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Schistura shuensis, a new species of loach from Myanmar (Teleostei: Nemacheilidae)

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Schistura shuensis, new species, is described from Shu stream on the eastern slope of the Rakhine range in Myanmar. It reaches up to 39.1 mm SL and is diagnosed by a combination of the following characters: males with suborbital flap, bearing tubercles on its posterior part, females with suborbital groove; caudal fin deeply forked (mean length of median caudal-fin rays 57 % of length of upper caudal lobe); caudal peduncle shallow (depth 11–12 % SL and 49–63 % of body depth); and presence of 6–9 indistinct dark brown bars on body.

Introduction

The genus *Schistura* presently consists of 196 species (Kottelat, 2012a) and is the largest genus among loaches, with a large variation of morphologically dissimilar species. New species of *Schistura* are still regularly described (e.g. Bohlen & Šlechtová, 2009, 2011, 2013; Bohlen et al., 2014; Kottelat & Leisher, 2012; Lalramliana, 2012; Lokeshwor & Vishwanath, 2012; Ou et al., 2011; Plongsesthee et al., 2011; Zheng et al., 2012) whenever material from formerly unsampled areas is examined, indicating that the diversity of the genus is even larger. A recent collection in Myanmar revealed a new species of *Schistura* described in the present study.

Material and methods

The specimens were fixed in 10 % formalin and later transferred to 70 % ethanol for storage. All measurements and counts follow Kottelat (1990). Measurements were made point-to-point with dial callipers to the nearest 0.1 mm. Collection abbreviations used: CMK, Collection of Maurice Kottelat, Cornol; IAPG, Institute of Animal Physiology and Genetics, Laboratory of Fish Genetics, Liběchov; ZRC, Zoological Reference Collection, Raffles Museum of Biodiversity Research, Department of Biological Sciences, National University of Singapore, Singapore.

Schistura shuensis, new species

(Figs. 1–2)

Holotype. ZRC 54186, 34.4 mm SL, male; Myanmar: Magway devision: Shu Chaung [chaung = stream] at bridge of Pathein-Monywa highway; 19°09.395' N 94°47.835' E; J. Bohlen, 18 Nov 2011.

Paratypes. ZRC 54187, 5, 30.8–39.1 mm SL; CMK 23959, 2, 33.7–36.8 mm SL; same data as holotype.

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Fig. 1. *Schistura shuensis*, ZRC 54187, paratype, 39.1 mm SL; Myanmar: Magway division: Shu Chaung, shortly after capture.

Diagnosis. *Schistura shuensis* is distinguished from all other species of *Schistura* except *S. hypsiura* by adult males having a suborbital flap and adult females a suborbital groove. *Schistura shuensis* differs from *S. hypsiura* by having a more slender caudal peduncle, less than ⅔ of body depth (vs. caudal peduncle depth about same as body depth). It further differs from all other species of *Schistura* by a combination of the following characters: caudal fin deeply forked (length of median ray 53–58 % of length of upper lobe) length of median rays 53–58 % of length of upper lobe); caudal peduncle slender (depth 11–12 % SL and 49–63 % of body depth); and presence of 6–9 indistinct dark brown bars on body.

Description. See Figures 1 and 2 for general appearance and Table 1 for morphometric data of holotype and 7 paratypes. A small (largest known specimen 39.1 mm SL) nemacheilid loach with moderately elongated body (depth 4.3–5.3 times in SL). Body slightly compressed, caudal peduncle compressed. Maximum body depth at dorsal-fin origin. Head slightly depressed. Snout rounded in lateral and dorsal view. Width of head constantly increasing from level of mouth backwards. Depth of caudal peduncle 0.8–1.0 times in its length. Axillary pelvic lobe present and free. A very small adipose crest on posterior third of dorsal and ventral midline of caudal peduncle.

Dorsal fin with 4 simple and 9½ branched rays. Distal margin of dorsal fin slightly concave. Anal fin with 3 simple and 5½ branched rays, not reaching caudal-fin base. Caudal fin with 9+8 branched rays, deeply emarginated (length of median ray 53–58 % of length of upper lobe), lobes pointed. Pelvic fin with 8 rays; origin under first or second branched dorsal-fin ray; reaching distinctly beyond half of distance to anal-fin origin; usually just reaching anus, which is situated about one eye diameter in front of anal fin. Pectoral fin with 10 or 11 rays, exceeding half of distance between bases of pectoral and pelvic fins.

Body (except belly) covered by very small scales. Lateral line complete, reaching to base of caudal fin, with 73–80 pores. Cephalic lateral line system with 6 supraorbital, 3+8 infraorbital, 8 pre-operculo-mandibular and 3 supratemporal pores. Lips and barbels covered with unculi.

Anterior nostril pierced in front side of a flap-like tube, with a low anterior rim. Eyes moderately large (4.5–4.9 times in lateral head length), directed sidewards and slightly upwards, eye diameter 1.2–1.3 times in interorbital width. Mouth gape about 2 times wider than long (Fig. 3). Processus dentiformis wide, very low, broadly rounded. Slight notch in lower jaw. Lips thick; upper lip with a well-marked median incision and numerous small furrows. Lower lip with a broad median interruption and few small folds on both sides of median interruption. Inner rostral barbel reaching corner of mouth, outer barbel reaching vertical through posterior rim of pupil, maxillary barbel reaching well behind vertical through posterior rim of eye.

Sexual dimorphism. Males with a short, broad, round suborbital flap; posterior third or half of flap and posterior margin bearing about 10–30 spiny tubercles (Fig. 4a). Tubercles present in all examined males, regardless of size [no information about seasonality of tubercles]. Females with suborbital slit in approximately same position as posterior margin of suborbital flap is in males (Fig. 4b). In males, whole head (except ventral side) and dorsal side of first two pectoral-fin rays

Fig. 2. *Schistura shuensis*; Myanmar: Magway division: Shu Chaung. **a–b,** ZRC 54186, holotype, male, 34.4 mm SL; **c–e,** ZRC 54187, paratypes; **c,** female, 39.1 mm; **d,** female, 36.5 mm SL; **e,** male, 33.7 mm SL.

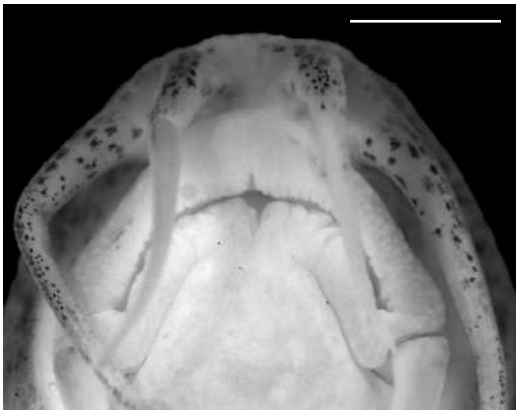

Fig. 3. *Schistura shuensis*, ZRC 54186, holotype, 34.4 mm SL, male; mouth. Scale bar 1 mm.

covered with small tubercles, which are very scarce in females. Tubercles resembling seasonal spawning tubercles in many Cyprinidae [no information available about seasonality of tubercles in *S. shuensis*].

Colouration. Ground colour in preserved specimens light beige. Head with indistinct black stripe from snout to eye and indistinct dark brown blotches on opercle, on top of head and between eyes. Body with 6 to 9, most frequently 7 or 8, dark brown bars, reaching ventrally usually until lateral midline, wider than interspaces, usually widening at dorsum into a saddle. Often a dark brown stripe along lateral midline, blurring bars. Bars and all other pigmentation elements very faint and often hard to discern. Base of caudal fin with 2 black blotches, upper one comma-shaped, stretching from dorsal midline to base of second branched fin ray from top; lower blotch round or oval, stretching across base of all branched fin rays of lower caudal-fin lobe, usually connected with posterior end of lateral stripe. Nearly no pigmentation between and anterior of

Table 1. Morphometric data of holotype and 7 paratypes of *Schistura shuensis*. Range, mean and SD include holotype.

	holotype	range	mean	SD
SL (mm)	34.4	30.8–39.1		
In percentage of standard length				
Total length	132.3	128.0–132.3	129.5	1.5
Dorsal head length	22.4	20.3–22.8	21.7	0.7
Lateral head length	24.7	23.0–25.3	24.3	0.8
Predorsal length	51.5	49.0–54.0	51.7	1.5
Pre-pelvic length	54.7	54.0–58.5	55.9	1.6
Pre-anus length	73.8	72.3–76.5	73.9	1.5
Preanal length	80.5	79.1–82.1	80.5	0.8
Head depth at eye	12.2	11.5–13.6	12.2	0.6
Head depth at nape	14.5	13.7–15.9	14.6	0.6
Body depth	19.8	17.5–23.0	20.2	1.6
Depth of caudal peduncle	11.6	10.6–11.9	11.2	0.4
Length of caudal peduncle	10.8	9.7–11.0	10.4	0.5
Snout length	9.9	8.9–11.4	9.7	0.7
Head width at nares	9.6	8.9–10.4	9.5	0.4
Maximum head width	14.8	14.8–17.1	15.8	0.8
Body width at dorsal-fin origin	13.7	12.0–17.9	14.8	1.9
Body width at anal-fin origin	7.0	6.5–7.6	7.0	0.4
Eye diameter	5.5	4.7–5.5	5.2	0.3
Interorbital width	6.4	6.0–6.8	6.3	0.2
Height of dorsal fin	17.2	14.9–19.6	17.2	1.2
Length of upper caudal-fin lobe	28.5	24.8–28.5	26.3	1.3
Length of median caudal-fin ray	15.1	14.0–15.4	14.7	0.6
Length of lower caudal-fin lobe	29.7	25.3–29.7	27.2	1.6
Depth of anal fin	18.6	16.9–18.6	17.4	0.5
Length of pelvic fin	18.0	16.3–18.7	17.9	0.8
Length of pectoral fin	20.3	20.3–24.7	22.3	1.5

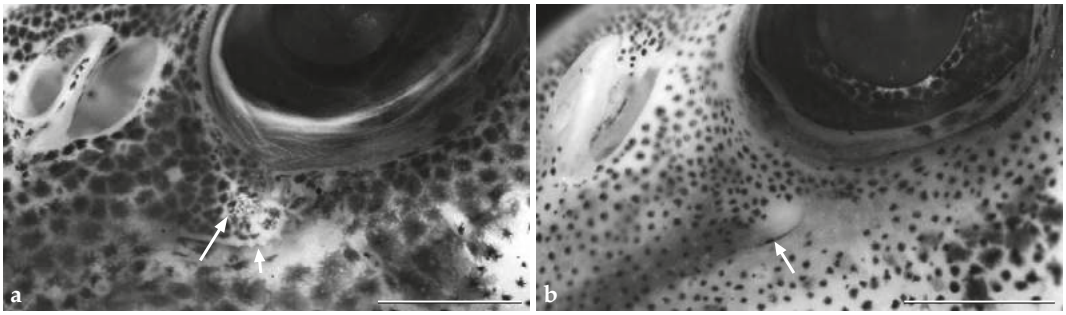

Fig. 4. *Schistura shuensis*, sexual dimorphism. **a,** ZRC 54186, holotype, 34.4 mm SL, male; showing suborbital flap (long arrow) bearing small tubercles (small arrows); **b,** ZRC 54187, paratype, 39.5 mm SL, female with suborbital slit (arrow). Scale bars 1 mm.

both blotches, making area lighter than rest of background colour.

Each branched dorsal-fin ray with very small dark brown spot just under first branching point; together forming row of brown spots through fin; interradial membranes hyaline. Caudal fin with diffuse black pigmentation on proximal third of uppermost and lowermost branched rays. Other fins hyaline.

Distribution. *Schistura shuensis* is presently known only from the type locality, the Shu Chaung, a right-side tributary of Maton Chaung, draining via Pani Chaun into the Irrawaddy River.

Etymology. The specific name referring to the Shu Chaung, the type locality of the species. An adjective.

Remarks. Using the identification key to genera in the most comprehensive study about Indochinese nemacheilid loaches (viz. Kottelat, 1990), *S. shuensis* is identified as a member of the genus *Schistura* because of its nearly smooth lips, with a median interruption in the lower lip, but without triangular pads, strongly arched mouth with processus dentiformis and notched lower jaw, posterior position of anus shortly before anal-fin origin and nares closely set.

The most conspicuous character of *S. shuensis* is the presence of a suborbital slit in mature females. While sexual dimorphic feature are widespread among Nemacheilidae and include suborbital flaps (in the genera *Acanthocobitis*, *Mesonoemacheilus*, *Nemacheilus*, *Neonoemacheilus*, *Oxynoemacheilus*, *Physoschistura*, *Schistura* and others), thickened rays in pectoral fins (e. g. *Acanthocobitis*, *Barbatula*, *Physoschistura*), extensions of branched pectoral-fin rays *(Pteronemacheilus)*, tubercles on head (e. g. *Nemacheilus*, *Triplophysa*) and pigmentation patterns (e. g. *Lefua*, *Petruichthys*, *Pteronemacheilus*), the modified state is nearly exclusively expressed in males, while female and juvenile specimens do not develop any specific structures. Up to now, *Acanthocobitis pictilis*, *Neonoemacheilus labeosus*, *N. peguensis* and *Schistura hypsiura* are the only members of Nemacheilidae in which adult females exhibit a special structure and possess a suborbital groove (Kottelat, 1990, 2012b; Bohlen et al., 2014; pers. obs.). *Schistura shuensis* differs from *A. pictilis* by males having a suborbital flap (vs. suborbital slit), by having lips with moderate furrows (vs. strongly papillated) and dorsal fin with 9½ (vs. 12½ or 13½) branched rays. Both species of *Neonoemacheilus* can be separated from *S. shuensis* by having hypertrophied lips forming a preoral cavity (vs. moderately thick, not forming preoral cavity). *Schistura shuensis* is distinguished from *S. hypsiura* by having the depth of the caudal peduncle significantly less than the body depth at the origin of the dorsal fin (vs. about identical), 9½ branched rays in dorsal fin (vs. 8½), a faint pigmentation pattern (vs. clear and distinct pattern) and the suborbital flap in males bears tubercles (vs. smooth).

Schistura shuensis is further differentiated from all other species of *Schistura* by a combination of the following characters: caudal fin deeply forked (length of median rays 53–58 % of length of upper lobe), caudal peduncle slender (depth 11–12 % SL and 49–63 % of body depth) and 6–9 faint dark brown bars on the body.

A deeply forked caudal fin is also present in *Schistura bella* (length of median rays 61–68 % of length of upper lobe), *S. callidora* (60–68 %), *S. maepaiensis* (64–68 %), *S. mahnerti* (66–68 %), *S. sikmaiensis* (64 %) and *S. yersini* (64–69 %). In all these species the caudal fin is less deeply forked than in *S. shuensis*. Only three species, *S. hypsiura* (41–52 %), *S. thanho* (55–69 %) and *S. udomritthiruji* (53–70 %) have a caudal fin forked to the same extant as *S. shuensis* (53–58 %). The differences between *S. shuensis* and *S. hypsiura* have been listed above. *Schistura shuensis* differs from *S. thanho* by having a shorter caudal peduncle (10–11 % SL vs. 14–17), a greater pre-pelvic length (54–59 % SL vs. 49–52), a very faint pigmentation pattern (vs. conspicuously contrasting) and the black bar at the base of the caudal fin dissociated (vs. continuous bar). *Schistura shuensis* differs from *S. udomritthiruji* by having all bars on body of similar width (vs. predorsal bars much narrower than posterior ones), lateral line reaching to base of caudal fin (vs. ending before end of anal-fin base), scales present on the predorsal area (vs. absent) and a shorter caudal peduncle (10–11 % SL vs. 12–14).

Schistura shuensis shares with *S. prashadi* from Manipur the presence of tubercles on the suborbital flap of males (Kottelat 1990), but differs from it in having bars on the body reaching from dorsal midline to at least lateral midline (vs. blotches along dorsal midline not connected with those along lateral midline), a deeply forked caudal fin (length of median rays 53–58 % of length of upper lobe vs. 72–73), fewer pores in the cephalic lateral line system (6 supraorbital, 3 + 8 infraorbital and 8 pre-operculo-mandibular vs, 7, 4 + 10 and 9, respectably) and the presence of the suborbital slit in adult females (vs. not reported).

Comparative material. *Neonoemacheilus labeosus*: IAPG A4853–4854, 2, 53.6–57.8 mm SL; Thailand: Tak province: Nam Moei.

Neonoemacheilus peguensis: IAPG A 6287–6289, 3, 49.3–55.1 mm SL; Myanmar: Magway division: River Pani.

Schistura bella: IAPG A 8342–8344, 3, 31.4–34.8 mm SL; Thailand: Chiang Mai province: Nam Fang.

Schistura callidora: ZRC 52037, ZRC 52037, 5, 35.8–41.5 mm SL; Myanmar: Shan state: Nam Paw.

Schistura maepaiensis: IAPG A7309–7318, 10, 40.8–52.1 mm SL; Thailand: Mae Hong Son province: Nam La Ka.

Schistura mahnerti: IAPG 4850–4852, 3, 42.6–54.5 mm SL; Thailand: Tak province: Nam Moei.

Schistura thanho: IAPG A3472, 1, 70.5 mm SL; IAPG A3310–3319, 10, 26.3–36.7 mm SL; Vietnam: Binh Dinh province: river Vinh Thanh.

Schistura udomritthiruji: ZRC 51724, ZRC 51725, 35, 24.4–47.8 mm SL; Thailand: Ranong province: river Kra.

Schistura yersini: IAPG A3512–3515, 4, 49.9–57.2 mm SL; Vietnam: Lam Dong province: river Dong Nai. – IAPG A3460, 1, 64.7 mm SL; Vietnam: Lam Dong prov.: River Dai Tan.

Data for other species taken from Bohlen et al., 2014, Bohlen & Šlechtová, 2009, 2011, 2013a, 2013b; Freyhof & Serov, 2001; Kottelat, 1990, 1998, 2000; Kottelat & Leisher, 2012; Lalramliana, 2012; Lokeshwor & Vishwanath, 2012; Menon, 1987; Ou et al., 2011; Plongsesthee et al., 2011; Zheng et al. 2012; Zhu & Wang 1985.

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