

SYSTOMUS NAVJOTSODHII, A NEW CYPRINID FISH FROM CENTRAL KALIMANTAN, BORNEO

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ABSTRACT. — A deep-bodied tiger barb with broad black bars is described from hill stream habitats in the headwaters of the Katingan River in Central Kalimantan, Borneo. *Systomus navjotsodhii* differs from other tiger barbs in having four complete broad black bars and the deepest body (body depth at dorsal-fin origin 53.6–59.2 % SL). The species is named in memory of Navjot Sodhi.

KEY WORDS. — taxonomy, tiger barb, cypriniformes, Southeast Asia, biodiversity

INTRODUCTION

The genus *Puntius* sensu lato as recognised currently is probably non-monophyletic (sensu Roberts, 1989). Rainboth (1996) considered *Systomus* to be a valid genus distinct from *Puntius* sensu stricto in having a finely-serrated (vs. smooth) dorsal-fin spine, 2–4 maxillary barbels (vs. 2 only) and fewer than 12 (vs. 12–20) gill rakers on the first gill arch. The present article follows Rainboth (1996) in recognising *Systomus* as a valid genus.

Alfred (1963) revised the ‘tiger barbs’ of the genus *Puntius*, which had a striking colour pattern consisting of four to six black bars on a yellow or reddish body. Taki et al. (1978), based on colour pattern, divided the 23 species of Southeast Asian cyprinids they studied into seven groups.

Two groups of tiger barbs as first recognised by Kottelat (1992), the subspecies proposed by Alfred (1963) are recognised as full species by Kottelat (1992) and followed herein. Group 1 possesses a deep rhomboidal, usually yellow body with intense black bars and a complete or incomplete lateral line, occurring in swamps, streams, and along river margins. This group 1 comprises of four species: *Systomus tetrazona* (Bleeker, 1855) from Sumatra; *S. anchisporus* (Vaillant, 1902) from Borneo (West and Central Kalimantan); *S. partipentazona* (Fowler, 1934) from Peninsular Malaysia, Thailand, Cambodia, and Vietnam; and *S. pulcher* (Rendahl, 1922) from Borneo (East Kalimantan; revalidated recently by Kottelat & Tan, 2011). Members of Group 2 have a shallower, elongated, reddish-brown body with blackish-brown bars (complete or incomplete), complete lateral line, and occur in acid-water streams and peat swamps. This comprises of five species: *Systomus pentazona* (Boulenger,

1894) from Borneo (North Sarawak, Brunei Darussalam, East Kalimantan); *S. hexazona* (Weber & de Beaufort, 1912) from Malay Peninsula, Sumatra and Borneo; *S. rhomboocellatus* (Koumans, 1940) from Borneo (West and Central Kalimantan); *S. foerschii* (Kottelat, 1982) from Borneo (Central Kalimantan); and *S. endecanalis* (Roberts, 1989) from Borneo (West Kalimantan).

During a recent trip to the upper reaches of Katingan River basin in Central Kalimantan, a series of darkly-pigmented deep-bodied tiger barbs were obtained from a hill stream habitat. Upon comparison with other members of his group, it proved to be distinct and is herein described as a new species.

MATERIAL AND METHODS

Specimens were collected with push nets and preserved in 10 % formalin, and later transferred to 75% ethanol for long-term storage. Specimens were measured with dial calipers (0.05 mm accuracy) on the left side following Kottelat (1984); colour pattern terminology follows that of Taki et al. (1978). Trunk length is measured from the posterior edge of opercle opening to caudal fin base. Abbreviations used: SL – standard length, HL – head length.

Specimens examined are deposited in the MZB – Research and Development Centre for Biology, The Indonesian Institute of Sciences (formerly the Museum Zoologicum Bogoriense), Cibinong, Indonesia; and ZRC – Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore, Singapore.

TAXONOMY

Systomus navjotsodhii, new species

Figs. 1A, 1B, 2A–D

Material examined. — MZB 17198, holotype, 41.7 mm SL; Borneo: Central Kalimantan: Katingan basin, Mendawai sub-basin: hill stream at buffer zone of Bukit Raya–Bukit Baka National Park, ca. 200 m asl (00°44.91'S, 112°15.85'E); H. H. Tan et al., 10–13 Aug. 2007.

Paratypes: MZB 17199, 6 ex., ZRC 52509, 8 ex., 21.1–47.8 mm SL; same locality data as holotype.

Non-type material: ZRC 52507, 10 ex., 13.6–38.3 mm SL; Borneo: Central Kalimantan: Barito basin: stream southeast of Muara Teweh (01°00.83'S, 115°06.47'E); T. Idei, 2000.

Diagnosis. — *Systomus navjotsodhii* can be distinguished from Group 1 tiger barbs by the combination of the following characters: presence of 4 broad, black bars (up to 5 scales wide), second and third bars distinctly curved posteriorly; dorsal fin anterior $\frac{3}{4}$ black (anterior-most portion red in life, whitish when preserved), posterior margin red in life, whitish when preserved; pelvic fins almost entirely red in life (whitish when preserved); upper and lower lips black; complete lateral line, lateral scale series 20–21 (all pored); deep body (body depth at dorsal-fin origin 53.6–59.2% SL); and deep caudal peduncle (18.4–19.9% SL).

Description. — For morphometric data, refer to Table 1; meristic data based on five specimens. Transverse scales $\frac{1}{2}$ 5.1.3 $\frac{1}{2}$; caudal peduncle transverse scales $\frac{1}{2}$ 2.1.2 $\frac{1}{2}$; lateral scales 20–21 (mode 21). Body shape rhomboidal, deepest at dorsal-fin origin (53.6–59.2% SL), body most slender at caudal peduncle (18.4–19.5% SL), body dorsum with 9 predorsal and 9 postdorsal scales. From lateral view, anterior dorsal slope of body slightly convex. Head blunt, relatively long (head length 30.7–33.2% SL). Eyes large (orbit diameter 10.0–10.5% SL, 31.4–33.8% HL). Lateral line on body complete, relatively straight, a slight dip at middle. Dorsal, anal, and pelvic fins triangular. Dorsal fin with 2 simple, 8 branched rays, dorsal-fin origin at 8–9th lateral-line scale; anal fin with 2 simple, 5 branched rays, anal-fin origin beneath 11–12th lateral-line scale; pelvic fin with 9 rays. Caudal fin deeply forked, with 8+9 principal rays. Pectoral fins rounded, with 14 rays. Maximum known size 47.8 mm SL (ZRC 52509).

Colouration in life. — See Figs. 1A, 1B, 2A. Dorsal region of head and body with slight reddish flush, ventral region cream. Snout tip reddish in males, pale red in females, lips black, eye black. Body with 4 broad black bars (up to 5 scales across), second and third bars obviously curved posteriorly; first one running through eye, second through pelvic-fin origin, third through posterior base of dorsal-fin origin down to anal-fin origin, fourth at base of caudal fin. All 4 black bars flushed with greenish iridescence. All body scales with anterior $\frac{1}{4}$ to $\frac{1}{3}$ with melanophores. Anterior base of dorsal-fin red, nearly $\frac{5}{6}$ black, suffused with reddish pigmentation, posterior sub-margin bright red with hyaline edge. Caudal fin hyaline, with suffused red on upper and lower lobes. Base of anterior part of anal-fin black with some red in males, rest

hyaline. Base of anterior part of pelvic-fins black, rest red. Pectoral fins yellowish, suffused with red.

Preserved colouration. — See Fig. 2B–D. As described above, except all red colour on body faded, replaced with cream. All red in the fins faded, leaving whitish fins. Black bars without iridescence. Juvenile with similar colour pattern, but less intense colouration; and black bar on dorsal fin is narrower (Fig. 2D).

Field notes. — The clear-water stream habitat consisted of several small series of riffles and deeper pools, on a substratum of sand, gravel and rocks (Fig. 3). There was overhanging bank vegetation and submerged leaf litter, which provided refuge and forage for some fish species. The width of the stream did not exceed 5 m, with water depth from 10 cm to about 1 m deep, pH 6.0. Syntopic fishes include: Cyprinidae – *Barbonymus collingwoodi*, *Crossocheilus cobitis*, *Garra borneensis*, *Hampala bimaculata*, *Mystacoleucus marginatus*, *Osteochilus waandersii*, *Paracrossochilus acerus*, *Rasbora elegans*, *R. sarawakensis*, *Systomus banksi*, *S. kuchingensis*, *Tor* sp.; Balitoridae – *Gastromyzon* cf. *praestans*, *Homaloptera nebulosa*, *H. stephensoni*; Cobitidae – *Pangio* cf. *shelfordii*; Bagridae – *Hemibagrus bongan*, *Leiocassis micropogon*;

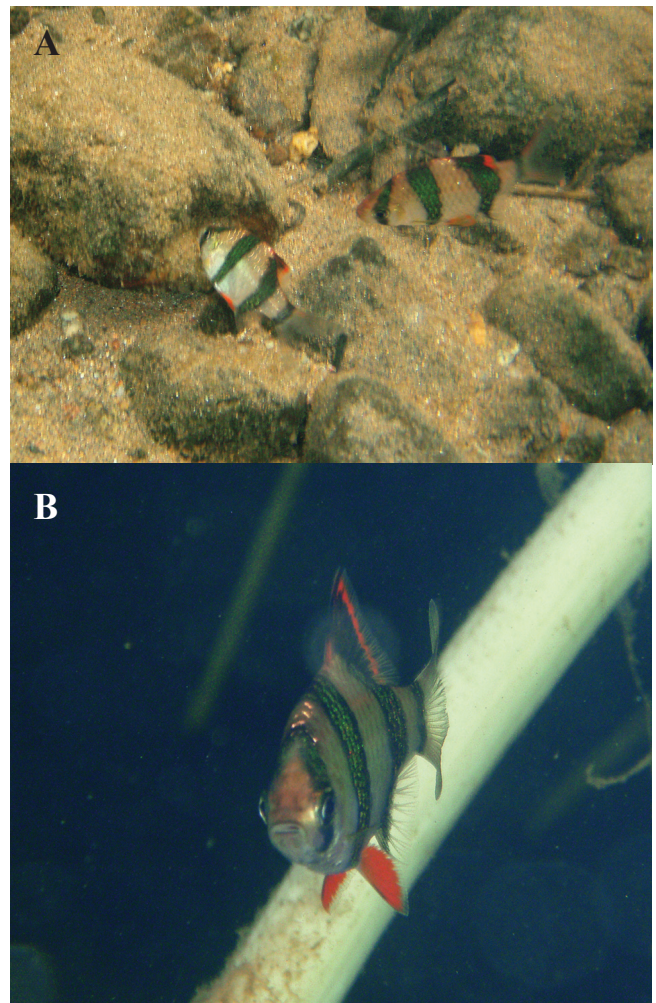


Fig. 1. *Systomus navjotsodhii*: A, a pair near the rocky substratum; B, male near submerged river bank vegetation. In-situ photographs in type location, a hill stream habitat (Aug. 2007).

Sisoridae – *Glyptothorax major*; Belontiidae – *Xenentodon canciloides*; Channidae – *Channa lucius*; Mastacembelidae – *Macrognathus maculatus*, *Mastacembelus unicolor*.

Distribution. — *Systomus navjotsodhii* is currently only known from both the upper Katingan and Barito river basins in Central Kalimantan, Borneo (Fig. 4).



Fig. 2. *Systomus navjotsodhii*: A, MZB 17198, holotype, 41.7 mm SL, life colour; B, ZRC 52509, 47.8 mm SL male; C, ZRC 52509, 42.4 mm SL female; D, ZRC 52509, 21.1 mm SL juvenile; Kalimantan Tengah: Katingan.



Fig. 3. Hill stream habitat (type locality, 00°44.91'S, 112°15.85'E) of *Systomus navjotsodhii* (Aug.2007).



Fig. 4. Map of Borneo showing distribution of *Systomus navjotsodhii* (solid circle for type locality, hollow circle for other locality).

Etymology. — Named after the late Professor Navjot S. Sodhi (1962–2011), for his inputs to conservation and ecological research in Southeast Asia, also for his considerable contributions and services to the editorship of the Raffles Bulletin of Zoology (as Editor-in-Chief from 1996 to 2001, Associate Editor from 2001 to 2005, and Editorial Board member from 2006 to 2011).

Discussion. — *Systomus navjotsodhii* belongs to the group of tiger barbs with a rhomboidal body, which include *S. anchisporus* (Fig. 5A), *S. partipentazona* (Fig. 5B), *S. pulcher* (Fig. 5C), and *S. tetrazona* (Fig. 5D). These are unlike the tiger barbs with an elongated body form, viz. *S. endecanalis*, *S. foerschi*, *S. hexazona*, *S. pentazona*, and *S. rhombozellatus*. This former (rhomboid) group possesses a unique colour pattern, consisting of four or five black bars, with a dorsal fin with black pigmentation; whereas the group with the elongate body has five or six black bars, with a hyaline dorsal fin.

Systomus navjotsodhii can be differentiated from the other rhomboidal-bodied tiger barbs by the following characters:

- The black bars on the body of *S. navjotsodhii* are posteriorly curved, as compared with the other rhomboid-body tiger barbs, where the body bars are more vertical.
- From *S. anchisporus* in having broader black bars on the body (5 scales wide, vs. $2\frac{1}{2}$); a blunter (vs. pointed) snout; 4–5 scales between mid-flank body bars (vs. 6–7); dorsal fin almost entirely black with only a narrow hyaline posterior margin (vs. half of dorsal fin with black pigment); fewer lateral scales (20–21, vs. 22–23); fewer pre- and post-dorsal scales on body dorsum (9, vs. 10); fewer transverse scales ($\frac{1}{2}$ 5.1.3 $\frac{1}{2}$, vs. $\frac{1}{2}$ 5.1.4 $\frac{1}{2}$); lesser preanal length (71.5–73.8, vs. 74.0–77.0 % SL); greater body depth (53.6–59.2, vs. 51.4–53.5 % SL); greater caudal-peduncle depth (18.4–19.9, vs. 17.0–17.5 % SL); longer dorsal-fin base (24.5–27.2, vs. 23.3–24.9 % SL); smaller orbit diameter (10.0–10.5, vs. 10.5–10.9 % SL); and longer snout (29.2–30.8, vs. 26.7–28.8 % HL).
- From *S. partipentazona* in having broader black bars on the body (5 scales wide, vs. $2\frac{1}{2}$); 4–5 scales between mid-flank body bars (vs. 7 or more); complete lateral line (vs. incomplete, ending at 8–9th lateral scale); dorsal fin almost entirely black with a narrow hyaline posterior margin (vs. anterior one-third of dorsal fin with black pigment); a continuous black bar from dorsal-fin base to anal-fin base (vs. interrupted bar); more pre- and post-dorsal scales on body dorsum (9, vs. 8); fewer transverse scales ($\frac{1}{2}$ 5.1.3 $\frac{1}{2}$, vs. $\frac{1}{2}$ 5.1.4 $\frac{1}{2}$); greater predorsal length (58.2–64.4, vs. 57.0–58.1 % SL); greater body depth (53.6–59.2, vs. 45.0–46.4 % SL); greater caudal-peduncle depth (18.4–19.9, vs. 16.4–17.8 % SL); longer dorsal-fin base (24.5–27.2, vs. 20.8–22.5 % SL); longer anal-fin base (18.7–20.1, vs. 13.4–14.9 % SL); and smaller orbit diameter (10.0–10.5, vs. 11.1–11.6 % SL; 31.4–33.8, vs. 35.1–35.6 % HL).
- From *S. pulcher* in having a larger adult size (maximum 47.8, vs. 27.4 mm SL); broader black bars on the body (5 scales wide, vs. $1\frac{1}{2}$); 4–5 scale between mid-flank body bars (vs. 7 or more); complete lateral line (vs.

incomplete, ending at 7–10th lateral scale); dorsal fin almost entirely black with a narrow hyaline posterior margin (vs. entirely black dorsal fin); anterior tip of anal fin black (vs. anterior half of anal fin black); anterior tip of pelvic fins black (vs. entirely black pelvic fins); more lateral scales (20–21, vs. 18–19); fewer transverse scales ($\frac{1}{2}$ 5.1.3 $\frac{1}{2}$, vs. $\frac{1}{2}$ 5.1.4 $\frac{1}{2}$); greater trunk length



Fig. 5. A, *Systomus anchisporus* – ZRC 38795, 39.6 mm SL, West Kalimantan: Kapuas; B, *Systomus partipentazona*, ZRC 40853, 26.8 mm SL, Thailand: Trat Province; C, *Systomus pulcher* – ZRC 52503, 25.9 mm SL male, East Kalimantan: Mahakam; D, *Systomus tetrazona* – ZRC 42336, 24.0 mm SL male, Sumatra: Batang Hari.

(69.0–72.1, vs. 65.8–66.5 mm SL); shorter head (head length 30.7–33.2, vs. 34.3–35.0% SL); greater body depth (53.6–59.2, vs. 42.9–44.2% SL); greater caudal peduncle depth (18.4–19.9, vs. 16.5–16.9% SL); longer dorsal-fin base (24.5–27.2, vs. 21.9–24.2% SL); longer anal-fin base (18.7–20.1, vs. 16.1–18.5% SL); lesser postorbital length (12.9–13.8, vs. 14.3–14.6% SL); smaller orbit diameter (10.0–10.5, vs. 11.3–12.0% SL); longer snout (snout length 29.2–30.8, vs. 24.7–27.8% HL); and greater interorbital width (37.7–42.3, vs. 34.9–37.0% HL).

- From *S. tetrazona* in having broader black bars on the body (5 scales wide, vs. 2 ½); 4–5 scale in between mid-flank body bars (vs. 7); complete lateral line (vs. incomplete, ending at 7–12th lateral scale); anterior tip of pelvic fins black (vs. anterior half black); fewer transverse scales (½ 5.1.3 ½, vs. ½ 5.1.4 ½); greater body depth (53.6–59.2, vs. 44.5–49.9% SL); greater caudal peduncle depth (18.4–19.9, vs. 15.5–16.2% SL); longer dorsal-fin base (24.5–27.2, vs. 21.1–23.8% SL); lesser postorbital length (12.9–13.8, vs. 13.9–14.7% SL); smaller orbit diameter (10.0–10.5, vs. 11.2–11.4% SL; 31.4–33.8, vs. 35.0–37.3% HL); and greater interorbital width (12.1–14.0, vs. 10.9–11.4% SL; 37.7–42.3, vs. 34.0–36.3% HL).

Comparative material examined. — Please refer to Kottelat & Tan (2011) for a detailed list of comparative material. Additional material examined in the present study as follows:

Systemus anchisporus: Kapuas drainage: CMK 6846, 10101, 10102, 11644, 11681. ZRC 38821, 5, 30.4–35.8 mm SL; Kalimantan Barat : Kapuas basin; Sungai Lanjak in Lanjak and Sungai Lanjak Deras 1-km east of Lanjak; M. Kottelat, 11 Jun.1995. ZRC 52523, 6, 18.4–24.6 mm SL; Kalimantan Tengah : Kotawaringin basin; Arut River, opposite bank facing Hotel Abadi, Pangkalan Bun; H. H. Tan et al., 11 Mar.2008.

Systemus pulcher: Mahakam drainage: CMK 7610, 1, 22.1 mm SL; Kalimantan Timur: Mahakam river at Muara Kaman, 0°14'S, 115°44'E; M. Kottelat, 31 Jul.1991. CMK 7657, 1, 21.8 mm SL; Kalimantan Timur: Mahakam basin: submerged trees downriver of Banjut, 0°17'S, 115°55'E; M. Kottelat, 1 Aug.1991. CMK 7680, 1, 26.9 mm SL; Kalimantan Timur: Mahakam river at Melak, 0°14'S, 115°44'E; M. Kottelat, 2 Aug.1991.

Systemus tetrazona: Batang Hari drainage: ZRC 38578, 4, 13.3–22.2 mm SL; Sumatra: Jambi, Danau Kaming near Kampung Transos; M. Kottelat & H. H. Tan, 31 May 1994. ZRC 38659, 2, 19.0–28.6 mm SL; Sumatra: Jambi, Batang Hari near Tanjung Johor; M. Kottelat, 5 Jun.1994.

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