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A new loach of the genus *Physoschistura* Bănărescu & Nalbant (Teleostei: Nemacheilidae) from Chindwin basin, Manipur, India

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Abstract

The paper describes *Physoschistura tigrinum*, a new nemacheilid from the Chindwin basin in Manipur, India. The new species is distinguished from congeners in having 9½ branched dorsal-fin rays; 12–14 irregularly arranged light reddish brown bars on the side, some of which are broken into blotches and short bars; 5–6 dark brown saddles; forked caudal fin with 9+8 branched rays; axillary pelvic lobe well formed but not prominent; 10 pores in preoperculo-mandibular canal and suborbital flap in the male. The status of *Schistura prashadi* is also discussed, and the species is validated to *Physoschistura*.

Key words: New nemacheilid, Changa River, northeastern India

Introduction

Fishes of the genus *Physoschistura* Bănărescu & Nalbant are small fishes inhabiting the hill streams of northeastern India to southeastern Asia through the southern Yunnan province of China. They are characterized by a deep body with small scales; eight or nine branched dorsal-fin rays; distal margin of the dorsal fin slightly convex; forked caudal fin; posterior chamber of air bladder well developed, not encapsulated, more or less conical, in direct contact with the capsule; strongly arched mouth, 1.5–2.0 times wider than long; and lower lip with a median interruption forming two lateral broadly triangular pads with deep furrows (Bănărescu & Nalbant 1995; Kottelat 1990). Kottelat (1990) reported all the known species of *Physoschistura* to be generally small, attaining not more than 40 mm SL.

Hora (1921) reported that the fish fauna of the southern watershed (= Chindwin basin) of Manipur included the endemic Manipur element and the Burmese element of which the endemic species were confined to hill streams. The Chindwin headwaters in Manipur are the least explored ichthyologically. The hill streams of the basin are ideal habitats for small nemacheilid fishes.

Kottelat (1990) recognized five species of *Physoschistura*, viz., *P. shanensis* (Hora 1929), *P. rivulicola* (Hora 1929), *P. raoi* (Hora 1929), *P. pseudobrunneana* Kottelat 1990, and *P. brunneana* (Annandale 1918) from the Indochinese region. Zhu (1982) described *Nemacheilus meridionalis* from Yunnan Province, China, but Kottelat (2001) treated the species under the genus *Physoschistura*. Böhlen & Šlechtová (2011) considered the species under the new genus *Pteronemacheilus*. Chen *et al.* (2011) described *Physoschistura yunnaniloides* from the Chindwin River drainage, Sagaing Division, Myanmar. Sen and Nalbant (in Singh *et al.* 1981) described *Physoschistura elongata* from Barapani (Brahmaputra basin), India. Lokeshwor *et al.* (2012) and Lokeshwor & Vishwanath (2012) described *Physoschistura tuivaiensis* and *P. chindwinensis*, respectively, from the Tuivai River (Brahmaputra basin) and the Changa River (Chindwin drainage), Manipur, India, and considered *P. elongata* a representative of *Schistura* on the basis of its lip morphology.

A collection of fishes from the Changa River of the Chindwin drainage, Manipur, included an undescribed species, which is herein described as *Physoschistura tigrinum*, new species.

Materials and methods

Measurements were made point to point with dial calipers and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of the specimens wherever possible. Measurements of the subunits of the head are presented as percentage of head length while head length and other body parts are reported as percentages of standard length. Counts and measurements follow Kottelat (1990). The specimens are deposited in the Manipur University Museum of Fishes (MUMF). Museum code: ZSI, Zoological Survey of India, Kolkata.



FIGURE 1. *Physoschistura tigrinum*, n. sp.: lateral aspect of (A) holotype, MUMF 11051, 73.6 mm SL, male; (B) paratype, MUMF 11053, 73.2 mm SL, female; (C) dorsal aspect of holotype.

***Physoschistura tigrinum*, new species**

(Fig. 1)

Type material. Holotype. MUMF 11051, 73.6 mm SL, male; India: Manipur: Ukhrul district: Phungrei, Changa River (the Chindwin drainage); 25°12'26"N 94°31'35"E; Kingson, December 2004.

Paratypes. MUMF 11050, 72.8 mm SL, female & MUMF 11052–11053, 2, 73.0–73.2 mm SL, males; same data as holotype; one paratype (MUMF 11053, 73.2 mm SL) was dissected for study of the intestine and air bladder.

Diagnosis. A large *Physoschistura* reaching 73.6 mm SL, distinguished from its congeners in having the following combination of characters: 12–14 irregular light reddish brown bars (few become broken and forming blotches) on side of body; 5–6 reddish brown irregular saddles on back; lateral line complete with 90–94 pores; 9+8 branched caudal fin rays; axillary pelvic-fin lobe present but not prominent; male with suborbital flap; 10 pores in preoperculomandibular canal.

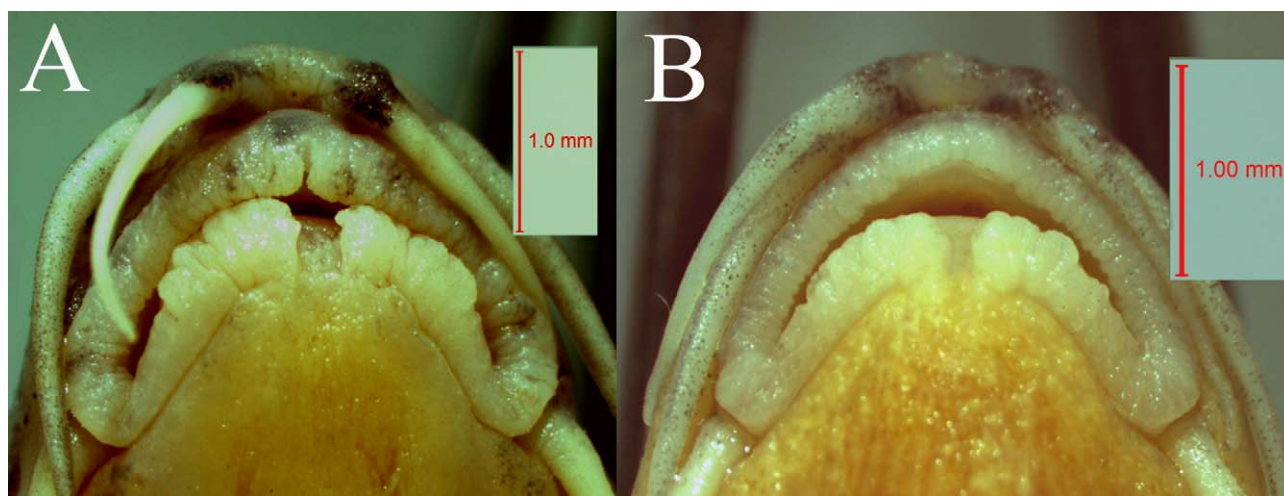


FIGURE 2. Lip structure of (A) *Physoschistura tigrinum* and (B) *P. prashadi*.

Description. Counts and measurements are in Table 1. Body elongated and stout. Dorsal profile gently arched, elevating evenly from tip of snout up to dorsal-fin origin, sloping to the point vertical to anal-fin origin and then nearly horizontal to caudal-fin origin. Body oval in cross section anteriorly, becomes slightly compressed and then more compressed posteriorly. Ventral profile of body more or less straight throughout length. Head slightly depressed and almost as broad as high at nape. Snout length almost half head length, almost as long as broad at nares and about twice eye diameter.

Dorsal fin with three simple and 9½ branched rays, articulating nearer to tip of snout (predorsal length, 45.0–47.0% of SL) than to caudal-fin base, in advance of pelvic-fin origin; distal margin slightly convex. Anal fin with three simple and 5½ branched rays. Pectoral fin with 11 rays, reaching about half distance to pelvic-fin base. Pelvic fin with 8 rays, origin below base of 3rd or 4th branched dorsal-fin ray, reaching about midway to anal-fin origin; distal margin of pelvic fin reaching vent when adpressed. Axillary pelvic-fin lobe present and is prominent. Caudal fin with 9+8 branched rays, slightly forked, lobes equal, upper lobe 1.3–1.5 times longer than median rays. Caudal peduncle 1.4–1.7 times longer than deep, with low dorsal and ventral adipose crests on posterior half. Largest recorded size 73.6 mm SL (MUMF 11051).

Body covered with partly overlapping minute scales, except between base of pectoral fin and belly where scales are absent. Lateral line complete, straight, with 90–94 pores. Cephalic lateral-line system with 12 supraorbital, 3+8 infraorbital, 10 preoperculomandibular and three supratemporal pores. Unculi present on lips, barbels, throat, snout, interorbital area, and pectoral and pelvic rays.

Anterior nostril pierced on anterior side of low pointed flap-like tube. Mouth strongly arched, 1.4–1.5 times wider than length. Lips fleshy; upper lip finely pleated, with a median incision. Lower lip with two lateral, broadly triangular pads separated by a wide median furrow (Fig. 2A). Processus dentiformis present, not prominent. No median notch in lower jaw. Inner rostral barbel reaching to vertical of nostril or maxillary barbel base; outer one

more elongated, reaching vertical below middle of eye. Maxillary barbel reaching to vertical of occiput. Free posterior chamber of air bladder present, not encapsulated, slightly conical (Fig. 3A). Intestine with bend immediately behind stomach (Fig. 4A).

Sexual dimorphism. Male with prominent suborbital flap.

TABLE 1. Morphometric data of *Physoschistura tigrinum*.

	Holotype	Paratypes		
	MUMF 11051	MUMF 11050	MUMF 11052	MUMF 11053
% SL				
Body depth	17.0	18.0	19.0	17.5
Head depth at nape	13.0	13.0	14.0	13.3
Lateral head length	22.0	23.0	22.0	22.5
Dorsal head length	19.0	19.0	20.0	19.7
Head depth at eye	10.0	11.0	12.0	10.5
Caudal-peduncle length	15.0	16.0	15.0	15.4
Caudal-peduncle height	9.8	9.8	11.0	10.0
Predorsal length	47.0	47.0	45.0	45.7
Prepelvic length	48.0	51.0	53.0	50.5
Preanus length	67.0	69.0	72.0	68.5
Preanal length	73.0	76.0	79.0	75.0
Dorsal-fin height	16.0	15.0	17.0	16.0
Pelvic-fin length	16.0	18.0	17.0	16.5
Anal-fin depth	17.5	16.5	17.0	17.0
Pectoral-fin length	19.0	20.0	18.0	18.5
Max. head width at cheek	12.0	14.0	14.0	13.0
Head width (at nares)	9.5	8.4	9.5	9.0
Body width at anal-fin origin	7.1	8.1	7.9	7.5
Body width at dorsal-fin origin	12.0	13.0	12.0	12.4
% HL				
Snout length	47.4	50.6	46.9	47.2
Interorbital distance	27.3	28.5	29.2	28.0
Eye diameter	23.8	23.8	23.9	23.9
Mouth gape width	35.1	31.2	29.9	33.0
Lateral length of head	114.0	119.0	112.0	113.5
Head depth at eye	53.9	58.5	58.3	55.0
Head depth at nape	68.6	68.8	69.4	68.6
Body depth at dorsal-fin origin	90.2	91.3	94.4	92.0
Depth of caudal peduncle	50.4	50.7	55.6	53.6
Length of caudal peduncle	79.2	85.5	77.4	80.2
Maximum head width	62.6	70.9	71.1	64.0
Body width at dorsal-fin origin	59.6	66.0	61.1	60.0
Body width at anal-fin origin	36.5	41.9	40.3	37.6

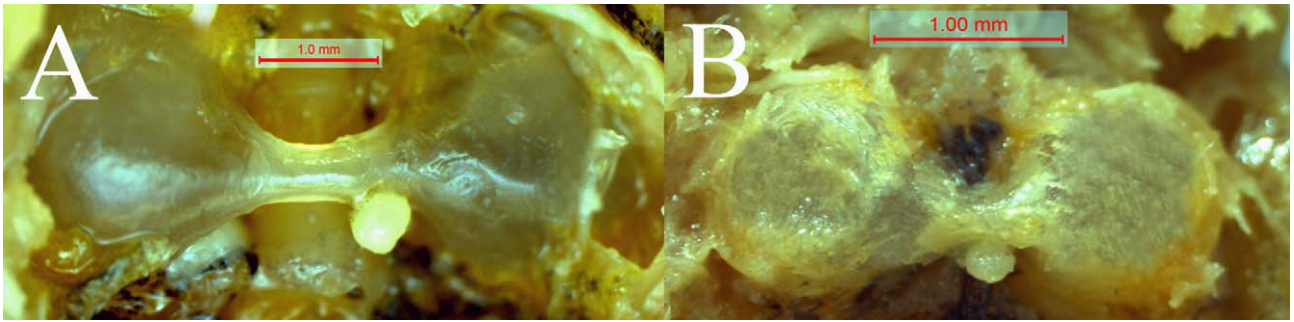


FIGURE 3. Air bladder of (A) *Physoschistura tigrinum* and (B) *P. prashadi* showing free posterior chambers.

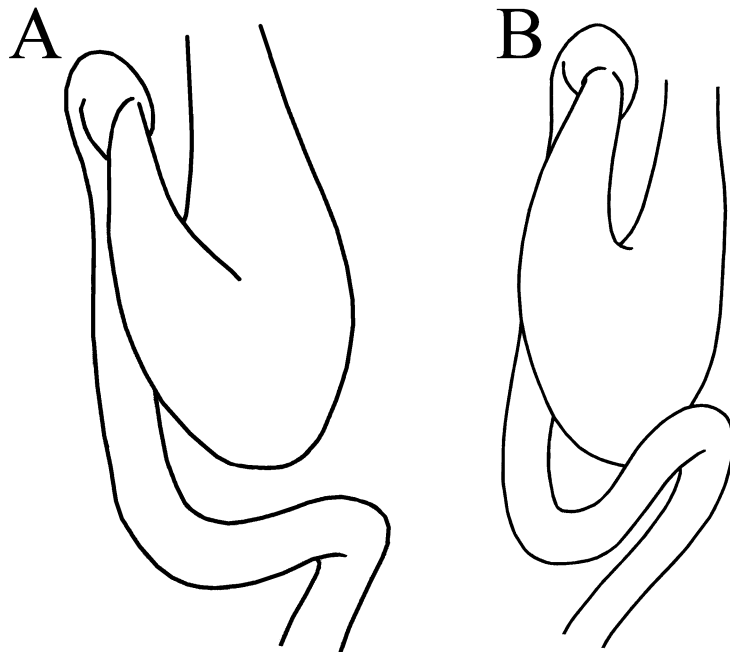


FIGURE 4. Coiling pattern of intestine of (A) *Physoschistura tigrinum* and (B) *P. prashadi*.

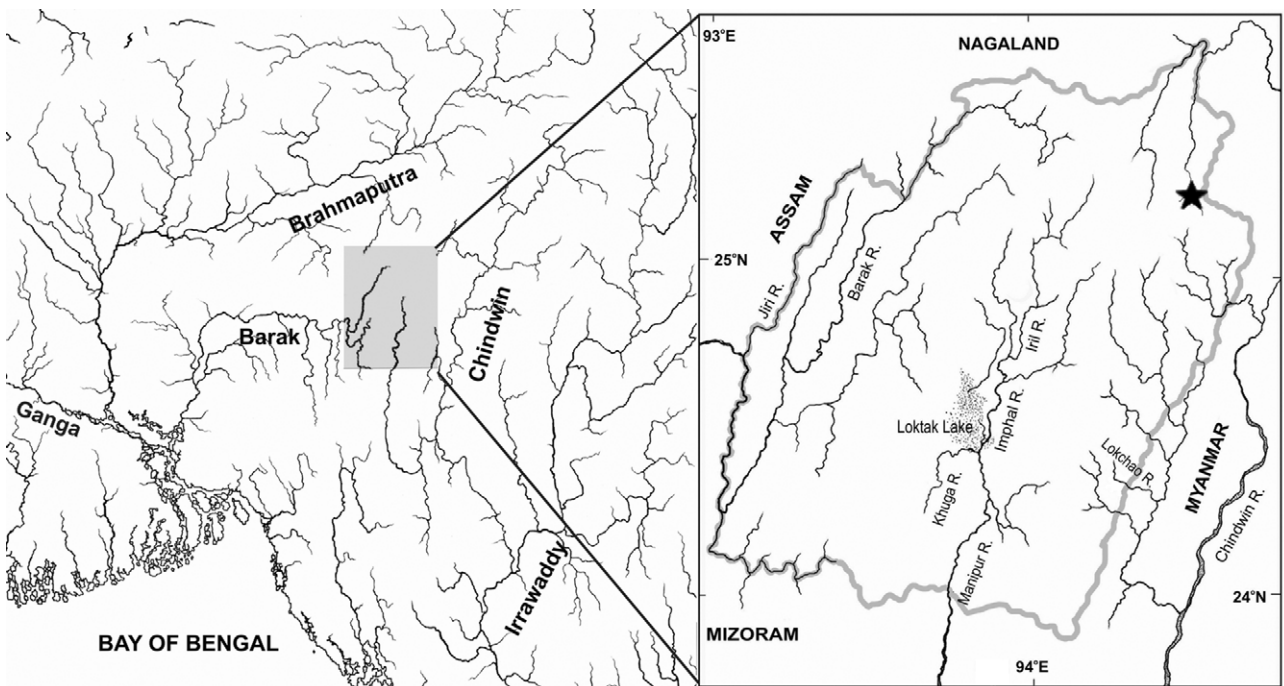


FIGURE 5. Map showing type locality of *Physoschistura tigrinum*.

Color. In 10% formalin: body light yellowish with 12–14 irregular light reddish brown bars on the side/flank, extending from upper side, crossing lateral line, reaching level of pectoral fin. Some bars broken, forming irregular blotches. Dorsal and lateral aspect of head mottled with irregular reddish brown spots. Dorsal surface of body with 5–6 reddish brown saddles of irregular shape. Dorsal-fin base with two black spots; first one larger, extending from first simple ray to first branched ray; second extending from between second and third branched rays to base of fourth branched ray. Caudal-fin base with prominent dark brown bar subtended at top and bottom by black spots. Middle of caudal fin with irregular elongated rows of dark brown spots. Branched pectoral-fin rays with 3 transverse rows of brown spots, one at base, one in middle and one in subterminal region. Outer rostral barbel with black spot at base.

Distribution. India: Manipur: Ukhrul district: Phungrei, Changa River, tributary of Tizu River (Chindwin drainage) (Fig. 5).

Etymology. The species is named for the tiger-like bars on the body.

Discussion

All known species of *Physoschistura* except *P. chindwinensis*, *P. shanensis*, *P. tuivaiensis* and *P. yunnaniloides* have an incomplete lateral line. *Physoschistura tigrinum* is similar to *P. chindwinensis*, *P. shanensis*, *P. tuivaiensis* and *P. yunnaniloides* in having a complete lateral line. However, it is easily distinguished from *P. chindwinensis* in having 5–6 (vs. 11–16) saddles on dorsum, 11 (vs. 10) pectoral-fin rays, 9½ (vs. 8½) branched dorsal-fin rays, 9+8 (vs. 8+8) branched caudal-fin rays, and basicaudal bar complete (vs. interrupted); from *P. shanensis* in having 12–14 irregular bars (vs. eight elongated blotches) on the body, three (vs. four) simple dorsal-fin rays, a shorter pectoral fin (18.4–20.1% SL vs. 24.3) and 17 (vs. 16) branched caudal-fin rays; from *P. tuivaiensis* in having three (vs. four) simple and 9½ (vs. 8½) branched dorsal-fin rays, 11 (vs. 10) rays in pectoral fin, 9+8 (vs. 8+7) branched caudal-fin rays, free posterior chamber of air bladder conical (vs. oval), and basicaudal bar complete (vs. interrupted); and from *P. yunnaniloides* in the presence (vs. absence) of a free posterior air bladder, more simple (three vs. four) and branched (9½ vs. 8½) dorsal-fin rays; more pectoral-fin rays (11 vs. 10), and more branched caudal-fin rays (9+8 vs. 8+8).

The new species is also distinguished from *Physoschistura rivulicola* in having fewer simple dorsal-fin rays (three vs. four), a deeper head at nape (13.0–14.0% SL vs. 11.8), longer dorsal head length (19.0–20.0% SL vs. 18.1), longer predorsal space (45.0–47.0% SL vs. 44.2), deeper body (17.0–19.0% SL vs. 15.6), longer snout (46.9–50.6% HL vs. 29.1) and smaller eye (diameter, 23.8–23.9% HL vs. 26.6).

Physoschistura tigrinum is easily distinguished from *P. raoi* in having three (vs. four) simple and 9½ (vs. 8½) branched dorsal-fin rays, 12–14 (vs. 22) irregular vertical bars, shallower body (body depth, 17.0–19.0% SL vs. 19.1), shorter head (19.0–20.0% SL vs. 23.1), shallower head at nape (13.0–14.0% SL vs. 15.4), shorter predorsal length (45.0–47.0% SL vs. 50.2), wider body at dorsal-fin base (12.0–13.0% SL vs. 11.1), longer snout (46.9–50.6% HL vs. 45.8), and smaller eye (diameter, 23.8–23.9% HL vs. 29.1). It differs from *P. brunneana* in having three (vs. four) simple dorsal-fin rays, and presence (vs. absence) of an axillary pelvic lobe. It also differs from *P. pseudobrunneana* in having 9+8 (vs. 8+8) branched caudal-fin rays, three (vs. four) simple dorsal-fin rays and 10 (vs. seven) preoperculo-mandibular pores.

Hora (1921) described *Nemachilus prashadi* based on 74 specimens collected from three localities, viz., Thonagpal Tank, Thoubal Stream, Sikmai Stream (all Chindwin basins, Manipur). He did not report the type locality of the holotype. Kottelat (1990) put the species in the genus *Schistura* but did describe the structure of the lips and the posterior free air chamber because of the unavailability of fresh materials.

In the present study, nemacheiline specimens in MUMF collected from the Chindwin drainage within a 30-kilometer radius of the localities from where the species was collected by Hora (1921) were examined. All of the specimens agree with Hora's (1921) description of *Nemachilus prashadi*. All of the specimens have 9½ branched dorsal-fin rays; slightly convex distal margin of the dorsal fin; feebly to moderately developed processus dentiformis; strongly arched mouth, 1.4–1.5 times wider than length; lower lip with a wide median interruption forming two lateral broad triangular pads (Fig. 2B); free posterior chamber of air bladder well formed, not encapsulated, more or less conical (Fig. 3B); and intestine with a large loop which reaches forward to the stomach (Fig. 4B). These characters agree with the descriptions of *Physoschistura* by Bănărescu & Nalbant, and Kottelat

(1990). On the basis of this study, we include the species hitherto known as *Schistura prashadi* in *Physoschistura*. Biometric data for specimens examined are in Table 2.

TABLE 2. Morphometric data of *Schisura prashadi* (N = 12).

	mean	range	s.d.
% SL			
Body depth	20.4	18.4–23.3	1.5
Head depth at nape	14.4	13.1–15.7	0.9
Lateral head length	23.6	22.4–25.4	1.0
Dorsal head length	20.6	18.6–21.6	0.9
Head depth at eye	12.5	11.4–14.9	0.9
Caudal-peduncle length	15.3	12.2–17.8	1.4
Caudal-peduncle height	11.4	10.5–12.1	0.5
Predorsal length	50.2	46.5–52.4	1.9
Prepelvic length	54.6	50.4–61.9	3.0
Preanus length	72.1	69.7–80.1	3.0
Preanal length	78.0	72.9–84.2	3.3
Dorsal-fin height	16.0	11.8–19.3	1.8
Pelvic-fin length	17.5	16.0–19.0	0.8
Anal-fin depth	16.4	14.6–17.8	1.0
Pectoral-fin length	22.2	18.9–24.8	1.7
Max. head width at cheek	14.7	12.5–17.4	1.2
Head width (at nares)	9.5	7.9–12.9	1.1
Body width at anal-fin origin	7.8	4.7–9.2	0.6
Body width at dorsal-fin origin	14.1	11.4–17.0	1.8
% HL			
Snout length	49.3	43.8–57.0	4.0
Interorbital distance	34.3	28.2–40.1	3.0
Eye diameter	26.6	24.0–29.1	2.2
Mouth gape width	34.3	29.7–42.5	3.8
Lateral length of head	114.8	106.8–127.9	6.3
Head depth at eye	60.9	54.2–68.8	5.1
Head depth at nape	70.6	61.6–84.0	6.3
Body depth at dorsal-fin origin	99.7	86.6–115.6	10.4
Depth of caudal peduncle	55.4	50.1–63.3	3.5
Length of caudal peduncle	74.6	68.5–95.6	8.6
Maximum head width	71.9	61.6–83.4	7.6
Body width at dorsal-fin origin	69.8	54.4–79.8	10.1
Body width at anal-fin origin	38.3	32.6–43.2	3.3

Comparative Materials. Morphometric data are from Chen *et al.* (2011), Kottelat (1990), and material examined.

Physoschistura chindwinensis, MUMF 11077, 1 ex., 43.3 mm SL, holotype; Lokchao River at Moreh, Manipur, India (Chindwin basin). MUMF 11074–11089, 13 exs., 40.9–49.6 mm SL, paratopotypes. ZSI FF 4603/3, 3 exs., 40.3–43.6 mm SL, paratopotypes.

Physoschistura rivulicola, ZSI F 11060/1, 1 ex., 50.8 mm SL, holotype; Heho, Southern Shan States, Myanmar (poor state of preservation).

Physoschistura raoi, ZSI F 11062/1, 1 ex., 28.3 mm SL, holotype; Mongyai, Northern Shan States, Myanmar.

Physoschistura tuivaiensis, MUMF 5089, 1 ex., 46.0 mm SL, holotype; Tuivai River at Likhailok, Churchandpur district (Brahmaputra basin), Manipur, India; Lokeshwor and party, 20 December 2011. MUMF 5082-88, 7 exs., 37.4–45.2 mm SL, paratypes; Tuivai River, Churchandpur district, Manipur, India; K. Shanta Devi, 5 May 2004.

Schistura prashadi, MUMF 5140-75, 7 exs., 43.4–58.4 mm SL; Khuga River Churchandpur District; Shanta Devi, 9th August 2000. MUMF 11054-57, 4 exs., 48.4–65.3 mm SL; Imphal River, Serou (Chindwin drainage), Manipur.

Physoschistura shanensis, data from Kottelat (1990)

Physoschistura brunneana, data from Kottelat (1990)

Physoschistura pseudobrunneana, data from Kottelat (1990)

Physoschistura yunnaniloides, data from Chen *et al.* (2011)

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