

Psilorhynchus olliei, a new species of torrent minnow from eastern Myanmar (Ostariophysi: Psilorhynchidae)

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Psilorhynchus olliei, new species, is described from the Irrawaddy drainage, Kachin State, eastern Myanmar. It is distinguished from other members of the *P. balitora* species group by a combination of characters, including unique features of body and fin coloration and lateral-line scale, fin-ray, vertebrae, and cephalic lateral-line canal pore counts. Photographs of members of the *P. balitora* species group from Myanmar are also provided.

Introduction

The torrent minnows of the genus *Psilorhynchus* occur in fast flowing, oxygen-rich mountain streams in the Indo-Burma region. Although the first two species of *Psilorhynchus* were already described almost 200 years ago by Hamilton (1822) in his monograph on the Gangetic fishes, torrent minnows have attracted considerable attention by taxonomists only in recent years leading to the description of 17 species since 2007 (Nebeshwar et al., 2007; Conway & Kottelat, 2007, 2010; Arunachalam et al., 2007, 2008; Conway & Mayden, 2008a–b; Conway & Britz, 2010; Conway et al., 2013; Shangningam & Vishwanath, 2014a–c; Lalramliana et al., 2014). The center of diversity of *Psilorhynchus* seems to be located in the mountain ranges separating Myanmar and India, with

a single species known from the Western Ghats in Southern India (Arunachalam et al., 2008) and another species from the Tenasserim hill range separating Myanmar from Thailand (Conway & Kottelat, 2007). A total of 8 species are currently known from Myanmar and these can be assigned to all three of the species groups erected by Conway (2011).

During a recent collection trip to Myanmar, one of us (RB) encountered specimens of *Psilorhynchus* in a small left hand stream of the Ayeyarwaddy near Bhamo and a nearby market that could not be assigned to any of the species known currently from Myanmar. Further study confirmed that these specimens belong to the *P. balitora* group and represent an undescribed species, whose formal description is provided in the present paper.

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Fig. 1. *Psilorhynchus olliei*, BMNH 2015.3.3.138, holotype, male, 48.0 mm SL, male; Myanmar: Kyari Chaung.

Materials and methods

Measurements follow Conway et al. (2013) and counts follow Conway & Britz (2010). The number in parentheses following a meristic value denotes the frequency of that value. An asterisk denotes the value obtained from the holotype (if available). Select specimens were cleared and double stained (c&s) for bone and cartilage study following the protocol of Taylor & Van Dyke (1985). All fin-ray counts, except those reported for *P. amplicephalus*, *P. chakpiensis*, *P. gokkyi*, *P. maculatus*, *P. ngathanu* and *P. piperatus*, were confirmed through the examination of c&s specimens. Vertebral counts are based on c&s specimens and include the four

Weberian centra and the terminal compound centrum (Fink & Fink, 1981). General osteological terminology, oromandibular terminology and colour pattern terminology follow Conway et al. (2013). Specimens of *P. amplicephalus*, *P. chakpiensis*, *P. maculatus* and *P. ngathanu* were not available for study and information on these was obtained directly from the descriptions of these species (Arunachalam et al., 2008; Shangningam & Vishwanath, 2013a–c). Collection abbreviations: BMNH, Natural History Museum, London; NRM, Swedish Museum of Natural History, Stockholm; UMMZ, University of Michigan, Museum of Zoology, Ann Arbor.

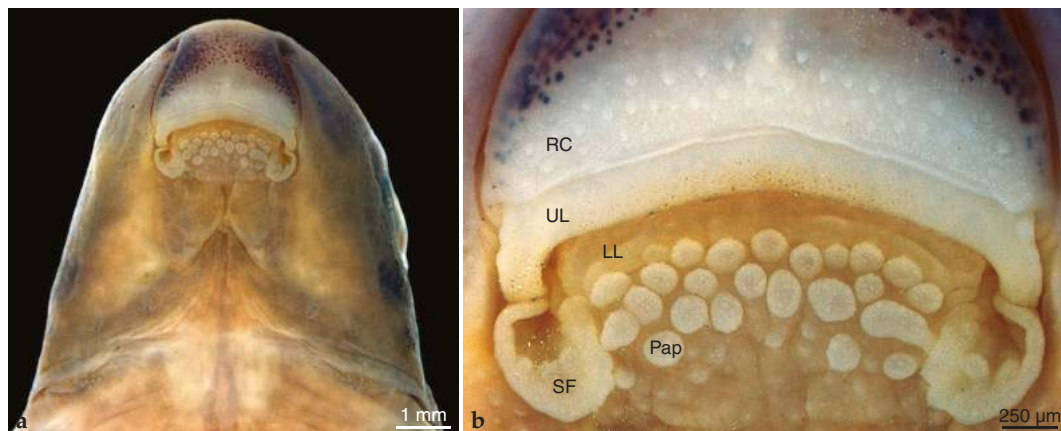


Fig. 2. Ventral surface of head (a) and mouthparts (b) of *Psilorhynchus olliei*, BMNH 2015.3.3.138, holotype, male, 48.0 mm SL; Myanmar, Kyari Chaung. Abbreviations: LL, lower lip; Pap, globular papillae; RC, rostral cap; SF, skin fold; UL, upper lip.

Psilorhynchus olliei, new species

(Figs. 1–2)

Holotype. BMNH 2015.3.3.138, 48.0 mm SL; Myanmar: Kachin State: Kyari Chaung, 24°14' 06.4" N 97°23'20.4" E; R. Britz & O. Crimmen, 25 February 2011.

Paratypes. BMNH 2015.3.3.139–161, 23, 27.9–54.3 mm SL; BMNH 2015.3.3.162–164, 3 (c&s) 45.0–50.0 mm SL; BMNH 2015.3.3.165–170, 6, 38.0–45.0 mm SL; Myanmar: Kachin state: market stall at Kyauksachan Village, collected from Kyari Chaung by local fishers; R. Britz & O. Crimmen, 25 February 2011.

Diagnosis. A member of the *P. balitora* species group, distinguished from all other members by the following combination of characters: 5–6 round to squarish lateral blotches; 6–7 dorsal saddles, all but largest separated from lateral blotches; small dark brown blotches scattered irregularly across scales in L1, L+1 and L+2 scale rows in posterior half of body; obvious row of small dark brown blotches in L–1 row, bordering ventral margin of lateral blotches in posterior half of body; caudal fin with elongate black marking extending along ventral margin of lower lobe; dorsal fin with black stripe across center that is widest anteriorly; lateral line scales 31–32 on body; principal caudal-fin rays 10+9; pectoral-fin rays v.9–10.i-ii; total vertebrae 32–33 (16–17+16–17);

anteriormost branchiostegal ray present; parietal portion of temporal sensory canal with 3 openings; preopercular portion of preopercular-mandibular canal with 4 openings; ventral surface between paired fins without scales.

Description. General body shape as in Figure 1. Morphometric data and selected meristic characters listed in Table 1. Body elongate, dorsal profile strongly arched. Body depth greatest at dorsal-fin origin, narrowest at base of caudal peduncle. Ventral profile straight from lower jaw to anal-fin origin, weakly concave from anal-fin origin to caudal-fin base.

Head and eye large, pupil elliptical, with longest axis of ellipse orientated along dorsal-ventral body axis. Mouth inferior, relatively wide (Fig. 2). Snout short, rounded anteriorly, its ventral surface bordered by a deep longitudinal groove on each side. Rostral cap and upper lip fused, separated by a shallow groove; posterior margin of rostral cap smooth. Lower lip portion of lower-jaw cushion broadly rectangular, anterior edge weakly convex; superficial layer of lower-jaw cushion covered in large globular papillae. Upper lip covered with unculi. Skin fold around posterolateral corner of mouth large and flap-like, continuous anteriorly with posterolateralmost part of upper lip and rostral cap; outer edge of skin fold smooth or weakly scalloped. Posterior edge of rostral cap, lower lip, skin fold, and globular papillae all densely cov-

ered with tastebuds. Gill membranes joined to isthmus.

Pre-epiphyseal fontanelle small, triangular. Post-epiphyseal fontanelle present, long, irregularly shaped (pinched along its center), separated from pre-epiphyseal fontanelle by wide expanse of frontal. Five infraorbitals (IO1–5). IO1–3 plate-like, IO1 largest of the series, IO4–5 narrow tube-like bones, composed of sensory canal ossification only. Anguloarticular portion of preoperculo-mandibular canal absent. Openings in preopercular portion of preoperculo-mandibular canal 4. Openings in nasal portion of supraorbital canal 3. Openings in parietal portion of temporal canal 3. Supraoccipital portion of temporal canal with 2

openings. Fifth ceratobranchial with a single row of four needle-like teeth. Branchiostegal rays 3; anteriormost branchiostegal ray short, composed of articulatory head only. Anterior swimbladder chamber surrounded by a thick peritoneal tunic, partially enclosed in a bony capsule formed anteriorly by lateral process of 2nd vertebral centrum and laterally by outer arm of os suspensorium. Posterior swimbladder chamber of males vesicular, approximately four times larger than tiny, singular posterior chamber of females.

Dorsal-fin rays iii.9. Anal-fin rays ii.5.i(1) or ii.6(8*). Principal caudal-fin rays 10+9, dorsal procurent rays 6(1) or 7(2), ventral procurent rays 5(2) or 6(1). Pectoral-fin rays v.9.ii(5*), or

Table 1. Selected morphometric and meristic characters for holotype and 5 paratypes of *Psilorhynchus olliei*. Values of holotype included in range.

	holotype	range	mean	SD
Standard length (mm)	48.0	27.9–54.3		
In percent of standard length				
Body depth	24.3	21.6–26.2	24.0	1.9
Head length	22.5	21.5–24.1	22.7	0.9
Pre-dorsal length	49.4	47.6–49.4	48.4	0.6
Pre-pectoral length	21.4	20.6–24.1	22.5	1.3
Pre-pelvic length	51.6	47.5–53.5	51.6	2.3
Pre-anal length	80.0	75.6–81.7	78.9	2.2
Snout-anus	57.1	57.1–64.3	59.8	2.7
Anus-anal fin	22.7	19.2–22.8	20.6	1.3
Caudal peduncle length	11.9	11.2–16.2	13.2	1.8
Caudal peduncle depth	10.0	7.9–10.0	9.4	0.8
Caudal peduncle width	4.6	4.6–5.0	4.8	0.2
Pectoral-fin length	25.8	24.1–26.3	24.9	0.9
Pelvic-fin length	19.3	19.4–22.7	21.1	1.5
Length of last unbranched anal-fin ray	15.8	15.7–18.3	16.6	1.0
Length of last unbranched dorsal-fin ray	24.1	22.5–25.5	24.2	1.3
In percent of head length				
Head width	72	67–72	69.4	1.8
Head depth	50	50–54	51.2	1.6
Eye diameter	32	30–37	32.6	2.4
Snout Length	53	45–53	51.0	3.0
Interorbital width	43	35–43	40.1	2.7
Mouth width	28	27–33	30.1	2.2
Dorsal-fin rays	iii.9	–		
Anal-fin rays	ii.6	ii.5.i or ii.6		
Principal caudal fin-rays	10+9	–		
Pectoral-fin rays	v.9.ii	v.9.ii or v.10.i		
Pelvic-fin rays	ii.7	ii.6.i or ii.7		
Lateral line scales	32	31–32		
Scales between dorsal and pelvic fins	3.5/1/2	3.5/1/2–2.5		
Circumpeduncular scale rows	10	–		
Preanal scale rows	10	9–10		
Predorsal scale rows	11	10–11		

v.10.i(3), pelvic-fin rays ii.7(7*) or ii.6.i(1). Paired fins horizontally placed, pectoral fins larger than pelvic fins. Pectoral fin reaching vertical through dorsal-fin origin when adpressed. Pelvic-fin origin posterior to dorsal-fin origin, insertion opposite second or third branched dorsal-fin ray. Well-developed unculiferous paired-fin pads present along ventral surface of six anteriormost pectoral fin rays (five branched and one unbranched) and two anteriormost pelvic-fin rays. Dorsal fin moderately high, triangular in shape with weakly pointed tip; posterior margin weakly concave. Anal fin small, triangular in shape with weakly pointed tip; posterior margin weakly concave; not reaching caudal-fin base when adpressed. Caudal fin weakly forked, tips of both lobes rounded.

Scales cycloid, large, with several well-developed radii over posterior field of scale body. 31 (1) or 32(7*) scales along lateral line, plus 2 pored scales on base of caudal fin. 3.5/1/2 (4) or 3.5/1/2.5 (2*) transverse scale rows from dorsal-fin origin to pelvic-fin origin. 10 scale rows around caudal peduncle, 10(2) or 11 (4*) predorsal scales, 9(1) or 10(4*) scales between anus and anal-fin origin. Ventral surface between paired fins without scales. Total number of vertebrae 32(1) or 33(2), consisting of 16+16(1), 16+17(1) or 17+16(1) abdominal and caudal vertebrae.

Following description of tubercles based on male holotype only. Small conical tubercles with keratinised tips distributed over entire surface of snout, lateral surface of head, branchiostegal membranes, rostral cap and skin folds lateral to mouth. Tubercles on dorsal surface of head arranged as a series of small, irregular longitudinal ridges. Scales on anterior half of body with similar elongate tubercles, forming a series of small parallel ridges across scale surface. Strip of minute conical tubercles, multiple rows thick, present along dorsal surface of unbranched and anteriormost branched pectoral-fin rays. Single row of minute conical tubercles present along dorsal surface of unbranched and anteriormost branched pelvic-fin rays.

Coloration. In alcohol body background colour light cream (Fig. 1). Occiput dark brown. Dorsal surface between occiput and dorsal fin with two faint brown saddles, first situated closer to occiput than dorsal-fin origin, extending between predorsal scales 4–5, second situated 1–2 scales anterior to dorsal-fin origin, not reaching posteriorly be-

yond base of last unbranched dorsal-fin ray. Dorsal saddles between occiput and dorsal-fin origin most obvious in smaller specimens; anteriormost saddle restricted to an irregular brown blotch in largest specimens examined (including holotype). A small, prominent dark brown spot situated at anteriormost point of dorsal fin. Four or five dark brown saddles along dorsal surface between mid-dorsal fin and caudal-fin base. In specimens with four saddles, first situated below posterior half of dorsal fin (between insertions of branched dorsal-fin rays 3–8/9), second situated approximately midway between dorsal and anal-fin origin, third directly above anterior half of anal fin, fourth situated slightly anterior to caudal-fin base. First or second saddle divided into two narrower saddles in specimens with five post-dorsal saddles. Saddle situated below posterior half of dorsal fin largest of series, extending ventrad 2–3 scale rows on body side and in contact with lateral blotches. Remaining dorsal saddles extending ventrad 1–2 scale rows on body side, without contact to lateral blotches.

Flank with 5 or 6 indistinct round to squarish dark brown blotches arranged in a longitudinal row. In specimens with 5, first situated postero-dorsal to gill opening, extending beneath lateral-line scales 1 or 2–7 or 8, second extending beneath lateral-line scales 8 or 9–13 or 14, third extending beneath lateral-line scales 15 or 16–19 or 20, fourth extending beneath lateral-line scales 21 or 22–27 or 28, fifth situated at base of caudal fin, extending beneath lateral-line scales 30 or 31–32. Fourth blotch described above separated into two smaller dark brown blotches in specimens with lateral blotch counts of 6. Lateral stripe weakly developed or absent. Scales in L1, L+1 and L+2 rows irregularly marked with dark brown pigment in posterior half of body, occluding margin of three or four posteriormost lateral blotches. A row of small dark brown blotches bordering ventral margin of lateral blotches in posterior half of body, formed by pigment at center of scales in L-1 row; length of row variable, consisting typically of 12–14 small dark brown blotches (12 in holotype) and separate from short row of 4 or 5 similar small dark brown blotches in L-1 row between pectoral and pelvic fins. Unscaled base of pectoral fin peppered with small dark brown melanophores, forming indistinct pectoral-base spot. Scales adjacent to pelvic-fin origin densely marked with dark brown melanophores, forming obvious pre-pelvic spot. Lateral surface of snout, lateral



Fig. 3. Schematic illustration of the caudal-fin pigmentation of a single paratype (a) and holotype (b) of *Psilorhynchus olliei*.

surface of head directly ventral to posterior half of eye and skin over opercle densely scattered with dark brown melanophores, forming three dark brown lateral markings on head.

Ventral surface largely devoid of pigment except for dark brown melanophores along anterior edge of rostral cap, small patch of dark brown melanophores situated beneath scales at anal-fin origin and a short line of dark brown melanophores posterior to anus, running along ventral midline from anus to 4th or 5th scale in scale row running between anus and anal-fin origin. Dorsal surface of anterior pectoral- and pelvic-fin rays marked with small dark brown melanophores. Dorsal fin with stripe across center, formed by small aggregations of dark brown melanophores around first branching point



Fig. 4. Kyari Chaung [stream], Kachin State, Myanmar. Type locality of *Psilorhynchus olliei*.

of branched rays and adjacent fin membranes between rays; stripe widest anteriorly, tapered posteriorly. Caudal fin (Fig. 3) with two black blotches, one at the base of each lobe; an irregular black vertical bar across center of fin, formed by small aggregations of melanophores around first branching point of branched rays; a second, more distal, irregular black vertical bar across tips of upper and lower lobes, formed by small aggregations of melanophores around second branching point of branched rays; elongate black marking along lower lobe, formed by dense scattering of melanophores along lateral surface of two lowermost branched principal rays anterior to first branching point, frequently confluent anteriorly with black blotch at base of lower lobe. Anal fin immaculate.

Distribution. *Psilorhynchus olliei* is known currently only from the type locality (Fig. 4) on Kyari Chaung (Ayeyarwaddy drainage) in eastern Myanmar (Fig. 5).

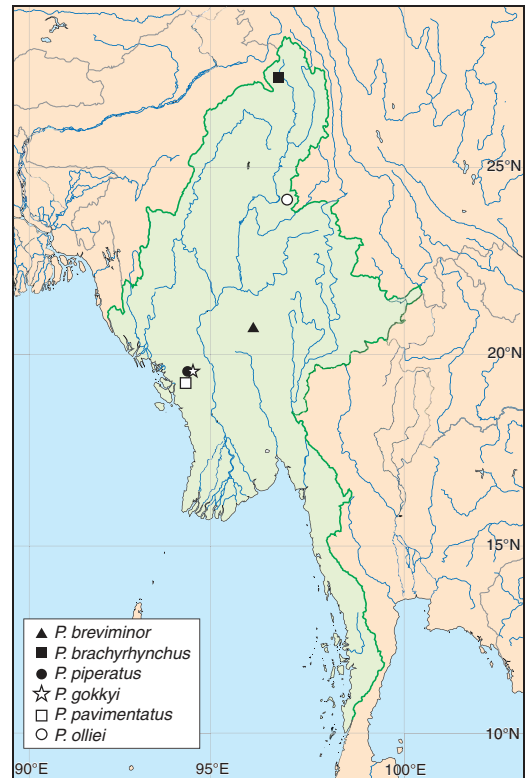


Fig. 5. Distribution of the *Psilorhynchus balitora* group in Myanmar.



Fig. 6. Members of the *Psilorhynchus balitora* species group from Myanmar. **a**, *P. brachyrhynchus*, NRM 40935, holotype, male, 44.9 mm SL; Kachin State: Ma Kyaww Wa Chaung; **b**, *P. breviminor*, BMNH 2015.3.3.177–184, male, 35.7 mm SL; Shan State: Ma Gawe River; **c**, *P. gokkyi*, BMNH 2010.4.1.4.1, holotype, male, 50.7 mm SL; Magwe Division: Pani Chaung; **d**, *P. piperatus*, BMNH 2010.4.14.8, holotype, male, 47.7 mm SL; Magwe Division: Man Chaung; **e**, *P. pavimentatus*, UMMZ 248831, holotype, male, 48.7 mm SL; Rakhine State: Ann Chaung.

Etymology. Named for our friend and colleague Oliver (Ollie) Crimmen. A noun in genitive.

Discussion

Psilorhynchus olliei exhibits all of the characters of the *P. balitora* species group proposed by Conway et al. (2013), including the absence of the articular portion of the preoperculo-mandibular sensory canal, three openings in the parietal portion of the temporal sensory canal, a greatly reduced anteriormost branchiostegal ray that is composed solely of the articulatory head, and a weakly forked caudal fin with rounded lobes, and we assign it with confidence to this group. With the addition of *P. olliei*, the *P. balitora* species group now contains fourteen species, over half of which have been described only in the last ten years (Conway & Mayden, 2008a–b; Conway & Britz, 2010; Conway & Kottelat, 2010; Conway et al., 2013; Shangningam & Vishwanath, 2013a–c), including all of the members of this group known to date from Myanmar (Fig. 6).

The caudal-fin pigmentation of *P. olliei* (Fig. 3), consisting of a black blotch at the base of the upper and lower lobes, two irregular black vertical bars (equivalent to the central and distalmost bars described by Conway & Britz, 2010) and an elongate black marking that extends along much of the lower lobe, is distinctive. Caudal-fin pigmentation is highly variable among species of the *P. balitora* species group, including species with three or fewer irregular black vertical bars, species with small black markings that are peppered over both upper and lower lobes, species with small irregular black markings that are restricted to the outer margins of the upper and lower lobes, and species without caudal-fin pigmentation. The caudal-fin pigmentation of *P. olliei* is most similar to that of *P. gokkyi* and *P. chakpiensis*, both of which exhibit a dark blotch at the base of the upper lobe in combination with an irregular black vertical bar across the center of the fin and irregular black markings along the ventral margin of the lower lobe (small elongate black blotches in *P. gokkyi*; thin black streaks in *P. chakpiensis*). The black pigmentation along the ventral margin of the lower lobe in *P. gokkyi* and *P. chakpiensis* is less developed than that of *P. olliei*, however, and both lack the distalmost irregular black vertical bar that runs across the tips of the upper and lower lobes in *P. olliei*, a feature found otherwise only

in some western members of the *P. balitora* species group (viz. *P. amplexcephalus*, *P. balitora* and *P. nepalensis*; Arunachalam et al., 2007; Conway & Britz, 2010). The body pigmentation of *P. olliei* is also similar to that of *P. gokkyi* and *P. chakpiensis*, which share an irregular scattering of small dark blotches in the L, L+1 and L+2 scale rows in the posterior half of the body (Fig. 5; see figure 1a in Shangningam & Vishwanath, 2013b). The most striking similarity between *P. olliei* and *P. gokkyi* is the presence of an obvious row of small dark blotches, formed by a dense concentration of melanophores located at the center of the scales in the L-1 scale row in the posterior half of the body, which borders the ventral margin of the four or five posteriormost lateral blotches and contrasts sharply with the pale region directly below, along the lowermost part of the body surface. This feature is also present in *P. nepalensis* (see figure 7 in Conway & Mayden, 2008b) but is absent from *P. chakpiensis* (which exhibits an irregular scattering of small dark blotches along the L-1 scale row; see figure 1a in Shangningam & Vishwanath, 2013b) and the majority of the remaining members of the *P. balitora* species group, which exhibit either a diffuse scattering of small melanophores along the scales in this row (e.g., *P. balitora*, *P. brachyrhynchus* [Fig. 5a], *P. maculatus*, *P. ngathanu*, *P. pavimentatus* [Fig. 5e]) or lack pigmentation in addition to that which contributes to the lateral blotches and, if present, the lateral stripe (e.g., *P. breviminor* [Fig. 5b], *P. hamiltoni*, *P. rahmani*). *Psilorhynchus piperatus* also exhibits a row of blotches along the L-1 scale row (Fig. 5d), but in this case the blotches are larger and cover the entire surface of the scales (vs. restricted to the center of the scales in *P. olliei*, *P. gokkyi* and *P. nepalensis*). Whether the row of small dark blotches along the L-1 scale row in *P. olliei*, *P. gokkyi* and *P. nepalensis* is indicative of a close relationship between these three species or not is an open question that can not be answered until a phylogenetic hypothesis for the species-level relationships between members of the *P. balitora* species group is available.

In addition to features of colour pattern, *P. olliei* can be distinguished from the other members of the *P. balitora* species group inhabiting the Ayeyarwaddy drainage of Myanmar and India by a number of meristic and/or morphometric characters. It can be distinguished from *P. brachyrhynchus*, *P. gokkyi*, *P. maculatus* and *P. piperatus* by a lower total number of vertebrae (32–33 vs.

34 in *P. gokkyi*, 35 in *P. brachyrhynchus* and *P. piperatus*, 36 in *P. maculatus*), from *P. chakpiensis*, *P. maculatus* and *P. ngathanu* by its narrower head (head width 67–72 % HL vs. 74–83 in *P. chakpiensis*, 77–83 in *P. maculatus*, 76–100 in *P. ngathanu*), from *P. maculatus* and *P. chakpiensis* by its shorter snout (45–53 % HL vs. 55–68 in *P. maculatus*, 75–81 in *P. chakpiensis*) and from *P. breviminor* by having four (vs. three) openings in the preopercular portion of the preoperculo-mandibular sensory canal. It can be further distinguished from *P. brachyrhynchus* by having a lower modal number of lateral line scales (32, range 31–32 vs. 33, range 32–35), a slightly deeper body (body depth 21.6–26.2 % SL vs. 18.6–21.9 % SL) and a slightly shallower head (head depth 50–54 % SL vs. 54–70), from *P. piperatus* by having more principal rays in the upper caudal-fin lobe (10 vs. 9) and a wider head (67–72 vs. 63–65 % HL), and from *P. maculatus* by having fewer lateral line scales (31–32 vs. 35–36). *Psilorhynchus olliei* can be distinguished from *P. pavementatus*, the only non-Ayeyarwaddy member of the *P. balitora* species group from Myanmar, and the four members of the *P. balitora* species group from Ganga-Brahmaputra drainage (viz. *P. amplicephalus*, *P. balitora*, *P. hamiltoni* and *P. nepalensis*) by having more principal rays in the upper caudal-fin lobe (10 vs. 8–9 in *P. balitora*, 9 in *P. hamiltoni*, *P. nepalensis* and *P. pavementatus*).

Though relatively widespread throughout the western half of the Ayeyarwaddy drainage, *Psilorhynchus* has not been reported previously from the eastern part of this drainage. The discovery of *P. olliei* in the southernmost corner of Kachin State significantly extends the range of the genus within the Ayeyarwaddy drainage and to the doorstep of the Chinese province of Yunnan. Given that other Indo-Burmese taxa with similar distributions to *Psilorhynchus* are also known from the headwaters of the Ayeyarwaddy drainage in Yunnan (e.g., *Dario*, *Devario*; Kullander & Britz, 2002; Fang, 2000) we suspect that *Psilorhynchus* may also be present in this region of China.

Comparative material

For complete list of comparative material examined see Conway et al. (2013), with the addition of the following material: *Psilorhynchus breviminor*: BMNH 2015.3.3.171–174, 4, 33.2–40.5 mm SL; BMNH 2015.3.3.175–176, 2, 30.2–34.0 mm SL; BMNH 2015.3.3.177–184, 8, 27.1–35.7 mm SL; Myanmar: Shan State: Ma Gawe River,

along Kalaw-Thazi highway, close to state border between Mandalay and Shan near village of Nampantet.

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Literature cited

- Arunachalam, M., M. Muralidharan & P. Sivakumar. 2007. *Psilorhynchus amplicephalus*, a new species from Balishwar river of Assam, India. *Current Science*, 92: 1352–1354.
- Arunachalam, M. & M. Muralidharan. 2008. Description of a new species of the genus *Psilorhynchus* (Teleostei: Psilorhynchidae) from a western Ghat stream in southern India. *Raffles Bulletin of Zoology*, 56: 405–414.
- Conway, K. W. 2011. Osteology of the South Asian genus *Psilorhynchus* McClelland, 1839 (Teleostei: Ostariophysi: Psilorhynchidae) with investigation of its phylogenetic relationships within the order Cypriniformes. *Zoological Journal of the Linnean Society*, 163: 50–154.
- Conway, K. W. & R. Britz. 2010. Three new species of *Psilorhynchus* from Myanmar (Ostariophysi: Psilorhynchidae). *Zootaxa*, 2616: 1–16.
- Conway, K. W. & M. Kottelat. 2010. Two new species of torrent minnow (Ostariophysi: Psilorhynchidae: *Psilorhynchus*) from Western Myanmar. *Raffles Bulletin of Zoology*, 58: 259–267.
- Conway, K. W. & R. L. Mayden. 2008a. *Psilorhynchus breviminor*, a new species of psilorhynchid from Myanmar (Ostariophysi: Psilorhynchidae). *Ichthyological Exploration of Freshwaters*, 19: 111–120.
- Conway, K. W. & R. L. Mayden. 2008b. Two new species of *Psilorhynchus* (Ostariophysi: Psilorhynchidae) with the redescription of *P. balitora*. *Ichthyological Exploration of Freshwaters*, 19: 215–232.
- Conway, K. W., D. E. Dittmer, L. E. Jazisek & H. H. Ng. 2013. On *Psilorhynchus sucatio* and *P. nudithoracicus* with the description of a new species of *Psilorhynchus* from northeastern India (Teleostei: Psilorhynchidae). *Zootaxa*, 3686: 201–243.
- Fang, F. 2000. Barred *Danio* species from the Irrawaddy River drainage (Teleostei, Cyprinidae). *Ichthyological Research*, 47: 13–26.
- Fink, S. V. & W. L. Fink. 1981. Interrelationships of ostariophysan fishes (Teleostei). *Zoological Journal of the Linnean Society*, 72: 297–353.

- Hamilton, F. 1822. An account of the fishes found in the river Ganges and its branches. Constable, Edinburgh. 405 pp.
- Kullander, S. O. & R. Britz. 2002. Revision of the family Badidae (Teleostei: Perciformes), with description of a new genus and ten new species. *Ichthyological Exploration of Freshwaters*, 13: 295–372.
- Lalramliana, B. Solo, S. Lalronunga & Lalnuntluanga. 2014. *Psilorhynchus khopai*, a new fish species (Teleostei: Psilorhynchidae) from Mizoram, northeastern India. *Zootaxa*, 3793: 265–272.
- Nebeshwar, K., K. Bagra & D. N. Das. 2007. A new species of the cyprinoid genus *Psilorhynchoides* Yazdani et al. (Cypriniformes: Psilorhynchidae) from Arunachal Pradesh, India. *Zoos' Print Journal*, 22: 2632–2636
- Shangningam, B. & W. Vishwanath. 2013a. *Psilorhynchus maculatus*, a new species of torrent minnow from the Chindwin basin, Manipur, India (Teleostei: Psilorhynchidae). *Ichthyological Exploration of Freshwaters*, 24: 57–62.
- Shangningam, B. & W. Vishwanath. 2013b. A new species of *Psilorhynchus* (Teleostei: Psilorhynchidae) from the Chindwin basin of Manipur, India. *Zootaxa*, 3694: 381–390.
- Shangningam, B. & W. Vishwanath. 2013c. *Psilorhynchus ngathanu*, a new torrent minnow species (Teleostei: Psilorhynchidae) from the Chindwin Basin, Manipur, India. *Ichthyological Research*, 61: 27–31.
- Taylor, W. R. & G. G. Van Dyke. 1985. Revised procedure for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybium*, 9: 107–119.

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