



Article

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***Schistura maejotigrina*, a new stream loach (Pisces: Nemacheilidae) from northern Thailand**

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Abstract

Schistura maejotigrina, new species, is described from Maechaem River, a tributary of Ping River, in the upper Chao Phraya River drainage, Chiang Mai Province, Thailand. It is distinguished from all other species of *Schistura* in having 21–24 dark tiger-stripe black bars on the side of the body and 6½–7½ branched dorsal soft rays. The species is medium-sized, reaching 53.0 mm SL (69.6 mm TL), and is known only from the Maechaem River system, Ping River drainage, northern Chao Phraya River basin, Chiang Mai Province, Thailand. It lives in fast running, clear water over a substrate of mixed gravel, small stone and sand.

Key words: Chiang Mai Province, Maechaem River, nemacheilines, new species

Introduction

Nemacheilines are small benthic fishes that inhabit running water and well oxygenated hill streams. Many species of this group inhabit mountainous areas, especially in northern Thailand and neighboring countries, including Laos, Myanmar, Vietnam, Cambodia, Malaysia and China (Kottelat 1990a). Nemacheilines in Southeast Asia are divided into nine genera (31 genera worldwide), with 68 species of *Nemacheilus*, 184 species of *Schistura*, seven species of *Physoschistura*, four species of *Acanthocobitis*, two species of *Tuberoschistura*, one species of *Sectoria*, five species of *Neonoemacheilus*, one species of *Yunnanilus*, and two species of *Pteronemacheilus* (Eschmeyer 2012).

Schistura McClelland 1838 is characterized by the following combination of characters: an elongated body with almost uniform depth; mouth moderately arched; blunt snout; inferior mouth; lower lip with median interruption but not forming two lateral triangular pads, from smooth to strongly furrowed; origin of dorsal fin inserted near to a vertical to origin of pelvic fin; pelvic fin not extending to anal fin; body with scales, no acuminate scales on caudal peduncle; secondary sexual dimorphism present or not; dorsal fin with one or two black marks along its base; dark band on base of caudal fin (Kottelat 1990a).

Species of *Schistura* in Southeast Asia were summarized by Kottelat (1990a). Subsequently, species have been described from Thailand (Kottelat 1990b; Vidthayanon 2003, Vidthayanon & Kottelat 2003; Plongsesthee *et al.* 2011), Laos (Kottelat 1998, 2000; Vidthayanon & Jaruthanin 2002), Myanmar (Bohlen & Šlechtová 2009, 2011), Vietnam (Freyhof & Serov 2001; Kottelat 2004; Nguyen 2005; Nguyen & Nguyen 2007), and Cambodia (Ou *et al.* 2011).

Materials and methods

Fishes were collected by electroshockers, scoop nets and side tracking. Color in freshly collected specimens was noted, and specimens were photographed before fixation and preservation in 10% formaldehyde, then stored in 75% ethanol and deposited at the Maejo Aquatic Resources Natural Museum (MARNM). Terminology follows Jayaram (2002) and for counts and measurements follow Kottelat (1990a). Morphological measurements were done using a slide caliper (0.1 mm precision). Thirty-one (26 morphometric and 5 meristic) characters were measured.

Schistura maejotigrina sp. nov.

Maejo Tiger Stream Loach

(Fig. 1)

Holotype. MARNM: 002435, male, 53.0 mm SL, 69.6 mm TL, Mae Abb, near water fall and terraced rice fields, 822 m above mean sea level, 18°17'55.2"N, 98°10'29.9"E, tributary of Ping River, Maechaem River system, northern Chao Phraya River basin, Maechaem District, Chiang Mai Province, Thailand, A. Suvarnaraksha, J. Keereelang, K. Talao and S. Suvarn, 19 January 2008.

Paratypes. MARNM: 002436, 39 exs., 28.0–47.5 mm SL, 34.0–54.5 mm TL, NIFI: 04551, 5 exs., 29.0–34.0 mm SL, 36.0–38.0 mm TL, and UF 183767, 5 ex., 28.0–38.0 mm SL, 35.0–46.0 mm TL; same data as holotype.

Diagnosis. A species of *Schistura* distinguishable from all other species by unique color pattern consisting of 21–25 dark brown tiger-stripe bars on side of body, bars not reaching venter (Fig. 1). Head short, 4.1–5.4 times in standard length. Interorbital width 48.1% HL (10.1% SL). Pelvic-fin length 97.0% HL (20.3% SL), approximately equal to head length; length of caudal peduncle 44.8% HL (9.3% SL). Dorsal fin with 4 simple rays and 6½ or 7½ branched rays.



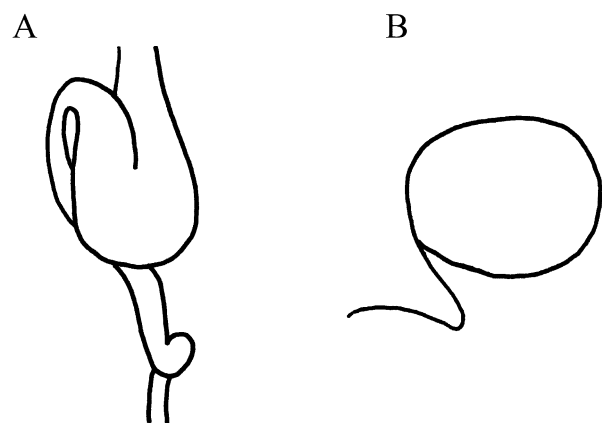
FIGURE 1. *Schistura maejotigrina*, holotype, 69.6 mm TL, holotype male (MARNM 002435); dorsal and lateral views.

Description. Morphological data are given in Tables 1–4. A medium-sized species (largest 69.6 mm in TL, holotype) compared to other species of *Schistura* with moderately elongated body, cylindrical anteriorly to origin of dorsal fin, slightly compressed thereafter; head slightly depressed; snout obtuse (Fig. 2). Mouth semi-circular; lips thin, upper lip without small medial incision, lower lip with deep medial incision; anterior nostril pierced, prolonged as a filament. Eyes small, 2.3–5.5% SL (mean 3.7, S.D. 0.88), diameter smaller than interorbital width; inner maxillary barbel shorter than outer, outer maxillary barbel longer than mandibular barbel, extending to margin of eye; processus dentiformis present on upper jaw; complete lateral line extending to caudal-fin base; cephalic lateral-line system with 3 supraorbital, 5+5 infraorbital, 7 preoperculomandibular and 4 supratemporal pores, 2 mandibular pores; iii 6½–7½ branched dorsal-fin rays; 10–11 pectoral-fin rays; 8–9 pelvic-fin rays; iii 5 anal-fin rays; 7–9 upper and 7–9 lower branched caudal rays; 12 abdominal vertebrae and 20 caudal vertebrae.

Dorsal fin about half way between tip of snout and caudal-fin base; distal margin of dorsal fin slightly convex; pelvic-fin origin slightly before origin of dorsal fin, anal fin at three-quarters of SL, reaching base of caudal fin when depressed; pectoral fin reaches two-thirds of distance to pelvic-fin origin, pelvic fin does not reach anus; axillary pelvic lobe present; caudal fin emarginate, lobes rounded; weakly developed adipose crest on caudal peduncle. Body covered by small embedded scales. Anus closer to anal fin than to pelvic-fin origin. Intestine turns sharply posteriorly at stomach-outlet with small loop behind the stomach (Fig. 3a).

TABLE 1. Summary of morphometric data for *Schistura maejotigrina*.

Characteristics	Holotype	Paratypes Range, n = 49	MEAN	SD
Total length	69.6	34.0–63.5	46.15	7.69
Standard length	53.0	27.4–51.0	37.50	6.21
Fork length	68.7	33.0–62.0	44.41	7.45
Head length	11.3	6.0–10.55	7.58	1.28
Head width	8.55	2.5–7.5	5.57	0.94
Head depth at occiput	6.95	3.0–6.6	4.44	0.76
Interorbital length	4.75	2.0–5.0	3.80	0.87
Caudal-peduncle length	5.44	2.0–5.5	3.50	0.90
Caudal-peduncle depth	9.2	3.0–6.37	4.34	0.91
Predorsal length	26.7	14.5–25.5	19.77	3.03
Preanal length	43.4	21.0–40.1	29.52	5.20
Prepelvic length	10.88	2.5–25.4	7.60	1.67
Pelvic to vent distance	13.7	6.0–12.5	9.22	1.87
Dorsal-fin base length	7.15	1.5–8.15	4.75	1.23
Anal-fin base length	5.10	2.0–5.1	3.26	0.69
Dorsal-fin length	9.58	5.0–11.52	8.27	1.64
Anal-fin length	7.68	5.0–10.0	7.03	1.39
Prepectoral-fin length	17.80	6.0–11.0	8.27	1.41
Pelvic-fin length	10.90	5.1–10.7	7.60	1.50
Pectoral-fin length	11.0	10.3–34.0	19.45	3.42
Body depth at dorsal	7.78	4.5–8.55	6.24	1.15
Body depth at anal	7.6	4.0–7.55	5.36	1.10
Eye diameter	2.05	1.0–2.35	1.36	0.27
Snout length	4.60	2.0–5.0	3.45	0.82
Width of mouth	3.35	2.0–4.5	2.73	0.59
Inter-nostril distance	4.91	2.0–3.0	2.56	0.39
Maxillary barbel length	2.40	0.5–2.5	1.22	0.56

**FIGURE 2.** *Schistura maejotigrina*, holotype; ventral view of head.**FIGURE 3.** *Schistura maejotigrina*. (A) digestive tract, MARNM 002436, 59.2 mm TL, (B) suborbital flap on male, MARNM 002435, 69.6 mm TL.

Coloration. Live specimens light yellowish-brown with 21–25 black, irregular tiger-stripe bars and with wavy black stripe on upper side, above lateral line, extending under dorsal fin. Preserved specimens creamy white with black stripe and bars; bars thinner above lateral line, without reaching venter except on caudal peduncle; head and snout with scattered dark-brown spots; dorsal fin with one black spot at base of simple dorsal ray; black bar at caudal-fin base incomplete, with small blotch dorsally at origin of fin, bar extends from middle of upper caudal lobe to middle of lower caudal lobe; pectoral, pelvic and anal fins hyaline, caudal fin with scattered dark spots. Lower lip without black marks.

TABLE 2. Meristic counts of *Schistura maejotigrina* and other species of *Schistura* in northern Thailand (*data from Kottelat 1990). Bold indicates significant differences among species.

Characteristics	<i>S. maejotigrina</i>	<i>S. breviceps</i> *	<i>S. poculi</i> *	<i>S. waltoni</i> *	<i>S. geisleri</i> *	<i>S. spilota</i> *	<i>S. bucculenta</i> *	<i>S. pridii</i> **
Dorsal-fin rays	iv 6½–7½	iv 8½	iv 7–8½	iv 8½	iv 8½	iv 8½	iv 8½	iii 7½
Pectoral-fin rays	10–11	10–11	10–11	11	10–11	11	11	9–10
Pelvic-fin rays	8–9	8	8	8	8	8	8	6
Caudal-fin rays	7–9+7–9	9+8	8+7	9+8	9+8	9+8	9+8	8+8
Bars/blotches on side of body	21–25	8–10	15–17	9–12	5–8	7–10	0	4

TABLE 3. Proportional measurements of *Schistura maejotigrina* (n = 50 specimens).

	% Standard length				% Head length			
	Holotype	Range	Mean	SD	Holotype	Range	Mean	SD
Total length	122.7	109.1–130.1	123.1	4.02				
Lateral head length	21.3	16.9–24.3	21.0	1.62				
Predorsal length	50.4	41.4–59.2	52.9	3.30				
Prepelvic length	48.7	37.3–57.2	51.9	3.32				
Preanal length	81.9	67.9–85.8	78.7	3.57				
Body depth	14.7	14.3–19.6	16.6	1.20	68.9	66.7–94.1	79.5	7.0
Depth of caudal peduncle	17.4	8.6–13.5	11.5	1.11	81.4	46.2–64.7	55.0	4.7
Length of caudal peduncle	10.3	6.3–16.3	9.3	1.81	48.1	22.8–82.5	44.8	10.3
Snout length	8.7	6.3–15.9	9.3	1.56	40.7	30.3–58.8	43.8	6.4
Maximum head width	16.1	12.4–16.9	14.9	1.05	75.7	60.0–83.3	71.2	5.9
Eye diameter	3.9	2.3–5.5	3.7	0.88	18.1	11.1–25.0	17.6	3.9
Interorbital width	9.0	6.3–12.5	10.1	1.34	42.0	28.2–61.5	48.1	7.0
Pelvic-fin length	20.5	18.1–22.3	20.3	1.29	96.2	79.3–113.2	97.0	8.4
Pectoral-fin length	22.8	17.3–25.9	22.1	1.64	107.1	92.3–122.2	105.5	7.1
Head depth at occiput	13.1	8.6–15.5	11.9	1.10	61.5	46.2–69.2	56.7	5.1
Pre-pectoral length	20.5	15.9–23.0	20.1	1.80	96.3	76.9–112.5	96.1	9.2

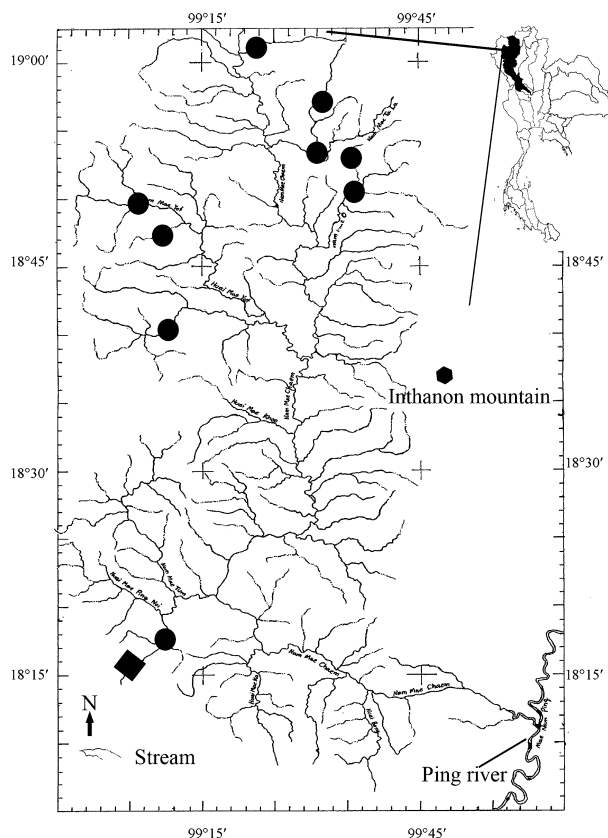
Sexual dimorphism. Males have a suborbital flap (Fig. 3b) and numerous tubercles on the pectoral fin in the breeding season.

Habitat. Specimens were collected from Mae Abb (18°17'55.2"N, 098°10'29.9"E), a stream near a waterfall and terraced rice fields. Elevation is 822 m above mean sea level. Mae Abb is a tributary of Ping River, in the northern Chao Phraya River basin, Maechaem District, Chiang Mai Province. The area has a mean annual rainfall of over 145 cm. Specimens were collected over substrates of mixed gravel, mud and sand in fast flowing, clear water. The catchment of this tributary is endowed with numerous torrential hill streams and vegetation cover. Vegetation cover is comprised of semi-evergreen, plantations and agricultural fields (mainly cabbages and tomatoes). On 19 January 2008, the water temperature was 17° C, air temperature 20.5° C, pH 7.7, ammonia and

nitrite 0 ppm, dissolved oxygen 8 mg/l, calcium 80 ppm, magnesium 24 ppm, and conductivity 20 μ S. Stream width was 3–4 meters and water depth 37.5 cm. All specimens were collected during the day time.

Distribution. *Schistura maejotigrina* is known only from the Maechaem River system, Ping River drainage, northern Chao Phraya River basin, Maechaem District, Chiang Mai Province, Thailand (Fig. 4). Other species collected at the type locality (Fig. 5) include the nemacheilids: *Schistura breviceps*, *S. pridii*, *S. spilota*; a sisorid: *Oreoglanis siamensis*; cyprinids: *Devario* sp., *Scaphiodonichthys burmanicus*, and a channid: *Channa gachua*.

Etymology. The specific epithet, *maejotigrina*, an adjective, refers to the 77th Maejo University Anniversary and the presence of the irregular tiger-stripe bars on the side of the body.



↑ **FIGURE 5.** Mae Abb Stream, Ban Mae Abb, Maechaem District, Chiang Mai Province, Thailand. Type locality of *Schistura maejotigrina*.

← **FIGURE 4.** Distribution of *Schistura maejotigrina* in the Maechaem River basin; type locality is indicated by the black diamond.

Discussion

The color pattern of *S. maejotigrina* is similar to that of *Pteronemacheilus lucidorsum*, but differs from it having no median incision on the upper lip (vs. present), lateral line complete (vs. reaching to anal-fin origin), and no elongated skinfolds on the dorsal side of the second and third branched pectoral-fin rays in males (vs. present) (Bohlen and Slechtová 2011). *Schistura maejotigrina* is easily differentiated from all species of *Schistura* by its color pattern.

Other species of *Schistura* in the Maechaem River system are *S. breviceps*, *S. bucculenta*, *S. geisleri*, *S. poculi*, *S. pridii*, *S. spilota*, and *S. waltoni*. All are easily separated from *S. maejotigrina* by data in Tables 2 and 4. *Schistura maejotigrina* is similar to *S. poculi* in having vertical bars on the side of the body, but in *S. poculi* the bars in front of the dorsal fin are conspicuously thinner than those behind the dorsal fin (Smith 1945, Kottelat 1990a). In *S. breviceps*, the body has 8–10 usually faint bars that are regularly shaped and with nearly constant width (Smith 1945, Kottelat 1990a). *Schistura bucculenta* has no dark bars or stripes on the body (Smith 1945, Kottelat 1990a). *Schistura geisleri* has a yellow background with 5–8 dark brown blotches, usually longitudinally elongated along the lateral line and 6–8 irregular dark saddles along the dorsal midline (Kottelat 1990a). *Schistura pridii* has a striking black and yellow color pattern, with uniquely shaped bars and dorsal saddles (Vidthayanon 2003).

Schistura spilota has a body color pattern of 7–10 dark brown blotches on a yellowish background, with blotches of irregular shape, often vertically elongated, and with the anterior blotches often larger than posterior ones (Fowler 1934, Smith 1945, Kottelat 1990a). *Schistura waltoni* has 9–12 dark bars on the side (vs. 21–25), with the bars slightly irregular in shape and not always distinct on the anterior part of the body, some of the bars may be incomplete, oblique or joined, and dorsal fin has a light margin bounded below by a black band and a dark base (Kottelat 1990a).

TABLE 4. Proportional differences separating *Schistura maejotigrina* and other species of *Schistura* in northern Thailand (*data from Kottelat 1990; **data from Vidthayanon 2003). Values are means.

Diagnostic character	<i>S. maejotigrina</i>	<i>S. poculi</i> *	<i>S. breviceps</i> *	<i>S. spilota</i> *	<i>S. waltoni</i> *	<i>S. bucculenta</i> *	<i>S. geisleri</i> *	<i>S. pridii</i> **
%SL								
Length of caudal peduncle	9.3	15.3	14.6	16.2	13.5	13.7	16.1	18.6
Interorbital width	10.1	6.5	7.8	5.6	7.9	6.2	6.8	5.7
Length of pelvic fin	20.3	17.3	16.5	17.2	17.0	15.3	18.9	14.3
%HL								
Length of caudal peduncle	44.8	74.0	68.0	79.0	65.0	63.0	71.0	---
Interorbital width	48.1	32.0	36.0	28.0	38.0	29.0	30.0	---
Length of pelvic fin	97.0	84.0	77.0	84.0	82.0	72.0	84.0	---

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