

TWO NEW SPECIES OF TORRENT MINNOW (OSTARIOPHYSI: PSILORHYNCHIDAE) FROM WESTERN MYANMAR

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ABSTRACT. – Two species of *Psilorhynchus* from the headwaters of the Ann Chaung drainage, central Rakhine State, Myanmar, are described. *Psilorhynchus melissa*, new species, differs from all its congeners by a unique colour pattern, including a dark band running along the distal edge of the dorsal fin and an intense scattering of dark melanophores along the anterior edge of the paired fins. *Psilorhynchus pavimentatus*, new species, differs from all its congeners by exhibiting sexual dimorphism of its pectoral fins, and from all similar looking species by a combination of characters, including the absence of scales from the midventral region between pectoral fins, a higher number of principal rays in the lower caudal-fin lobe (9 vs. 7-8) and aspects of its colour pattern, including the absence of vertical bars on the caudal fin.

KEY WORDS. – Cypriniformes, *Psilorhynchus melissa*, *Psilorhynchus pavimentatus*, new species, Rakhine State.

INTRODUCTION

Members of the genus *Psilorhynchus* are small cypriniform fishes, commonly referred to as torrent minnows, that inhabit the fast to swift flowing rivers and streams of the Ganga-Brahmaputra drainage of northeastern India, Nepal, Bangladesh and southeastern Tibet, the tributary streams of the Thunga River, Peninsular India, the Ayeyarwaddy drainage of northern and central Myanmar, and the Ataran River basin of southern Myanmar (Rainboth, 1983; Conway & Kottelat, 2007; Arunachalam & Muralidharan, 2008). The genus is diagnosed (following Rainboth, 1983) by a number of characters, including: an arched back and flattened ventral surface, a small inferior mouth, devoid of barbels, gill-membranes joined broadly to isthmus with aperture extending ventrally to base of pectoral fin, paired fins inserted horizontally, large scales, 31-50 in lateral line, ii-iii.7-9 dorsal-fin rays, ii-iii.5 anal-fin rays, iv-x.9-12 pectoral fin rays, ii.7 pelvic-fin rays, 5th ceratobranchial with 4 pharyngeal teeth, arranged in a single row, and at least 8 scale rows separating anus from anal fin origin.

Recently, specimens of *Psilorhynchus* were collected from the western slopes of the Rakhine Yoma (Rakhine State, Myanmar) at the headwaters of the Ann Chaung drainage

and made available via the aquarium-fish trade. These specimens appeared to belong to two different species, which on comparison with other known members of the genus were shown to represent two undescribed species. The purpose of this paper is to describe these two new species from western Myanmar.

MATERIALS AND METHODS

Measurements and counts follow Conway & Kottelat (2007). Lateral line scales are counted from the anteriormost scale (the first scale to bear a canal) to the posteriormost scale of the caudal peduncle. Lateral line scale counts do not include those canal bearing scales at the base of the caudal fin, which are counted separately. The last two branched rays of the dorsal and anal fins that articulate with the same pterygiophore are counted separately. Selected specimens were cleared and doubled stained (c&s) for bone and cartilage study (Taylor & van Dyke, 1985). All fin-ray counts were confirmed through the examination of cleared and stained specimens. Vertebral counts are based on c&s specimens and include the four Weberian centra and the terminal compound centrum (Fink & Fink, 1981). Collection abbreviations: CMK, Collection of Maurice Kottelat, Cornol; KU, University of Kansas Natural

History Museum and Biodiversity Research Center, Kansas; UMMZ, University of Michigan Museum of Zoology, Ann Arbor; ZRC, Zoological Reference Collection, Raffles Museum of Biodiversity Research, National University of Singapore.

TAXONOMY

Psilorhynchus melissa, new species

(Figs. 1–2)

Material examined. – Holotype: UMMZ 248829, 47.6 mm SL; Myanmar: Rakhine state, headwaters of Ann Chaung drainage, approx. 19 km East by South of Ann (19°43'N 94°11'E), Than Kyaw Toe, 5 Apr.2008.

Paratypes: UMMZ 248830, 2 (1 c&s), 34.9–49.8 mm SL; CMK 21507, 1, 35.3 mm SL; same data as holotype.

Diagnosis. – A species of *Psilorhynchus* most similar to *P. robustus* and *P. gracilis*, sharing with those species a dark reticulate pattern over the dorsal and lateral surfaces of the body. *Psilorhynchus melissa* is distinguished from *P. robustus* and all other species of the genus by the presence (vs. absence) of a dark band running along the distal edge of the dorsal fin and by the presence of intense (vs. light) scattering of dark melanophores along the anterior edge of the paired fins. It is further distinguished from *P. robustus* by its longer, narrower head (head length 22–26% SL vs. 20–22, head width 62–65% HL vs. 67–73), and narrower mouth (mouth width 24–28% HL vs. 28–31), from all other species of the genus, excluding *P. robustus* and *P. gracilis*, by the presence (vs. absence) of a dark reticulate pattern over the dorsal and lateral surfaces of the body, and from all other species of the genus, excluding *P. robustus*, by the presence (vs. absence) of an indistinct lateral streak, formed by a series of small dark spots between the pores of the lateral line canal.

In addition to *P. robustus*, two other species of *Psilorhynchus* are known from Myanmar, viz. *P. breviminor*, and the sympatric *P. pavementatus*. In addition to the characters listed above, *P. melissa* is easily distinguished from these two by its shallower caudal peduncle (7–8 % SL vs. 9–10 in both *P. breviminor* and *P. pavementatus*), and from *P. pavementatus* by a higher number of principal rays in the upper caudal fin lobe (10 vs. 9).

Description. – General body shape as in Figs. 1, 2. Morphometric data are listed in Table 1 and meristic characters in Table 2. Body high, greatest depth at dorsal-fin origin. Dorsal profile arched. Ventral profile straight from lower jaw to anal-fin origin, dorsally inclined from anal-fin origin to caudal-fin base.

Head and eye large, mouth inferior, snout rounded, ventral surface bordered by a deep longitudinal groove on each side. Rostral cap and upper lip fused, separated by a shallow groove. Lower jaw covered by a thick squarish ‘cushion’ that can be folded backwards. ‘Cushion’ composed of two

adnate tissue layers: a deeper layer, the lower lip, smooth, not continuous with upper lip around corner of mouth; and a superficial layer, papillated, thick, continuous with skin of isthmus and connected with rostral cap by a narrow strip of skin around corner of mouth, extended posteriorly and broadened as a ridged, slightly papillated skin fold at posterolateral most corner of mouth. Upper lip with numerous, horizontally arranged rows of unculi. Large, rectangular pre-epiphysial and post-epiphysial fontanelles, separated by a narrow strut of frontal bone directly dorsal to the epiphysial bar. Five infraorbital bones (IO1–5); IO1–3 platelike; IO4–5, reduced in width, composed of sensory canal ossification only. Gill membranes joined to isthmus. Fifth ceratobranchial with four needle-like pharyngeal teeth, arranged in a single row. Branchiostegal rays 3. Anterior swimbladder chamber surrounded by a thick peritoneal tunic and 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 greatly reduced in size.

Dorsal fin with iii.9 rays. Anal fin with ii.6 rays. Principal caudal-fin rays 10+9, dorsal procurrent rays 7, ventral procurrent rays 6. Pelvic-fin rays ii.7, pectoral-fin rays v.11. Paired fins large, horizontally placed. Pectoral fin reaching vertical through dorsal-fin origin, reaching to two or three scale rows anterior to pelvic-fin origin when depressed. Pelvic-fin origin posterior to dorsal-fin origin, insertion opposite 4th branched dorsal-fin ray. Skin on ventral surface of unbranched pectoral- and pelvic-fin rays thickened and covered in a layer of unculi, forming adhesive pads. Dorsal fin high, tip rounded, posterior margin weakly concave. Anal fin short, tip pointed, posterior margin concave, reaching to vertical through middle of caudal peduncle when depressed.



Fig. 1. *Psilorhynchus melissa*, UMMZ 248829, holotype, 47.6 mm SL; Myanmar: Rakhine state, headwaters of Ann Chaung drainage. Photo: Gary W. Lange.

Table 1. Morphometric characters of *Psilorhynchus melissa* (holotype plus 3 paratypes) and *P. pavimentatus* (holotype and six paratypes). Holotype included in range.

	<i>Psilorhynchus melissa</i>				<i>Psilorhynchus pavimentatus</i>			
	Holotype	Range	Mean	St. Dev.	Holotype	Range	Mean	St. Dev.
Standard Length	47.6	35.5–48.8	48.7	43.0–50.4				
Percent of standard length								
Body depth	19.7	15.6–19.7	17.5	1.8	20.1	17.7–23.0	20.4	1.9
Head length	25.8	22.1–25.8	23.2	1.8	23.0	21.2–24.8	22.8	1.2
Pre-dorsal length	52.7	50.1–53.6	51.7	1.7	50.1	49.4–51.4	50.9	1.6
Pre-pectoral length	25.4	21.5–25.4	23.0	1.7	20.5	20.5–23.9	21.8	1.3
Pre-pelvic length	53.8	52.7–53.9	53.8	0.9	48.3	48.3–53.7	51.8	2.3
Pre-anal length	80.4	79.1–82.0	80.4	1.4	80.7	80.7–85.3	82.4	1.5
Snout-anus	61.8	61.8–62.5	62.1	0.3	58.1	58.1–64.9	60.9	2.6
Anus-anal fin	19.5	17.8–19.9	19.0	0.9	21.0	18.1–23.6	21.0	2.0
Caudal peduncle length	12.4	10.8–12.4	11.5	0.7	11.5	9.8–11.5	11.0	0.6
Caudal peduncle depth	7.8	7.1–7.8	7.5	0.3	9.4	9.0–10.3	9.4	0.7
Caudal peduncle width	4.2	3.7–4.2	4.0	0.3	3.5	3.4–5.4	4.0	0.7
Pectoral-fin length	23.9	23.0–24.6	24.0	0.7	27.3	25.3–29.9	27.1	1.5
Pelvic-fin length	18.3	18.3–19.2	18.7	0.5	23.8	20.3–23.8	22.0	1.1
Length of last unbranched anal-fin ray	13.7	13.0–13.8	13.5	0.3	18.9	16.5–19.5	18.2	1.2
Length of last unbranched dorsal-fin ray	21.2	20.1–22.3	21.2	0.9	24.6	21.6–25.3	23.4	1.4
Percent of head length								
Head width	61.8	61.8–65.4	63.7	1.5	68.8	64.2–71.8	68.0	3.0
Head depth	48.8	48.8–55.1	51.6	2.8	57.1	54.5–59.0	56.6	2.2
Eye diameter	32.5	29.5–34.6	33.2	3.0	25.9	25.9–28.4	27.4	1.0
Snout Length	52.8	48.7–53.8	51.4	2.4	50.0	50.0–55.6	52.7	2.2
Interorbital width	36.6	34.6–38.2	36.3	1.5	41.1	37.9–42.7	40.4	1.9
Mouth width	24.4	24.4–28.2	26.2	1.7	28.6	26.8–31.3	29.6	1.9

Anus positioned 1–2 scales posterior to insertion of pelvic fins. Scales large, 32 (2), 33 (1) or 34 (1) along lateral line, plus 2 (2) or 3 (2) on base of caudal fin. 3.5/1/2 transverse scale rows from dorsal-fin origin to pelvic-fin origin, 10 around caudal peduncle, 11 (3) or 12 (1) predorsal scales, 10 (1) or 11 (3) scales between anus and anal-fin origin. Scales absent from midventral surface between pectoral fins, anterior to pelvic-fin origin. Total number of vertebrae 34, consisting of 18+16 abdominal and caudal vertebrae.

Following based on holotype only: Small conical tubercles with keratinised tip distributed over lateral surface of head ventral to lower margin of orbit. Similar sized tubercles, without keratinised tip, distributed over lateral and dorsal surface of snout and interorbital region. Tubercles distributed over dorsal surface of head, posterior to interorbital region, arranged as a series of small irregular ridges. Scales on anterior half of body with small conical tubercles on posterior edge. Strip of minute conical tubercles, several rows thick, present along dorsal surface of unbranched pectoral-fin rays. Pelvic fins and unpaired fins without tubercles. Smaller paratypes with small conical tubercles, without keratinised tips, present over dorsal, ventral and lateral surfaces of head.

Colouration. – In alcohol body background light cream. Scales on flanks and dorsal surface edged with dark pigment forming reticulate pattern. Dark pigment between pores of lateral line, forming an indistinct lateral streak. Occiput and dorsal surface of snout dark. Dorsal surface between occiput and dorsal-fin origin with two saddles, first situated closer to occiput than dorsal-fin origin, second situated at dorsal fin origin. Small prominent dark spot at anteriormost point of dorsal fin. Four distinctive saddles along dorsal surface posterior to dorsal-fin origin. First situated between insertions of branched dorsal-fins rays 6–9, second directly between dorsal fin and anal-fin origin, third situated at start of caudal peduncle, fourth situated anterior to caudal-fin base. Saddles decreasing in size posteriorly, extending downwards two to three scale rows on body side and connecting with round to squarish dark blotches arranged in longitudinal row on flank.

Flank with 5–7 indistinct round to squarish dark blotches, most prominent in smaller specimens, arranged in a longitudinal row, parallel to lateral line canal. First blotch situated posterodorsal to opercular opening, close to base of first indistinct saddle. Blotches posterior to first irregularly placed along flank. A broad swath of small melanophores at base of pectoral fin. Lateral surface of head speckled with small melanophores. Large melanophores forming a short stripe, most prominent in smaller specimens, between tip of snout and anterior edge of eye.

Ventral surface largely devoid of pigment except for a dense scattering of melanophores on anterior edge of rostral cap and a short line of melanophores, posterior to anus, running along ventral midline and terminating 3–4 scale rows post anus.

Anteriormost pectoral- and pelvic-fin rays with dense scattering of dark melanophores along interradi al membranes

of unbranched rays, most prominent on pectoral fins of holotype. Dorsal fin with dark pigment band running along distal edge. Anteriormost edge of dorsal fin of holotype edged in dark pigment. Caudal fin with prominent irregular dark markings along outer edges of upper and lower lobes. Anal fin with light scattering of melanophores along interradi al membranes between fin rays, most prominent anteriorly.

In life (Fig. 2), body background colour olive yellow. Round to squarish blotches on flank and fin pigmentation jet black. Dorsal saddles barely discernable. Base of paired fins and dorsal surface of unbranched paired-fin rays with a light



Fig. 2. *Psilorhynchus melissa*, live coloration, part of the type series; Myanmar: Rakhine state, headwaters of Ann Chaung drainage. Photo: Kamphol Udomritthiruj.



Fig. 3. Distribution of *Psilorhynchus breviminor*, *P. melissa*, *P. pavementatus* and *P. robustus* in Myanmar.

golden-yellow hue. Central part of scales along lateral body surface with an iridescent golden-yellow sheen.

Distribution and habitat. – Known only from the type locality in the headwaters of Ann Chaung drainage (Fig. 3). Precise habitat information is not yet available for this locality except that the new species was collected together with a number of other new fish species, including the recently described *Akysis vespertinus* (Ng, 2008) and *Psilorhynchus pavimentatus*, which is described below.

Etymology. – *melissa* (μέλισσα) is the classical Greek name of the honey bee, allusion to the black and yellow color pattern of live individuals. A noun in apposition.

***Psilorhynchus pavimentatus*, new species**
(Figs. 4–5)

Material examined. – Holotype: UMMZ 248831, 48.7 mm SL; Myanmar: Rakhine state, headwaters of Ann Chaung drainage, approx. 19 km East by South of Ann (19°43'N 94°11'E), Than Kyaw Toe, 5 Apr. 2008.

Paratypes: CMK 21506, 2, 46.7–50.4 mm SL; same data as holotype. UMMZ 248832, 2 (1 c&s), 45.1–43.0 mm SL; ZRC 52026, 2, 44.7–50.1 mm SL; same data as holotype.

Diagnosis. – A species of *Psilorhynchus* most similar to *P. amplicephalus*, *P. balitora* and *P. nepalensis*, sharing with those species a low number of rays in the upper caudal fin lobe and in terms of general appearance. *Psilorhynchus pavimentatus* is distinguished from these species and all other members of the genus, by presence of sexually dimorphic pectoral fins, which are much longer in males than in females (vs. pectoral fins of both sexes equal in size or only slightly longer in males). *Psilorhynchus pavimentatus* is further distinguished from *P. amplicephalus*, *P. balitora* and *P. nepalensis* by its higher number of principal rays in the lower caudal-fin lobe (9 vs. 8 in *P. amplicephalus* and *P. nepalensis*, 7–8 in *P. balitora*), from *P. balitora* by the absence (vs. presence) of scales from the midventral region between pectoral fins.

Three other species of *Psilorhynchus* are known from Myanmar, viz. *P. breviminor*, *P. robustus*, and the sympatric *P. melissa*. *Psilorhynchus pavimentatus* is easily distinguished from these three species by its lower number of principal rays in the upper caudal-fin lobe (9 vs. 10).

Description. – General body shape as in Figures 4–5. Morphometric data are listed in Table 1 and meristic characters in Table 2. Body high, greatest depth at dorsal-fin origin. Dorsal profile arched, rising gradually to dorsal-fin origin, sloping gently towards caudal peduncle. Ventral profile straight from lower jaw to caudal-fin base.

Head and eye large, mouth inferior, snout rounded, ventral surface bordered by a deep longitudinal groove on each side. Rostral cap and upper lip fused, separated by a shallow groove. Lower jaw covered by a thick squarish ‘cushion’

that can be folded backwards. ‘Cushion’ composed of two adnate tissue layers: a deeper layer, the lower lip, smooth, not continuous with upper lip around corner of mouth; and a superficial layer, papillated, thick, continuous with skin of isthmus and connected with rostral cap by a narrow strip of skin around corner of mouth, extended posteriorly and broadened as a ridged, slightly papillated skin fold at posterolateral most corner of mouth. Large, rectangular pre-epiphysial fontanelle and smaller, irregularly shaped post-epiphysial fontanelle, widely separated from pre-epiphysial fontanelle by large expanse of frontal bone. Five infraorbital bones (IO1–5); IO1–3 platelike; IO4–5, reduced in width, composed of sensory canal ossification only. Gill membranes joined to isthmus. Fifth ceratobranchial with four needle-like pharyngeal teeth, arranged in a single row. Branchiostegal rays 3, anteriormost ray greatly reduced in size. Anterior swimbladder chamber surrounded by a thick peritoneal tunic and 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 greatly reduced in size.

Dorsal fin with iii.9 rays. Anal fin with ii.6 rays. Principal caudal-fin rays 9+9, dorsal procurent rays 6 (1), ventral procurent rays 5 (1). Pelvic-fin rays ii.7, pectoral-fin rays vi.9 (1), vi.10 (3) or v.11 (3). Paired fins large, horizontally placed. Pectoral fin reaching vertical through dorsal-fin origin, reaching to pelvic-fin origin (in males) or two scale rows anterior to pelvic-fin origin (in females) when depressed. Pelvic-fin origin posterior to dorsal-fin origin, insertion opposite 2nd branched dorsal-fin ray. Skin on ventral surface of unbranched pectoral- and pelvic-fin rays thickened and covered in a layer of unculi, forming adhesive pads. Dorsal



Fig. 4. *Psilorhynchus pavimentatus*, UMMZ 248831, holotype, 48.7 mm SL; Myanmar: Rakhine state, headwaters of Ann Chaung drainage. Photo: Gary W. Lange.

Table 2. Meristic data of *Psilorhynchus melissa* (holotype plus three paratypes; vertebral counts obtained from single c&s specimen) and *P. pavimentatus* (holotype plus 6 paratypes; vertebral counts obtained from single c&s specimen). Data obtained from holotype listed in parentheses after range.

	<i>Psilorhynchus melissa</i>	<i>Psilorhynchus pavimentatus</i>
Dorsal-fin rays	iii.9	iii.9
Anal-fin rays	ii.6	ii.6
Principal caudal-fin rays	10+9	9+9
Pelvic-fin rays	ii.7	ii.7
Pectoral-fin rays	v.11	v–vi.9–11 (vi.9)
Lateral-line scales	32–34 (34)	31–33 (31)
Scales between dorsal to pelvic fins	3.5/1/2	3.5/1/2
Circumpeduncular scales	10	10
Predorsal scale rows	11–12 (11)	10–12 (11)
Preanal scale rows	10–11 (11)	10–11 (11)
Abdominal vertebrae	18	18
Caudal vertebrae	16	16
Total vertebrae	34	34

fin high, tip rounded to slightly pointed, posterior margin weakly concave. Anal fin long, tip pointed, posterior margin straight, reaching to base of caudal fin when depressed.

Anus positioned 1–2 scales posterior to insertion of pelvic fins. Scales large, 31 (2), 32 (3) or 33 (2) along lateral line, plus 2 (3) or 3 (4) on base of caudal fin. 3.5/1/2 transverse scale rows from dorsal-fin origin to pelvic-fin origin, 10 around caudal peduncle, 10 (1), 11 (3) or 12 (3) predorsal scales, 10 (2) or 11 (5) scales between anus and anal-fin origin. Scales absent from midventral surface between pectoral fins, anterior to pelvic-fin origin. Total number of vertebrae 34, consisting of 18+16 abdominal and caudal vertebrae.

Small conical tubercles with keratinised tip distributed over entire surface of snout, lateral surface of head and posterior most tip of rostral cap. Tubercles on dorsal surface of head without keratinized tip, arranged as a series of small ridges along anterior-posterior body axis. Scales on anterior half of body with small conical tubercles with keratinised tip arranged in rows along apical ridges. Conical tubercles on head surfaces and scales on anterior half of body more greatly developed in males. Strip of minute conical tubercles, 2–3 rows thick, present along dorsal surface of unbranched pectoral-fin rays in males only. Single row of minute conical tubercles present along lateral surface of anteriormost dorsal-fin rays of males only.

Colouration. – In alcohol, body background light cream. Occiput dark. Dorsal surface between occiput and dorsal-fin origin with two faint saddles, first situated closer to occiput than dorsal-fin origin, second situated anterior to dorsal-fin origin. Small, prominent dark spot at anteriormost point of dorsal fin. Four distinctive saddles along dorsal surface between dorsal-fin origin and caudal-fin base. First saddle situated between insertions of branched dorsal-fins rays 3–6, second directly posterior to dorsal fin, third directly above

anal-fin origin, fourth situated anterior to caudal-fin base. Saddles decreasing in size posteriorly, extending downwards two to three scale rows on body side and connecting with or terminating between round to squarish dark blotches arranged in longitudinal row on flank.

Flank with 6–7 indistinct round to squarish dark blotches, arranged in a longitudinal row, becoming increasingly more square-like posteriorly. Large scale at pelvic-fin origin, anterior to pelvic axillary scale, with dense speckling of small melanophores forming an indistinct pre-pelvic spot. Lateral surface of head speckled with small melanophores. Large melanophores forming a short stripe between tip of snout and anterior edge of eye and small spot directly below eye and over center of opercle.

Ventral surface largely devoid of pigment, except for melanophores on anterior edge of rostral cap, a small patch of melanophores situated beneath scales at anal-fin origin, a short line of melanophores, posterior to anus, running along ventral midline and terminating 3–4 scale rows post anus, continuing along base of caudal peduncle. Broad swath of small melanophores at base of pectoral fin. Anteriormost pectoral- and pelvic-fin rays faintly lined with small dark melanophores. Base of dorsal-fin rays lightly speckled with small melanophores. Caudal fin with faint irregular markings, most prominent at base of upper and lower lobes. Anal fin hyaline.

In life (Fig. 5), body background light grey to light cream. Indistinct round to squarish dark blotches, arranged in a longitudinal row on flank, light brown to charcoal grey. Dorsal saddles light brown. Pigmentation on median and paired fins faint.

Distribution and habitat. – Know only from the type locality in the headwaters of Ann Chaung drainage (Fig. 3). See under *P. melissa* above.



Fig. 5. *Psilorhynchus pavementatus*, live coloration, part of the type series; Myanmar: Rakhine state, headwaters of Ann Chaung drainage. Photo: Kamphol Udomritthiruj.

Etymology. – From the Latin *pavimentatus*, furnished with a pavement, paved, in reference to the colour pattern of this species. An adjective.

DISCUSSION

The two new species are placed in the genus *Psilorhynchus* (sensu Rainboth, 1983) based on the following combination of characters: back arched, ventral surface flattened; mouth small and inferior; barbels absent; gill-membranes joined broadly to isthmus with aperture extending ventrally to base of pectoral fin; paired fins inserted horizontally; scales large, 31–33 or 32–34 in lateral line; dorsal fin with iii.9

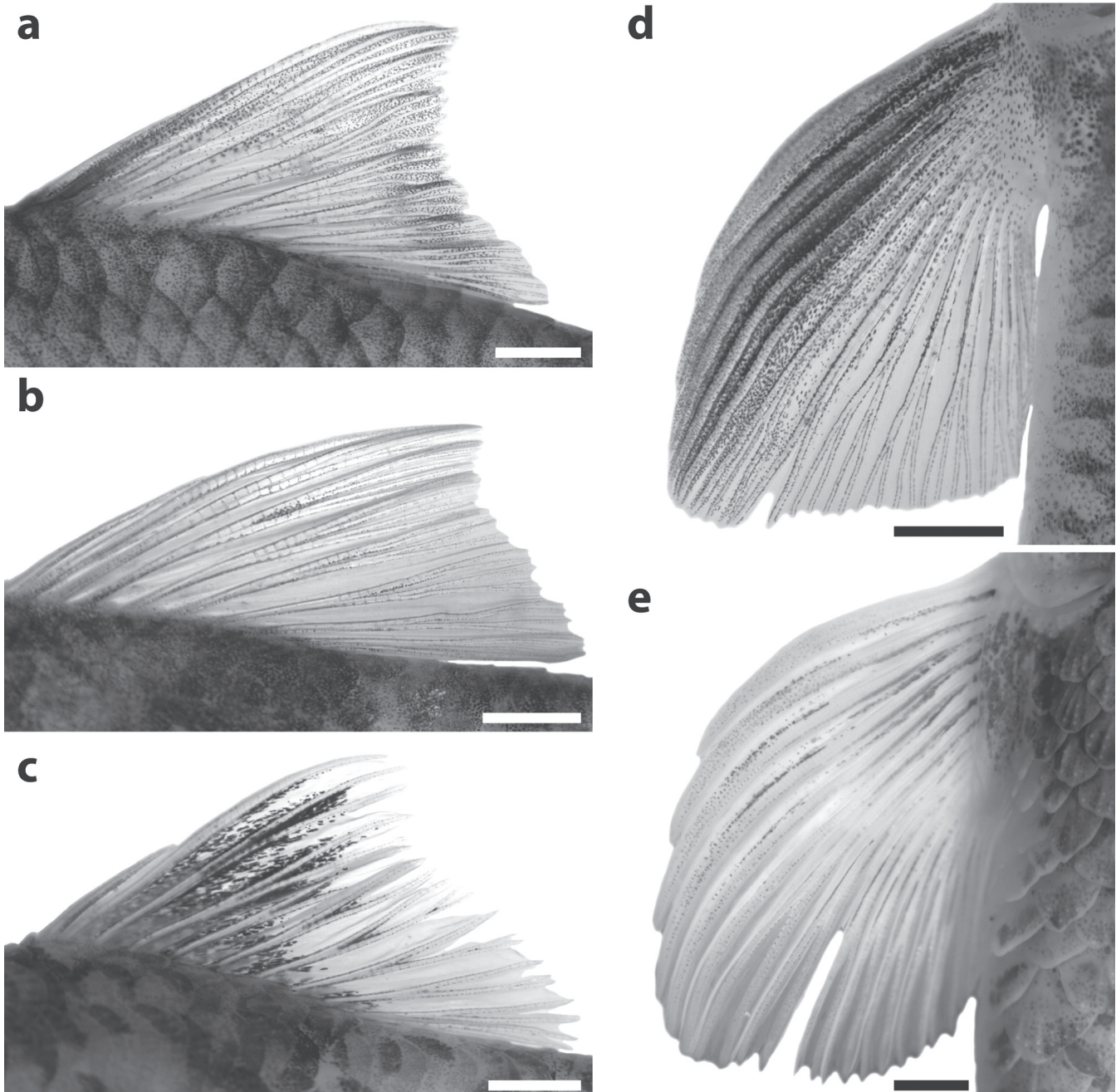


Fig. 6. Dorsal (a–c; lateral view) and pectoral (d–e; dorsal view) fins of *Psilorhynchus* species: a, d, *P. melissa*, UMMZ 248829, holotype, 47.6 mm SL. b, *P. pavementatus*, UMMZ 248831, holotype, 48.7 mm SL. c, e, *P. balitora*, KU 40375, 38.5 mm SL. Scale bars = 1 mm.

rays, anal fin with iii.6 rays, pectoral with v.11 or vi.9–11 rays, pelvic fin with ii.7 rays; 5th ceratobranchial with 4 pharyngeal teeth, arranged in a single row; 10–11 scale rows between anus and anal-fin origin. *Psilorhynchus melissa* is easily distinguished from all other species of *Psilorhynchus* by the presence (vs. absence) of a dark band running along the distal edge of the dorsal fin and by the presence of an intense (vs. light) scattering of dark melanophores along the anterior edge of the paired fins. *Psilorhynchus pavimentatus* is distinguished from all other species of the genus by its sexually dimorphic pectoral fins, which are much longer in males than in females. In both sexes the pectoral fins reaches the vertical through the dorsal-fin origin. In males, however, the posteriormost point of the pectoral fin reaches the pelvic-fin origin when depressed against the body side. In females the posteriormost tip of the depressed pectoral fin reaches two scale rows anterior to pelvic-fin origin. In the other species of *Psilorhynchus* the pectoral fins of both sexes are roughly equal in size or only slightly longer in males.

Though the phylogenetic relationships amongst species of *Psilorhynchus* are currently unknown (Conway & Kottelat, 2007) we suggest that the *P. melissa* and *P. pavimentatus* are each more closely related to other species of *Psilorhynchus* than they are to each other. Based on features of its colour pattern (including the presence of a dark reticulate pattern over the dorsal and lateral surfaces of the body and an indistinct lateral streak, formed by a series of small dark spots between the pores of the lateral line canal), *P. melissa* is more similar in general appearance to *P. robustus* (an inhabitant of the Ataran River drainage) and *P. gracilis* (Ganges-Brahmaputra drainage) than to other species of the genus. Additionally, *P. melissa*, *P. robustus* and *P. gracilis* also exhibit an osteological feature that may be indicative of a close relationship between the three: a hiatus between hypural 1 and the compound centrum (Fig. 7a). In other species of *Psilorhynchus*, as in the majority of other cypriniforms, the proximal tip of hypural 1 is fused to the proximal tip of the parhypural and this singular fused element contacts the ventral edge of the compound centrum (Fig. 7b). Fink & Fink (1981) considered the presence of a hiatus between hypural 1 and the compound centrum a derived feature of characiform fishes. Based on the plesiomorphic arrangement of hypural 1 in other species of *Psilorhynchus* and other cypriniforms we interpret the presence of such a hiatus as a shared and derived character, indicative of a close relationship between *P. melissa*, *P. gracilis* and *P. robustus*.

The relationships of *P. pavimentatus* to other species of *Psilorhynchus* are less clear at present. This species exhibits two derived features that it shares with a number of other species of *Psilorhynchus*: a reduced number of principal rays in the upper caudal fin lobe (a feature that it shares with *P. amplexcephalus* [Barak river, Assam], *P. balitora* [Ganges-Brahmaputra], *P. nepalensis* [Ganges] and *P. sucatio* [Ganges-Brahmaputra]) (Fig. 7b), and a reduced anteriormost branchiostegal ray (shared with *P. balitora*, *P. breviminor* [Irrawaddy], *P. rahmani* [Karnaphuli, Chittagong] and *P. sucatio* [it is unclear at present whether *P. nepalensis* also exhibits a reduced anteriormost branchiostegal ray

as cleared and stained material is not available for this species]). The plesiomorphic principal caudal-fin ray count in cypriniforms is 10+9 (Smith, 1992; Roberts, 2007) and numerous cypriniform taxa (particularly non-cyprinid cypriniformes) have undergone a reduction in the number of rays in the upper and/or the lower lobe (this reduction is most evident in members of the family Cobitidae, which may have as few as 6+6 principal caudal-fin rays; Sawada, 1982). Though the reduction in the number of principal caudal-fin rays in members of *Psilorhynchus* may not be as extreme as it is in other cypriniform taxa, its occurrence is noteworthy and may provide support for a monophyletic group within *Psilorhynchus*. The presence of a reduced anteriormost branchiostegal ray appears to be uniquely shared by the aforementioned species of *Psilorhynchus* amongst cypriniforms and we tentatively interpret this character as evidence of a close relationship between those species,

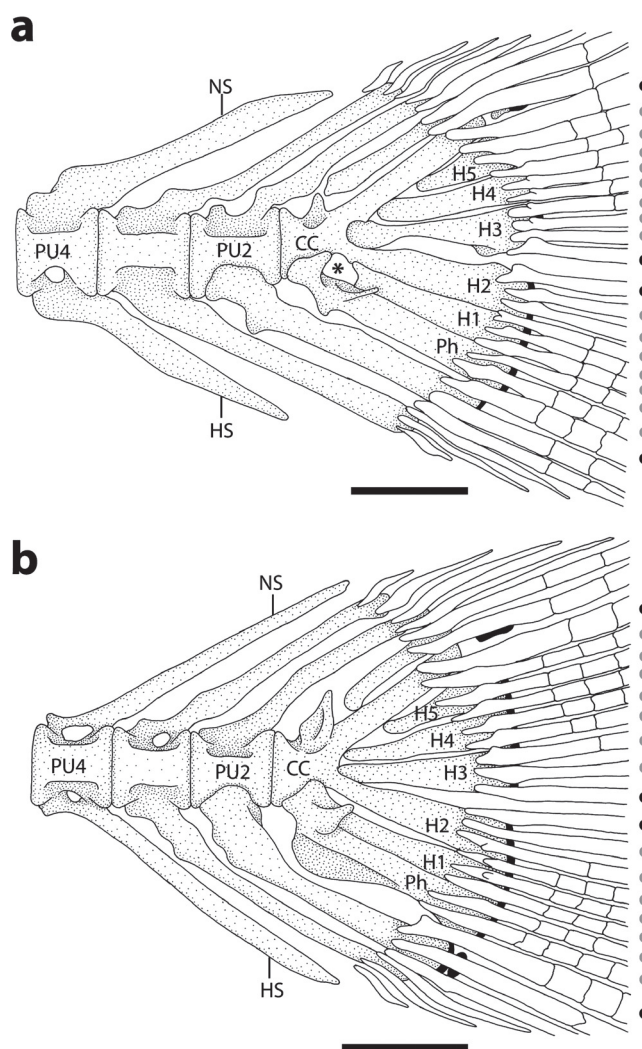


Fig. 7. Caudal-fin skeleton of cleared and stained specimens (left side in lateral view) of: a, *Psilorhynchus melissa*, UMMZ 248830, paratype, 47.6 mm SL. b, *P. pavimentatus*, UMMZ 248832, paratype, 48.7 mm SL. Scale bars = 1 mm. Cartilage black. Asterix marks the hiatus between hypural 1 and the compound centrum in a. Black circles indicate upper- and lowermost principal rays of the upper and lower lobes, grey circles indicate principal rays in between. Abbreviations: CC, compound centrum; HS, hemal spine; H1–5, hypural 1–5; NS, neural spine; PH, parhypural; PU2,4, preural centrum 2, 4.

pending the results of a forthcoming phylogenetic analysis (Conway, submitted).

The descriptions of *P. melissa* and *P. pavimentatus* brings the total number of valid *Psilorhynchus* species to 15, over half of which have been described in the last 5 years (Arunachalam et al., 2007; Arunachalam & Muralidharan, 2008; Conway & Kottelat, 2007; Conway & Mayden, 2008a, b; Nebeshwar et al., 2007). Given that most major groups of Indo-Burmese freshwater fishes contain species endemic to the Western slope of the Rakhine Yoma (an area of high endemism for freshwater fishes; Kullander & Fang, 2004; Britz, 2007) the presence of apparently endemic species of *Psilorhynchus* in this area is not particularly surprising. The fact that these two new species of *Psilorhynchus* do not appear to be each other's closest relative is of particular interest and reconstructing their phylogenetic relationships may provide valuable insight into the biogeographical history of the Indo-Burma region.

Comparative material. – For a complete list of comparative materials see Conway & Mayden (2008a,b).

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