang Hari basin. - ZMH H 328, lectotype, 22.3 mm SL; ZMH H 329, 2 paralectotypes, 24.1-24.9 mm SL; ZRC 2311, 1 paralectotype, 24.4 mm SL; Peninsular Malaysia: Johor: Muar River at Tubing Tinggi [= Tebing Tinggi]. - ZRC 565, 5 ex., 31.5-36.0 mm SL; Peninsular Malaysia: Pahang: Tasek Bera.

Diagnosis. - *Puntius lineatus* is distinguished from the other three species of striped *Puntius* in Southeast Asia by having only 0-1 pair of barbels, much shorter than eye (vs. 2 pairs of long barbels), 1/2 5 scale rows between dorsal origin and lateral line (vs. 1/2 4) and 4 between lateral line and pelvic origin (vs. 3); 17-20 gill rakers on anterior gill arch (vs. 7-11), mouth subinferior (vs. terminal), and especially by its fleshy lower lip forming a continuous postlabial groove in specimens larger than about 20 mm SL, a character unique among Southeast Asian *Puntius*. It is a smaller species, not known to grow larger than 53 mm SL.

Colour pattern (Fig. 6). - Stripe 0 is on row 0, except in the middle area of flank where it is between rows 0 and +1. Stripe +1 is on row 2, except in the middle where it is between rows +2 and +3. Stripe +2 is on row +3 anteriorly, going progressively to row +4 posteriorly; it ends at about posterior extremity of dorsal base. Stripe -1 is on row -2, except in the middle where it is between rows -1 and -2. Stripe -2 is on row -3 and extends between pectoral and anal origin; it is usually weak or even absent. The smallest examined specimens are about 16.0 mm SL and already exhibits this colour pattern, although the stripes may be weakly developed.

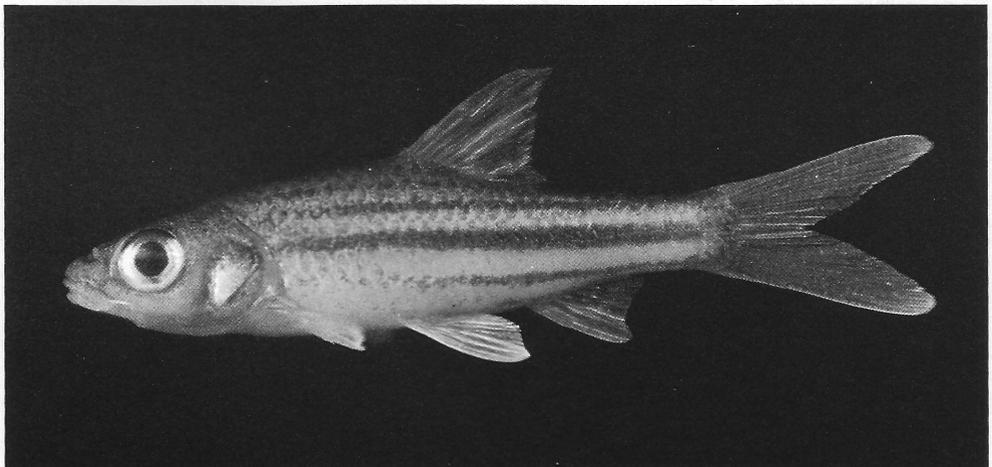


Fig. 6. *Puntius lineatus*, CMK 10150, 31.1 mm SL; Borneo: Kapuas basin.

Distribution. - I have examined specimens from the Malay Peninsula (Johor: Muar basin, Pahang: Tasek Bera), Sumatra (Jambi: Batang Hari basin) and Borneo (Kalimantan Barat: Kapuas basin). It has been collected in swamps and open areas with standing waters and submerged grasses.

DISCUSSION

Puntius lineatus differs strikingly from the other Southeast Asian species placed in the genus by its mouth shape and structure and it is possible that future research might show that it actually belongs to a distinct genus.

The variation in the colour pattern of *P. johorensis* and *P. trifasciatus* (Figs. 4-5) has been documented first by Taki et al. (1978, as *P. fasciatus*) and later by Roberts (1989, as *P. eugrammus*), Zakaria-Ismail, (1991, as *P. eugrammus*) and Kottelat (1992, Kottelat et al., 1993, as *P. eugrammus*), with most specimens examined by these authors apparently having 3-4 stripes. The existence of specimens considered as conspecific but with different number of stripes has been known for several years (see Hardenberg, 1936: 239; Imaki et al., 1981: 38) but only few specimens were available and they usually were of very large size and it was assumed (by me and others) that the number of stripes increases with age.

In September 1993 I had the opportunity to see a few hundred specimens of a species identified as *P. johorensis* in the Kapuas basin, Borneo. They are represented by series CMK 10169, 10228, 10241, 10476, 10782, 16.1-85.8 mm SL, but most specimens have not been preserved as they were part of fishermen's catches and damaged. None of them has more than 4 stripes, demonstrating that the number of stripes does not increase with age or size and suggesting that they represent a distinct species, *P. trifasciatus*.

Bleeker's (1853) original description of *Barbus fasciatus* refers to a large-sized species (95-120 mm TL) with 6 stripes and 2 pairs of barbels, which he later redescribed and illustrated (1863: 103, pl. 139 fig. 1). Bleeker's material had been obtained from East Sumatra (the 120 mm TL specimen) and Bangka (the 95 mm TL specimen). The name *B. fasciatus* is preoccupied in the genus *Barbus* and has been replaced by *P. eugrammus* Silas, 1956. Comparison of material from Sumatra showed that it is conspecific with material from the Malay Peninsula and southern and eastern Borneo, but that it differs from the western Borneo specimens in having 5-6 stripes in adults (vs. 3-4; see key above for details of stripe position) and a slightly deeper body in adults (head depth 20.9-23.0 % SL, vs. 19.8-21.6; body depth 29.8-37.2 % SL, vs. 29.7-35.4; depth of caudal peduncle 13.3-14.5 % SL, vs. 11.9-13.1).

Puntius trifasciatus and *P. eugrammus* are sympatric in the Mentaya basin (Kalimantan Tengah), but had earlier been identified as a single species (Kottelat, 1982). This material has now been re-identified (CMK 4196, 5540, 10796, MHNG 2058.95-97, 2155.23).

As no difference could be observed between material from Sumatra and the Malay Peninsula, other than slight details in the colour pattern, I conclude that they are conspecific.

A fourth species, *Puntius gemellus*, is known from Sumatra (including Bangka). It has four barbels and 5-6 stripes and was first identified as *P. johorensis*. The stripes are much narrower than in the other species and *P. gemellus* already has stripes at a size (25-35 mm SL) where *P. johorensis* and *P. trifasciatus* juveniles still have the barred pattern. The smallest

known specimen (13.5 mm SL) has 4-5 thin, irregular bars and in specimens 17-21 mm SL they are already reorganised into 3-4 longitudinal rows of dots, before becoming stripes. *Puntius gemellus* and *P. johorensis* have been collected together in the Indragiri basin and in the Batang Hari basin the two species are present in collections less than two km apart. I expect the species to be present in Kalimantan Tengah.

The identification of Bleeker's original material of *Barbus fasciatus* is difficult and not very satisfactory. Two specimens labelled as types of *Barbus fasciatus* exist: RMNH 4947, 90.0 mm SL, BMNH 1866.5.2:191, 77.0 mm SL; their status as types is discussed below. No locality data is associated with them, but in the Dutch discussion following his diagnosis, Bleeker (1853: 190) explicitly stated that the Bangka specimen is the smallest one. The Bangka specimen is from Marawang, a name which does not appear on any map available to me; Bleeker (1853: 177) explicitly states that Marawang is on the east coast of the island, about one degree northeast of Muntok and that Marawang district is immediately north of Pankalpinang district. The Sumatra specimen is from 'Moara kompeh, Sumatrae orientalis', also a name which does not appear on modern map. This place is now called Tanjung in Jambi Province. It is situated at the mouth of Sungei Kumpeh (muara means mouth or estuary in Indonesian, sungei means river), a side arm of the Batang Hari splitting from the main river immediately downstream of Jambi and joining it again in Tanjung.

I am not convinced neither that the two specimens labelled as types are really Bleeker's syntypes nor that they are conspecific. Both are in very poor state; BMNH 1866.5.2:191 is very soft, almost scaleless and has only little remains of colour pattern left and might represent *P. gemellus*; RMNH 4947 is hardened and has no trace of colour pattern; it is possibly *P. trifasciatus*, but this species has not yet been recorded from Sumatra. RMNH 4947 originally included four additional specimens now catalogued RMNH 4015. The 70.4 mm SL specimen is deep bodied (body depth 38 % SL), in a bad state, shows remains of six broad stripes and is readily identifiable as *P. johorensis*. The 73.5 mm SL specimen is in very poor state, very slender (body depth 28 % SL) and from its shape and colour pattern is reminiscent of *P. trifasciatus*. The 79.7 mm SL specimen is deep bodied (body depth 39 % SL) and is in bad state (it has apparently been dried before); it seems to be the specimen illustrated in the Atlas (1863: pl. 139 fig. 1); shrinkage due to desiccation probably explains the size difference between the figure and the specimen (most Bleeker's figure seem to have been natural size); it had once a tag in the mouth, but only a piece of thread subsists; it is identifiable as *P. johorensis*. The 88.0 mm SL specimen has a tag '744'; it is relatively slender (body depth 34 % SL) and might have had four stripes and I tentatively refer it to *P. trifasciatus*.

The BMNH specimen has been considered as type apparently because it has been received from Bleeker (in 1866 according to its catalogue number). Actually, as Bleeker already had four specimens in 1863 (p. 103), we cannot be sure that this specimen is one of the original two syntypes. Also, the origin of the five specimens originally in RMNH 4947 is not clear because Hubrecht (1879: 43) in the auction catalogue of Bleeker's collection listed only four specimens of *P. fasciatus*. It is not possible to know which are the original four specimens and what is the origin of the fifth one.

This would probably be of no great importance if all specimens were readily identifiable and conspecific, but this is not the case. Bleeker indicated only TL but these cannot be checked on any specimen because all have damaged or missing caudal fins. He gave the length of the caudal fin as $4 \frac{1}{3}$ times in "body length" (equivalent to TL) (= 130% SL). Using the present SL, a reconstruction of TL would be as follow:

Specimen	SL (mm) estimated	TL(mm)	Identification
RMNH 4015	70.4	92	<i>P. johorensis</i>
RMNH 4015	73.5	96	tentatively <i>P. trifasciatus</i>
BMNH 1866.5.2:191	77.0	100	tentatively <i>P. gemellus</i>
RMNH 4015	79.7 *	104	<i>P. johorensis</i>
RMNH 4015	88.0	114	tentatively <i>P. trifasciatus</i>
RMNH 4947	90.0 *	117	tentatively <i>P. trifasciatus</i>

In addition one should take into account 1) the shrinkage due to long preservation; 2) that Bleeker's way of measuring body length might have been different from our way of measuring SL; 3) that the soft, disformed specimens might be stretched and appear more slender than were originally so; and 4) the possible desiccation of two specimens (marked by *). It seems thus that the BMNH specimen is too large to have been the small syntype and that both the 70.4 and 73.5 RMNH specimens could be the small syntype. In 1853, Bleeker indicated its size as 95 mm and in 1863 he indicated that the size of the smallest of his four specimens was 93 mm. It cannot be ascertained now if he had received a smaller specimen between 1853 and 1863, if he re-measured the small syntype, or if the change results from a lapsus or a printer's error (a confusion between a hand-written 3 and 5 is possible). The fact that Bleeker (1853) clearly described the colour pattern as consisting of six stripes seems to obviously eliminate the 73.5 mm specimen and it seems that the 70.4 mm specimen is the most likely as the small syntype.

The 88.0 and 90.0 mm SL RMNH specimens could both be the largest syntype, but I cannot really recognise on them the six stripes mentioned by Bleeker.

At this stage, it seems that although there is no absolute certitude, only specimen RMNH 4015, 70.5 mm SL, reasonably conforms with Bleeker's size indication, body depth, and colour pattern description and it is here designated as lectotype of *P. eugrammus*. It agrees with *P. johorensis* as described above and *P. engrammus* is treated as a junior synonym.

To my knowledge, *P. johorensis* has not been collected in Bangka in recent years, but this probably only reflects the very limited ichthyological activity on this island in recent years (Kottelat, 1995a).

The single specimen of *P. johorensis* from Sarawak has been obtained in a peat swamp forest on one of the islands of the Rajang estuary. It appears that the species is distributed in most basins of the Malay Peninsula, Sumatra and Borneo, except the Kapuas and may be southern Sarawak where it is replaced by *P. trifasciatus*. This distribution pattern is shared with *Osteochilus hasselti* which is distributed throughout Southeast Asia, except the middle and upper Kapuas where it is replaced by the closely related *O. kappanii*.

The Sarawak specimen of *P. johorensis* looks more similar to those from the Malay Peninsula than to those from elsewhere in the species's range. Cases of closely related populations or species occurring in the Malay Peninsula and Sarawak are listed by Lim & Kottelat (1995).

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