

Two new species of *Schistura* from Myanmar (Teleostei: Nemacheilidae)

Jörg Bohlen* and Vendula Šlechtová*

Schistura rubrimaculata, new species, is described from two streams on the eastern slope of the Rakhine Range draining in Irrawaddy River. It reaches up to 27.7 mm SL and differs from all other species of *Schistura* by the presence of a distinct red dot above the midlateral line before the caudal-fin base (not visible in preserved specimens), a very slender body and a white ventral side below a broad black midlateral stripe; the dorsal side of the snout dark grey, and the anus located close to the anal-fin origin. *Schistura pawensis*, new species, shares with *S. rubrimaculata* the small size, slender body and general pigmentation pattern and is considered as closely related to *S. rubrimaculata*. *Schistura pawensis* differs from *S. rubrimaculata* in having fewer branched rays in caudal and dorsal fins, the anus at mid-distance between pelvic and anal fins, fewer pores in lateral line, the dorsal side of the snout white, and the red dot on the caudal peduncle smaller and less prominent.

Introduction

The loach genus *Schistura* is widespread across South and Southeast Asia and occurs in this area in nearly every stream. Up to now, about 193 species are considered as valid (Kottelat, 2012), most of them with a restricted area of distribution. Therefore new species are constantly described whenever material from formerly unexplored areas is inspected (Ou et al., 2011; Zheng et al., 2012; Plongsesthee et al., 2011; Kottelat & Leisher, 2012; Bohlen & Šlechtová 2009, 2011, 2013; Lokeshwor & Vishwanath, 2012). A recent collection in Myanmar revealed two new small-sized species of *Schistura* that are described below.

Material and methods

The specimens were either fixed in 4 % formaldehyde and later transferred into 70 % ethanol for storage (specimens deposited in ZRC and CMK) or fixed and stored in 96 % ethanol (specimens in IAPG). All measurements and counts follow Kottelat (1990). Measurements were made point-to-point with dial callipers to the nearest 0.1 mm. Collection abbreviations: 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.

* Institute of Animal Physiology and Genetics, Academy of Sciences of the Czech Republic, Rumburská 89, 277 21 Liběchov, Czech Republic. E-mail: bohlen@iapg.cas.cz



Fig. 1. *Schistura rubrimaculata*; ZRC 53774, paratype, 26.1 mm SL; Myanmar: Magway division: stream Man Chaung; shortly after capture. Right side, reversed.

Schistura rubrimaculata, new species
(Figs. 1–2)

Holotype. ZRC 53773, 26.2 mm SL, male; Myanmar: Magway division: stream Man Chaung about 10 km upstream of Datkon village; 19° 55.008' N 94° 30.104' E; J. Bohlen, 17 Nov 2011.

Paratypes. ZRC 53774, 15, 19.3–27.7 mm SL; CMK 23277, 5, 21.7–24.8 mm SL; IAPG A5904–5905, 2, 20.5–27.2 mm SL; same data as holotype. – ZRC 53775, 1, 19.2 mm SL; IAPG A66591, 15.9 mm SL; Myanmar: Magway division: stream Shwe Chaung at village Shwe Chaung; 19° 40.686' N 94° 41.698' E; J. Bohlen, 18 Nov 2011.

Diagnosis. *Schistura rubrimaculata* is distinguished from all other species of *Schistura* by a combination of the following characters: small size (largest known size 27.7 mm SL); slender body (maximum body depth 103–123 % of body depth at nape); ventral half of body and head white (with silver shine in life); body pigmentation composed of a prominent black midlateral stripe and up to six small dorsal saddles; all fins hyaline; dark blotch on base of central unbranched caudal-fin rays, with a median incision at its posterior margin; and a distinct red dot on the side of the caudal peduncle in life, fading when preserved.

Description. See Figures 1–2 for general appearance and Table 1 for morphometric data of holotype and 19 paratypes. A very small nemacheilid loach with strongly elongated body. Body round, caudal peduncle laterally compressed. Maximum

body depth at dorsal-fin origin. Width of head constantly increasing from level of mouth backwards. Depth of caudal peduncle 1.1–1.6 times in its length. A relatively large axillary pelvic lobe present and free. A very small adipose crest on posterior third of dorsal and ventral midline of caudal peduncle. Largest known size 27.7 mm SL.

Dorsal fin with 4 simple and 7½ or 8½ branched rays. Distal margin of dorsal fin straight. Anal fin with 3 simple and 5½ branched rays, not reaching caudal-fin base. Caudal fin with 9+8 branched rays, forked, lobes weakly pointed or round. Pelvic fin with 8 rays; origin under branched dorsal-fin rays 1–2; reaching slightly beyond half of distance to anal-fin origin; not reaching anus, which is about one eye diameter in front of anal-fin origin. Pectoral fin with 10 rays, reaching behind half of distance between bases of pectoral and pelvic fins.

Posterior half of body behind origin of dorsal fin covered by small scales, including belly. Few scales on body between vertical through dorsal-fin origin and halfway to head; arranged mainly along lateral line and dorsal midline. No scales between head and halfway to dorsal-fin origin. Lateral line complete, usually reaching to base of caudal fin, always reaching behind base of anal fin, with 70–83 pores. Cephalic lateral line system with 5 supraorbital, 4+10 infraorbital, 9 preoperculo-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. Mouth gape about 2.3 times wider than long (Fig. 3a). Processus dentiformis wide, low, broadly rounded. Lips



Fig. 2. *Schistura rubrimaculata*; Myanmar: Magway division: stream Man chaung. a- b, ZRC 53773, holotype, 26.2 mm SL; c, ZRC 53774, paratype, 26.9 mmSL; d, IAPG A5904, paratype, 27.2 mm SL.

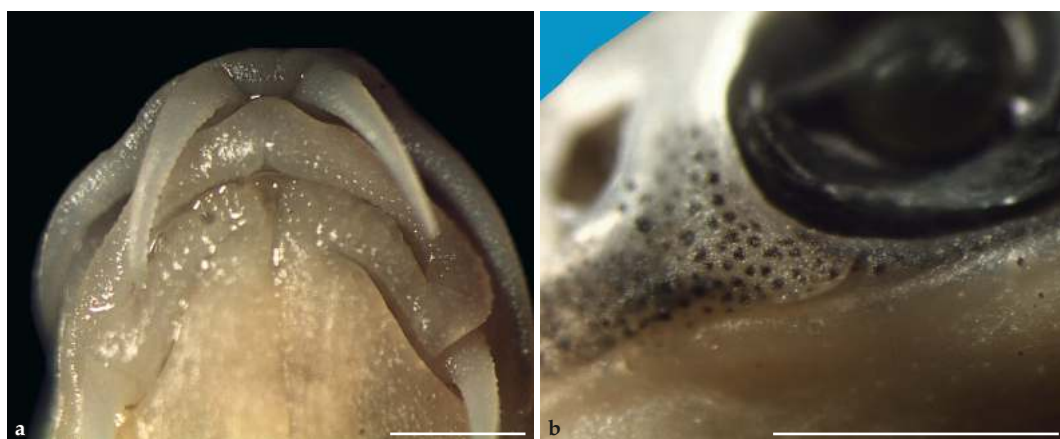


Fig. 3. *Schistura rubrimaculata*, ZRC 53773, holotype, 26.2 mm SL, male; a, mouth; b, lateral view of left side of head, showing suborbital flap. Scale bars 1 mm.

thick; upper lip with a well-marked median incision and no furrows. Lower lip with a broad median interruption and on each side 2–6 furrows. Inner rostral barbel reaching corner of mouth, outer one reaching behind base of maxillary barbel, maxillary barbel reaching behind vertical through middle of eye.

Sexual dimorphism. Males with a small roundish suborbital flap (Fig. 3b). Smallest specimen with suborbital flap 23.7 mm SL.

Colouration. In live and freshly preserved specimens, ventral half of body and head white with a silver glint. Dorsal half of body and head light brown. A prominent black stripe along midlateral line from end of opercle to base of caudal fin, width about same as eye diameter. Lateral stripe prolonged by a black blotch of similar width,

extending on base of branched caudal-fin rays 3 or 4 to 14 or 15; usually with an incision at its posterior margin, giving impression of a separation into two oval blotches. Dorsum either with up to 6 dark brown saddles, narrower than interspaces, broader than eye diameter, ventrally reaching midlateral stripe at least under dorsal-fin base, or with a narrow dark brown middorsal stripe, or a combination of stripe and saddles. Dorsal pigmentation always much fainter than midlateral stripe, in some specimens absent. A red blotch at base of caudal fin above midlateral stripe, as large as or larger than eye, with rectangular shape. Dorsal half of head from tip of snout to nape with black pigments, forming unclear blotches or bands. A black stripe from tip of snout to eye. Black pigment cells scattered on proximal $\frac{1}{5}$ of 5 lowermost branched rays in caudal fin, forming a faint grey blotch, not visible in some

Table 1. Morphometric data of holotype and 19 paratypes of *Schistura rubrimaculata*, and of holotype and 2 paratypes of *Schistura pawensis*. Range includes holotype.

	<i>S. rubrimaculata</i>				<i>S. pawensis</i>		
	holotype	range	mean	SD	holotype ZRC 53776	paratype ZRC 53777	paratype IAPG A5901
SL (mm)	25.8	19.0–27.8			31.3	24.5	25.2
In percents of standard length							
Total length	127.9	113.3–128.9	123.9	3.1	124.3	124.5	124.2
Dorsal head length	22.1	19.3–24.2	22.1	1.1	18.8	18.8	19.4
Lateral head length	23.3	20.4–26.3	23.7	1.5	20.1	20.8	20.2
Predorsal length	53.9	50.4–54.2	52.3	1.0	52.7	51.4	53.6
Pre-pelvic length	50.8	48.1–53.2	51.3	1.1	50.2	50.6	50.8
Pre-anus length	72.5	68.1–74.8	71.1	1.9	65.5	66.5	67.5
Preanal length	76.7	73.0–78.4	75.6	1.7	72.5	74.7	77.0
Head depth at eye	9.7	9.1–10.8	10.0	0.5	9.3	9.0	9.1
Head depth at nape	12.0	11.4–16.1	12.3	1.0	11.2	10.6	11.1
Body depth	14.0	12.9–14.7	13.7	0.5	13.1	12.2	11.9
Depth of caudal peduncle	10.1	8.7–10.9	10.0	0.5	9.3	8.6	8.7
Length of caudal peduncle	13.2	11.7–15.1	13.1	0.9	15.3	15.1	14.3
Snout length	7.8	7.2–9.4	8.4	0.6	8.6	8.2	7.9
Head width at nares	7.0	6.5–8.4	7.6	0.5	6.7	6.5	6.3
Maximum head width	13.6	12.6–14.2	13.5	0.4	11.8	11.4	11.9
Body width at dorsal origin	11.6	9.8–11.8	10.8	0.5	9.6	10.6	9.5
Body width at anal origin	7.0	5.7–7.6	6.5	0.5	6.4	6.9	5.2
Eye diameter	5.0	4.2–6.0	4.9	0.4	3.5	4.1	4.0
Interorbital width	6.6	5.3–6.9	6.2	0.4	5.4	5.3	5.2
Height of dorsal fin	19.0	17.3–21.7	19.4	1.0	19.2	17.6	17.5
Length of upper caudal lobe	24.8	21.6–25.3	23.6	1.0	20.4	20.0	20.6
Length of median caudal ray	20.2	17.4–21.3	19.2	1.2	16.0	15.9	17.5
Length of lower caudal lobe	25.6	22.5–26.1	24.5	1.0	20.8	20.8	21.4
Depth of anal fin	19.4	15.3–20.0	17.7	1.2	14.7	16.3	17.9
Length of pelvic fin	20.2	16.2–24.2	19.2	1.6	15.0	15.5	14.7
Length of pectoral fin	23.3	20.5–26.3	22.9	1.3	19.2	20.8	20.6

specimens. Other fins hyaline without pigmentation. In preserved specimens colour of ventral side of head and body changing to cream white or light brown and red blotch on caudal peduncle disappearing.

Habitat. The type locality is a stream up to 30 m wide with diverse structures (pool, riffle, cascade, gravelbed, shore, etc). Most specimens were collected in shallow (30–60 cm depth) water over a large bed of gravel overflowed by moderately swift water. At the time of sampling the water was clear.

Distribution. *Schistura rubrimaculata* is presently known from the Man Chaung and Shwe Chaung systems; two tributaries of the Irrawaddy River located on the eastern slope of the Rakhine Range.

Etymology. The name is derived from the latin words *ruber*, red, and *maculatus*, dotted, referring to the presence of a red dot on the caudal peduncle. An adjective.

Remarks. *Schistura rubrimaculata* differs from all other Nemacheilidae except *Schistura aizawlensis* by the presence of a distinct red blotch on the caudal peduncle, in life. While red colouration of the fins, especially the caudal fin, is widespread among Nemacheilidae and occurs in different genera (e.g. *Schistura vinciguerrae*, *S. yersini*, *S. personata*, *S. corruscans*, *Homatula variegata*, *Aborichthys elongatus*, *Traccatichthys taeniatus*, *Yunnanilus brevis*), red colour on the body is rare. Species of *Schistura* with red colouration on body include *S. vinciguerrae*, *S. nilgiriensis*, *S. robertsi* and *S. baltata*, but in all these cases the red colour is indistinctly distributed in certain areas of the body, not in the form of distinct blotches. To our knowledge, the recently described *S. aizawlensis* from northeastern India is the only other nemacheilid loach with a distinct red blotch on the body, and its blotch very much matches the one in *S. rubrimaculata* in size and position. Besides this rare character *S. aizawlensis* shares with *S. rubrimaculata* the small size (up to 48.9 mm SL), the general shape of the body and the presence of few (5–7) broad dark brown dorsal saddles, suggesting that *S. aizawlensis* and *S. rubrimaculata* might be closely related. *Schistura rubrimaculata* differs from *S. aizawlensis* by the presence (vs. absence) of a midlateral stripe, by the absence (vs.

presence) of a prominent black dot on the anterior base of the dorsal fin and by having 9 (vs. 8) pre-opercumandibular pores in the cephalic lateral line system.

Another striking character of *S. rubrimaculata* is the presence of a black midlateral stripe in combination with the silvery-white ventral side. Within the genus *Schistura*, a prominent black midlateral stripe is present in all or at least in some specimens of *S. melarancia*, *S. fusinotata*, *S. dorsizona*, *S. caudofurca* and *S. savona*, but only in *S. dorsizona* and *S. savona* the ventral side of the complete body has a similar shining white appearance in life as in *S. rubrimaculata*. *Schistura rubrimaculata* differs from *S. dorsizona* and *S. savona* by the uniformity of the pigmentation pattern: all specimens bear a midlateral stripe, while in *S. dorsizona* and *S. savona* the stripe is expressed only in a minority of specimens, while most specimens have dorsal saddles reaching to midlateral line, but no or only a very faint black stripe (Kottelat, 1998, 2001; Menon, 1987). *Schistura rubrimaculata* further differs from *S. dorsizona* and *S. savona* by the presence of a suborbital flap in adult males (vs. absent) and the presence of a distinct red dot on the caudal peduncle in life (vs. absent).

Schistura rubrimaculata differs additionally from striped specimens of *S. dorsizona* by having a complete lateral line (vs. incomplete, not reaching to vertical through anal-fin origin), a shorter caudal peduncle (12–15 % SL vs. 16–20 in *S. dorsizona*), a longer caudal fin (length of upper caudal-fin lobe 22–25 % SL vs. 19–20), a dark brown dorsal side of snout (vs. white) and a more deeply forked caudal fin (length of upper caudal-fin lobe/length of middle caudal-fin lobe 1.2–1.3 vs. 0.9–1.2 in *S. dorsizona*). *Schistura rubrimaculata* further differs from striped specimens of *S. savona* by having up to 6 dorsal saddles, narrower than interspaces (vs. 8–12, broader than interspaces).

Another nemacheilid species with an elongated cylindrical body, small body size, a prominent black midlateral stripe and a silvery-whitish ventral side of body is *Turcinoemacheilus kosswigi* from Turkey and western Iran (Bănărescu & Nalbant, 1995; Golzarianpour et al., 2009). The genus *Turcinoemacheilus* was originally diagnosed as completely scaleless, with a very short lateral line, the origin of the dorsal fin behind the origin of the pelvic fin, the posterior margin of the caudal fin slightly emarginate and the anus close behind the pelvic girdle (Bănărescu & Nalbant,



Fig. 4. *Schistura pawensis*; ZRC 53776, holotype, 31.3 mm SL; Myanmar: Shan State: Hsipaw; shortly after capture. Right side, reversed.

1964). These character states are observed in *T. kosswigi* as well as in an undescribed species from Iran, but the third known species, *T. himalaya*, has small scales on the posterior part of the body, the origin of the pelvic fin slightly before or under dorsal-fin origin and the lateral line reaching until end of dorsal-fin base (Convay et al., 2011). *Schistura rubrimaculata* differs from all three species of *Turcinoemacheilus* by having the anus about one eye diameter in front of anal-fin origin, a complete lateral line, the posterior margin of the caudal forked, the origin of the pelvic fin behind dorsal-fin origin and by the presence of a suborbital flap in adult males (vs. absence). *Schistura rubrimaculata* further differs from *T. kosswigi* and the undescribed species by having the posterior part of the body covered by scales and from *T. himalaya* by the black midlateral stripe (vs. dark bars or mottling along body sides).

Schistura rubrimaculata shares with *S. prolifasciata* from the Chinese Salween basin and *S. albirostris* from the Chinese Irrawaddy basin the slender body (Zheng et al., 2012; Chen & Neely, 2012). However, it differs from *S. prolifasciata* by having 9+8 branched caudal-fin rays (vs. 8+7), the anus located 1 eye diameter in front of anal-fin origin (vs. 2–3), eye diameter 4.2–6.0 % SL (vs. 3.4–3.9) and a midlateral black band (vs. broad bars reaching ventrally level of pelvic-fin origin). *Schistura rubrimaculata* differs from *S. albirostris* by having a complete lateral line with 70–83 pores (vs. incomplete with 27–51 pores), a dark brown dorsal side of snout (vs. unpigmented) and a suborbital flap in males (vs. absence). Moreover, both *S. prolifasciata* and *S. albirostris* lack the red blotch on the caudal peduncle that is visible in live *S. rubrimaculata*.

The general body shape of *S. rubrimaculata* is similar to that of *S. savona* and *S. aizawlensis*. These species overlap in all of the morphometric characters listed in Table 1.

Schistura pawensis, new species

(Figs. 4–5)

Holotype. ZRC 53776, 31.3 mm SL; Myanmar: Shan state: stream Nam Paw west of Hsipaw city; 22°37'40" N 97°18'17" E; J. Bohlen, 13 Nov 2011.

Paratypes. ZRC 53777, 1, 25.7 mm SL; IAPG A5901, 1, 25.4 mm SL; same data as holotype.

Diagnosis. *Schistura pawensis* is distinguished from all other species of *Schistura* by the combination of the following characters: body small (largest known size 31.3 mm SL) and slender (head depth at nape 1.1–1.2 times in body depth); all specimens with prominent black midlateral stripe; entire ventral side silvery-white; 6½ or 7½ branched dorsal-fin rays, 7–8+8 branched caudal-fin rays; and anus positioned halfway between pelvic-fin origin and anal-fin origin.

Description. See Figures 4–5 for general appearance and Table 1 for morphometric data. A very small nemacheilid loach with strongly elongated body. Body round, caudal peduncle laterally compressed. Dorsal outline straight. Maximum body depth at dorsal-fin origin. Width of head constantly increasing from level of mouth backwards. Depth of caudal peduncle 1.6–1.8 times in its length. A relatively large axillary pelvic lobe present and free. A very small adipose crest on



Fig. 5. *Schistura pavensis*, Myanmar: Shan State: Hsipaw. a- b, ZRC 53776, holotype, 31.3 mm SL; c, ZRC 53777, paratype, 25.7 mmSL; d, IAPG A5901, paratype, 25.4 mm SL.



Fig. 6. *Schistura pavensis*, ZRC 53776, holotype, 31.3 mm SL; mouth. Scale bar 1 mm.

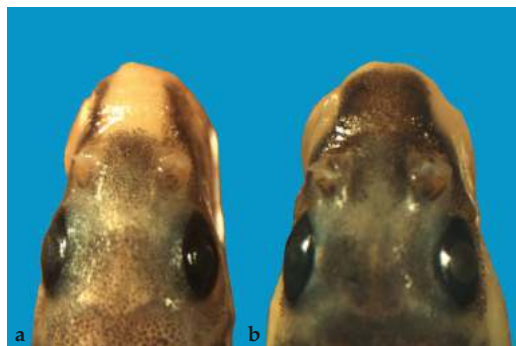


Fig. 7. Dorsal view of snout of: a, *Schistura pavensis*, showing white patch on snout in front of nostrils; and b, *S. rubrimaculata*, with a dark brown dorsal side of snout.

posterior third of dorsal and ventral midlines of caudal peduncle. Largest known size 31.3 mm SL.

Dorsal fin with 4 simple and $6\frac{1}{2}$ or $7\frac{1}{2}$ branched rays. Distal margin of dorsal fin straight. Anal fin with 3 simple and $5\frac{1}{2}$ branched rays, not reaching caudal-fin base. Caudal fin with 7–8+8 branched rays, forked, lobes round. Pelvic fin with 8 rays; origin under last unbranched dorsal-fin ray; reaching slightly beyond half of distance to anal-fin origin; reaching anus, which is situated about halfway between pelvic-fin origin and anal-fin origin. Pectoral fin with 10 rays, reaching behind half of distance between bases of pectoral and pelvic fins.

Posterior half of body behind origin of dorsal fin covered by small scales, including belly. No scales on body in front of dorsal-fin. Lateral line incomplete, ending either behind dorsal-fin base (ZRC 53776, IAPG A5901) or behind anal-fin origin (ZRC 53777), with 40–61 pores. Cephalic lateral line system with 5 supraorbital, 4+10 infraorbital, 9 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. Mouth gape about 2.3 times wider than long (Fig. 6). Processus dentiformis wide, low, broadly rounded. Lips thick; upper lip with a well-marked median incision and no furrows. Lower lip with a broad median interruption and on each side 2–6 furrows. Inner rostral barbel reaching corner of mouth, outer one reaching behind vertical through anterior margin of eye, maxillary barbel reaching behind vertical through middle of eye.

Sexual dimorphism. Not known.

Colouration. In live and freshly preserved specimens, ventral half of body and head white with a silver glint. Dorsal half of body and head light brown. A prominent black stripe along midlateral line starting shortly behind eye and ending on caudal fin. Lateral stripe prolonged by a black blotch of about $\frac{2}{3}$ of width of lateral stripe on base of branched caudal-fin rays 7 or 8 to 14 or 15, without prominent incision of posterior margin; extending onto lower lobe of caudal fin. Dorsum with 6 or 7 dark brown saddles, broader than interspaces and broader than eye diameter, ventrally reaching midlateral stripe. Largest specimen with uniformly brown pigmentation

on dorsal half of body, with only faint outline of four round dorsal saddles between dorsal-fin base and caudal-fin base. Dorsal pigmentation fainter than midlateral stripe. A very weak red blotch at base of caudal-fin above midlateral stripe, not clearly delimited; disappearing in preserved specimens. Dorsal half of head dark brown, only a squarish white area on dorsal side of snout before nostrils (Fig. 7a). Caudal fin with a black mark on proximal $\frac{1}{4}$ of upper unbranched and 3–4 unbranched rays. Dorsal fin with very faint black markings on last unbranched and all branched fin-rays. Remaining fins hyaline.

Habitat. The type locality is the mouth of Nam Paw, a shallow, but up to 50 m wide stream with diverse structures (pools, riffles, gravelbed, sandy shore, etc). The specimens were collected in shallow (30–60 cm depth) water above gravel with moderately fast flowing water. At the time of sampling the water was clear.

Distribution. *Schistura pawensis* is presently known only from the type locality, the confluence of Nam Paw into the Myitnge River, a left tributary of Irrawaddy River. It is expected to have a wider distribution in the Myitnge system.

Etymology. The name is derived from the Nam Paw stream, the first place where the species has been observed. An adjective.

Remarks. *Schistura pawensis* differs from all other species of *Schistura* except *S. rubrimaculata* and the occasionally occurring striped specimens of *S. savona* and *S. dorsizona* by its pigmentation pattern consisting of a dark brown midlateral stripe, 6–7 dorsal saddles and a silvery white ventral side of body and head. *Schistura pawensis* differs from striped specimens of *S. savona* by having 6 or 7 dorsal saddles (vs. 8–12); the anus halfway between the origins of the pelvic and anal fins (vs. 1 eye diameter in front of anal-fin origin); by a longer caudal peduncle (14–15 % SL vs. 11–13) and fewer branched rays in dorsal fin ($6\frac{1}{2}$ or $7\frac{1}{2}$ vs. $8\frac{1}{2}$ or $9\frac{1}{2}$) and caudal fin (7–8+8 vs. 9+8). *Schistura pawensis* differs from striped specimens of *S. dorsizona* by having a shorter caudal peduncle (14–15 % SL vs. 16–17), 6–7 dorsal saddles (vs. 6–11) and the anus halfway between the origins of pelvic and anal fins (vs. 1 eye diameter in front of anal-fin origin). *Schistura pawensis* is most similar to *S. rubrimaculata*, but

differs in having the anus halfway between the origins of pelvic and anal fins (vs. 1 eye diameter in front of anal-fin origin); a squarish white area on dorsal side of snout (vs. dorsal side of snout dark brown); fewer branched rays in dorsal and caudal fin ($6\frac{1}{2}$ or $7\frac{1}{2}$ vs. $8\frac{1}{2}$ and $7-8+8$ vs. $9+8$, respectively), 40–61 pores in the lateral line (vs. 70–83), the dark blotch at the base of the caudal fin without incision at posterior margin (vs. with incision), and a narrower head (maximum head width 11–12 % SL vs. 13–14).

Schistura albirostris shares with *S. pawensis* the white dorsal side of snout, the slender body, the small size (up to 41.9 mm SL), the incomplete lateral line and the presence of 5–7 dark brown saddles (Chen & Neely, 2012). *Schistura pawensis* differs from *S. albirostris* by having the anus halfway between the origins of pelvic and anal fins (vs. immediately in front of anal-fin origin), a distinct midlateral stripe (vs. faint and narrow), and a faint red blotch on caudal peduncle visible in live specimens.

Schistura prolixifasciata shares with *S. pawensis* the small size (up to 44.5 mm SL), the slender body (body depth 12.3–14.5 % SL) and few brown bars (4–7). *Schistura pawensis* is distinguished from *S. prolixifasciata* by having the dorsal side of snout white (vs. brown), the presence of a distinct midlateral stripe (vs. absence), an incomplete lateral line (vs. complete), and the bars not reaching below lateral midline (vs. reaching to level of pelvic-fin origin).

The recently described *S. aizawlensis* shares with *S. pawensis* the presence of a red blotch on the caudal peduncle, the small size (up to 48.9 mm SL), the general shape of the body and the presence of few (5–7) broad dark brown dorsal saddles. *Schistura pawensis* differs from *S. aizawlensis* by the presence of a midlateral line (vs. absence), the anus halfway between the origins of pelvic and anal fins (vs. 1 eye diameter in front of anal-fin origin), a squarish white area on dorsal side of snout (vs. dorsal side of snout dark brown), an incomplete lateral line (vs. complete), and fewer branched rays in the caudal fin ($7-8+8$ vs. $9+8$, respectively).

Schistura pawensis shares with all three known species of *Turcinoemacheilus* the small size, the elongated cylindrical body and the shining silvery-white colour of the ventral body. It further shares with *T. kosswigi* and an undescribed species from Iran the black midlateral stripe. However, *S. pawensis* differs from all three species of *Turci-*

noemacheilus by having the caudal fin forked (vs. slightly emarginate), the anus about mid-distance between pelvic fin and anal-fin origins (vs. closely behind pelvic fin base), and the origin of the pelvic fin behind the origin of the dorsal fin (vs. before or under the origin of the dorsal fin). It further differs from *T. kosswigi* and the undescribed species from Iran by having scales on the posterior half of the body (vs. entirely scaleless) and the lateral line reaching behind the base of the dorsal fin (vs. at most to dorsal-fin origin). It differs from *T. himalaya* by having a black midlateral stripe (vs. dark bars or mottling along body sides) and fewer branched caudal-fin rays ($7-8+8$ vs. $9+8$, respectively).

Discussion

The genus *Schistura* is presently defined by the combination of the following characters: moderately arched mouth; lower lip with a median interruption, but not forming two lateral triangular pads; colour pattern usually with more or less regular bars and a black bar at base of caudal fin; dorsal fin with one or two black marks along its base; no acuminate scales on caudal peduncle; median notch in lower jaw present or not; caudal fin usually emarginate; and sexual dimorphism present or not (Kottelat, 1990). Both new species fit to this definition and consequently have been placed in *Schistura*. However, the genus *Schistura* includes species that are morphologically quite different and has been considered as an artificial assemblage by Kottelat (1990) and Bănărescu & Nalbant (1995). A review of the genus most likely would split *Schistura* into several genera, but until such review is available, we consider *S. rubrimaculata* and *S. pawensis* as members of *Schistura*. The genus contains already other species that are very similar to *S. rubrimaculata* and *S. pawensis*, e.g. *S. savona*, *S. dorsizona* and *S. aizawlensis*, which share with *S. rubrimaculata* and *S. pawensis* the small size, the slender body, hyaline fins, the conspicuous silver-white ventral side of body and head and a comparably simple dark pigmentation composed of few bars and a broad midlateral stripe. The two new species share with *S. aizawlensis* the presence of a red or orange blotch on the caudal peduncle, a character not known from any other species of Nemacheilidae. We interpret the presence of this rare character in all three species as indicator of a close relation.

Comparative material. *Schistura savona*: IAPG A0468, 1, 22.9 mm SL; ornamental fish trade. – IAPG A 3440, 1, 26.2 mm SL; Nepal: Mechi River system. – IAPG A3962–3971, 7, 23.1–31.0 mm SL; India: West Bengal: Rydak I River. *S. dorsizona*: CMK 21522, 1, 32.8 mm SL; Laos: Sekong: River Xe Nam Noy.

Turcinoemacheilus kosswigi: IAPG A0439, 1, 38.3 mm SL; Turkey: Erzincan: River Karasu. – IAPG A2089, 1, 40.4 mm SL; Turkey: Diyarbakir: creek at Bismil.

Data about other species taken from Chen & Neely (2012), Conway et al. (2011), Golzarianpour et al. (2009), Lalramliana (2012) and Zheng et al. (2012).

Acknowledgements

We wish to thank R. Hoyer for his help with organisation and realisation of the field work. The study was supported by grant 206/08/0637 of the Czech Science Foundation and by the IRP IAPG No. AV0Z50450515.

Literature cited

- Bănărescu, P. & T. T. Nalbant. 1964. Süßwasserfische der Türkei. 2. Teil Cobitidae. Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut, 61: 159–201.
- Bănărescu, P. & T. T. Nalbant. 1995. A generic classification of Nemacheilinae with description of two new genera (Teleostei: Cypriniformes: Cobitidae). Travaux du Muséum d'Histoire Naturelle "Grigore Antipa", 35: 429–496.
- Bohlen, J. & V. Šlechtová. 2009. *Schistura udomritthiruji*, a new loach from southern Thailand (Cypriniformes: Nemacheilidae). Ichthyological Exploration of Freshwaters, 20: 319–324.
- Bohlen, J. & V. Šlechtová. 2011. A new genus and two new species of loaches (Teleostei: Nemacheilidae) from Myanmar. Ichthyological Exploration of Freshwaters, 22: 1–10.
- Bohlen, J. & V. Šlechtová. 2013. *Schistura puncticeps*, a new species of loach from Myanmar (Cypriniformes: Nemacheilidae). Ichthyological Exploration of Freshwaters, 24: 85–92.
- Chen, X.-Y. & D. A. Neely. 2012. *Schistura albirostris*, a new nemacheiline loach (Teleostei: Balitoridae) from the Irrawaddy River drainage of Yunnan Province, China. Zootaxa, 3586: 222–227.
- Conway, K. W., D. R. Edds, J. Shrestha & R. L. Mayden. 2011. A new species of gravel-dwelling loach (Ostariophysi: Nemacheilidae) from the Nepalese Himalayan foothills. Journal of Fish Biology, 79: 1746–1759.
- Golzarianpour, K., A. Abdoli, B. H. Kiabi & J. Freyhof. 2009. First record of the freshwater loach, *Turcinoemacheilus kosswigi* (Bănărescu and Nalbant, 1964), from Iran (Karoun drainage). Zoology in the Middle East, 47: 57–62.
- Kottelat, M. 1990. Indochinese nemacheilines. A revision of nemacheiline loaches (Pisces: Cypriniformes) of Thailand, Burma, Laos, Cambodia and southern Viet Nam. Pfeil, München, 262 pp.
- 1998. Fishes of the Nam Theun and Xe Bangfai basins, Laos, with diagnoses of twenty-two new species (Teleostei: Cyprinidae, Balitoridae, Cobitidae, Coiidae and Odontobutidae). Ichthyological Exploration of Freshwaters, 9: 1–128.
- 2001. Fishes of Laos. WHT Publications, Colombo, 198 pp.
- 2012. Conspectus Cobitidum: An inventory of the loaches of the world (Teleostei: Cypriniformes: Cobitoidei). The Raffles Bulletin of Zoology, Supplement 26: 1–199.
- Kottelat, M. & C. Leisher. 2012. Fishes from Phuong Hoang cave, northern Vietnam, with description of a new species of loach (Teleostei: Nemacheilidae). Ichthyological Exploration of Freshwaters, 23: 237–244.
- Lokeshwor, Y. & W. Vishwanath. 2012. *Schistura koladyne*, a new species of loach from the Koladyne basin, Mizoram, India (Teleostei: Nemacheilidae). Ichthyological Exploration of Freshwaters, 23: 139–145.
- Menon, A. G. K. 1987. The fauna of India and the adjacent countries. Pisces. Vol. IV. Teleostei – Cobitoidea. Part 1. Homalopteridae. Zoological Survey of India, Calcutta, x + 259 pp., 16 pls.
- Ou, C., C. G. Montaña, K. O. Winemiller & K. W. Conway. 2011. *Schistura diminuta*, a new miniature loach from the Mekong River drainage of Cambodia (Teleostei: Nemacheilidae). Ichthyological Exploration of Freshwaters, 22: 193–200.
- Plongsesthee, R., L. M. Page & W. Beamish. 2011. *Schistura aurantiaca*, a new species from the Mae Khlong basin, Thailand (Teleostei: Nemacheilidae). Ichthyological Exploration of Freshwaters, 22: 169–178.
- Zheng, L.-P., J.-X. Yang & X.-Y. Chen. 2012. *Schistura prolifasciata*, a new species of loach (Teleostei: Nemacheilidae) from the Salween basin in Yunnan, China. Ichthyological Exploration of Freshwaters, 23: 63–67.

Received 31 October 2012

Revised 17 May 2013

Accepted 27 May 2013