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***Balitora eddsi*, a new species of hillstream loach (Ostariophysi: Balitoridae) from Nepal**

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A new species of hillstream loach *Balitora eddsi* is described from the Karnali River drainage in south-western Nepal. The new species is distinguished from all its congeners by possessing the following combination of characters: six to seven unbranched pectoral-fin rays, pelvic-fin length 12–14% standard length (L_S), dorsal surface without circular or irregular shaped dark blotches, snout pointed, median lobe between anterior rostral barbels pointed posteriorly, dorsal-fin origin posterior to pelvic-fin origin, lateral line scales 66–67, caudal peduncle length 22–23.2% L_S , caudal peduncle depth 4.1–4.2 times its length.

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Key words: Cobitoidea; Cypriniformes; taxonomy.

INTRODUCTION

Members of the loach genus *Balitora* Gray, 1830, are small, elongate fishes with dorso-ventrally flattened bodies and large, horizontally placed paired fins. Following the diagnosis of *Balitora* by Kottelat & Chu (1988) and Kottelat (1988), Chen *et al.* (2005) listed nine valid species of *Balitora*, viz. *B. annamatica* Kottelat, *B. brucei* Gray, *B. burmanica* Hora, *B. kwangsiensis* (Fang), *B. lancangjiangensis* (Zheng), *B. longibarbata* (Chen), *B. meridionalis* Kottelat, *B. mysorensis* Hora and *B. nantingensis* Chen, Cui & Yang. An additional four species of *Balitora*, viz. *B. haithanhi*, *B. nigrocorpa*, *B. vanlani* and *B. vanlongi*, were described in the same year by Nguyen (2005). The genus is widespread throughout Indochina and is diagnosed (following Kottelat, 1988) by a number of characters, including: body strongly depressed; head and abdomen ventrally flattened; mouth inferior, arched, with both jaws covered by a horny sheath; rostral flap divided into three lobes, median lobe, between rostral barbels, largest; both lips with one or two rows of papillae; lower lip not interrupted; one or two maxillary barbels at the corner of mouth; gill-openings extending on the ventral surface of head; two unbranched pelvic-fin rays, eight to 10 branched and 10–12 unbranched pectoral-fin rays; presence of adhesive pads on ventral surface of eight to 11 anteriormost pectoral and three to four anteriormost pelvic-fin rays;

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principal caudal-fin rays 10 + 9, the four to five lowermost rays tightly bound to each other.

During a recent visit (September 2008) to the University of Kansas Museum of Natural History (KU), the authors observed dramatic differences in colour pattern and body shape between individuals in a single lot identified as *Balitora brucei* collected from south-western Nepal. Further investigation of these specimens and their comparison with a larger sample of *B. brucei* revealed the presence of an additional species of *Balitora*. This species is described herein as *Balitora eddsi*, new species, raising the number of valid species to 14.

MATERIALS AND METHODS

Counts and measurements generally follow Kottelat (1988) except that measurements of the head are expressed as a percentage of head length (L_H) instead of standard length (L_S). All measurements were taken point to point on the left side of specimens with digital callipers and recorded to 0.1 mm. Paired-fin counts were obtained from the left side of specimens only. The last two branched rays of the dorsal and anal fin, which share a single pterygiphore, are counted separately. Numbers in parentheses after a count indicate the frequency of that count, and an asterisk (*) after a number in parentheses indicates count obtained from holotype specimen. All counts were obtained with the aid of a Leica S8AP0 stereomicroscope (www.leica-microsystems.com). All photographs were taken using a Leica DFC280 mounted on the aforementioned microscope. Oromandibular structure terminology follows Roberts (1982). Specimens examined are housed at the ichthyology collections of the Academy of Natural Sciences of Philadelphia (ANSP), the Natural History Museum, London (BMNH) and the University of Kansas Natural History Museum and Biodiversity Research Center (KU). Specimens of *Balitora* examined for comparison with the new species are listed in Appendix. Morphometric and meristic characters for *B. annamatica*, and information on the morphology of *B. kwangsiensis*, *B. lancangjiangensis*, *B. longibarbata* and *B. mysorensis* was obtained from Kottelat (1988). Morphometric and meristic characters of *B. nantingensis* were obtained from Chen *et al.* (2005). An English translation of the descriptions of the species of *Balitora* recently described by Nguyen (2005) was not available to the authors and these species (*viz.* *B. haithanhi*, *B. nigrocorpa*, *B. vanlani*, and *B. vanlongi* Nguyen) are excluded from the diagnosis of the new species.

BALITORA EDDSI N. Sp.

HOLOTYPE

KU 40276, 39.1 mm L_S , from a 25 km stretch of the Gerwa River, Karnali River Basin, between Chisapani and Kothiaghat, Bardiya District, Nepal, 28° 34' 0.012" N; 81° 13' 59.88" E to 28° 23' 60.00" N; 81° 11' 59.99" E, collected by D. Edds, 2 March 1996 (Fig. 1).

PARATYPES

KU 40277, two specimens, 42.8–45.7 mm L_S ; same data as holotype (Fig. 1).

DIAGNOSIS

A species of *Balitora* distinguished from all congeners by its lower number of unbranched pectoral-fin rays (6–7 *v.* 8–12), by its shorter pelvic fins (12.8–14% L_S *v.* 19–24) and by the absence of dark circular or irregular shaped dark blotches along



FIG. 1. *Balitora eddsi*: (a) holotype, KU 40276, 39.1 mm standard length (L_S), Gerwa River, Nepal, in lateral view. (b) Paratype, KU 40277, 45.7 mm L_S , same locality as holotype, in dorsal and ventral view.

the dorsal midline (*v.* presence of dark circular or irregular shaped dark blotches arranged in a longitudinal row along dorsal midline). *Balitora eddsi* is further distinguished from *B. brucei* by its posteriorly pointed (*v.* posteriorly rounded) median lobe between anterior rostral barbels and its pointed (*v.* rounded) snout, from *B. brucei*, *B. burmanica*, *B. kwangsiensis*, *B. lancangjiangensis*, *B. meridionalis* and *B. nantingensis* by its more posteriorly positioned dorsal fin (dorsal-fin origin posterior to pelvic-fin origin *v.* dorsal-fin origin opposite pelvic-fin origin in *B. brucei*, *B. burmanica*, *B. lancangjiangensis* and *B. meridionalis* or anterior to pelvic-fin origin in *B. kwangsiensis* and *B. nantingensis*), from *B. burmanica*, *B. annamatica*, *B. meridionalis*, *B. mysorensis* and *B. nantingensis* by its higher number of lateral-line scales (66–67 *v.* 62–65 in *B. burmanica*, 61–62 in *B. annamatica*, 62–64 in *B. meridionalis*, 64–65 in *B. mysorensis*, 59–64 in *B. nantingensis*) and from *B. annamatica*, *B. meridionalis* and *B. mysorensis* by its longer and more slender caudal peduncle (caudal peduncle length 22–23.2% L_S , its depth 4.1–4.2 times its length *v.* caudal peduncle length 13–15% L_S in *B. annamatica*, its depth 1.9–2.2 times its length; 14–16% L_S in *B. meridionalis*, its depth 1.9–2.8 its length; caudal peduncle depth 1.9 times its length in *B. mysorensis*). It is further distinguished from *B. longibarbata* in having one barbel at each corner of the mouth (*v.* a pair of barbels at each corner of the mouth).

DESCRIPTION

General body shape as in Fig. 1. Morphometric and meristic characters are listed in Table I. Body elongate, rounded laterally and flattened ventrally, deepest at pelvic-fin

TABLE I. Morphometric and meristic characters of the holotype (KU 40276) and two paratypes (KU 40277) of *Balitora eddsi* n. sp. Morphometric characters expressed as a percentage of standard length (L_S) or head length (L_H)

	Holotype	Paratype	Paratype	Range	Mean	S.D.
L_S (mm)	39.1	45.7	42.8	39.1–45.7		
As percentage of L_S						
Head length	21.5	21.9	21.0	21.0–21.9	21.5	0.5
Dorsal head length	22.0	21.4	20.8	20.8–22.0	21.4	0.6
Pre-dorsal length	50.4	48.1	48.6	48.1–50.4	49.0	1.2
Pre-pelvic length	44.8	43.8	43.0	43.0–44.8	43.9	0.9
Pre-anal length	70.1	68.5	69.4	68.5–70.1	69.3	0.8
Pre-anus length	68.5	64.8	67.3	64.8–68.5	66.9	1.9
Body depth at pelvic-fin origin	12.3	11.2	11.0	11.0–12.3	11.5	0.7
Body width at dorsal-fin origin	12.0	11.6	11.4	11.4–12.0	11.7	0.3
Body width at anal-fin origin	7.4	6.8	8.2	6.8–8.2	7.5	0.7
Caudal peduncle length	22.0	23.2	22.7	22.0–23.2	22.6	0.6
Caudal peduncle depth	5.4	5.7	5.4	5.4–5.7	5.5	0.2
Caudal peduncle: length/depth	4.1	4.1	4.2	4.1–4.2	—	—
Length of upper caudal lobe	18.4	—	—	—	—	—
Length of lower caudal lobe	21.0	—	—	—	—	—
Length of median caudal-fin rays	12.8	—	—	—	—	—
Anal-fin height	12.8	12.3	12.6	12.3–12.8	12.6	0.3
Dorsal-fin height	17.9	16.8	17.1	16.8–17.9	17.3	0.6
Pelvic-fin length	12.8	14.0	12.9	12.8–14.0	13.2	0.7
Pectoral-fin length	21.7	21.0	19.6	19.6–21.7	20.8	1.1
As percentage of L_H						
Snout length	57.0	53.0	52.0	52.0–57.0	54.0	2.6
Eye diameter	17.0	14.0	16.0	14.0–17.0	15.0	1.4
Head depth through eye	36.0	35.0	37.0	35.0–37.0	36.0	0.9
Head depth through nape	42.0	42.0	47.0	42.0–47.0	43.0	2.8
Head width through eye	56.0	55.0	54.0	54.0–56.0	55.0	0.8
Selected meristic counts						
Dorsal-fin rays	iii.9	iii.9	iii.9			
Anal-fin rays	iii.7	iii.7	iii.7			
Caudal-fin rays	10 + 9	—	10 + 9			
Pectoral-fin rays	vii.12	vi.12	vii.11			
Pelvic-fin rays	ii.9	ii.8	ii.8			
Lateral-line scales	66(+3)	66(+3)	67(+3)			

origin. Head elongate, snout pointed (Fig. 2). Eye small, positioned closer to posteriormost point of opercle than tip of snout. Mouth inferior, with two pairs of rostral barbels and one pair of maxillary barbels. Upper and lower jaws covered by a horny sheath. Upper and lower lips with a single row of large papillae. Lower lip not interrupted. Deep groove between rostral fold and upper lip. Rostral fold divided into three lobes. Median lobe larger than lateral lobes, its tip sharply triangular. Tips of lateral lobes gently rounded.

Dorsal fin with iii.9 rays. Anal fin with iii.7 rays. Principal caudal-fin rays 10 + 9. Pelvic fin with ii.9(1*) or ii.8(2) rays, pectoral fin with vii.11(1), vi.12(1) or vii.12(1*)

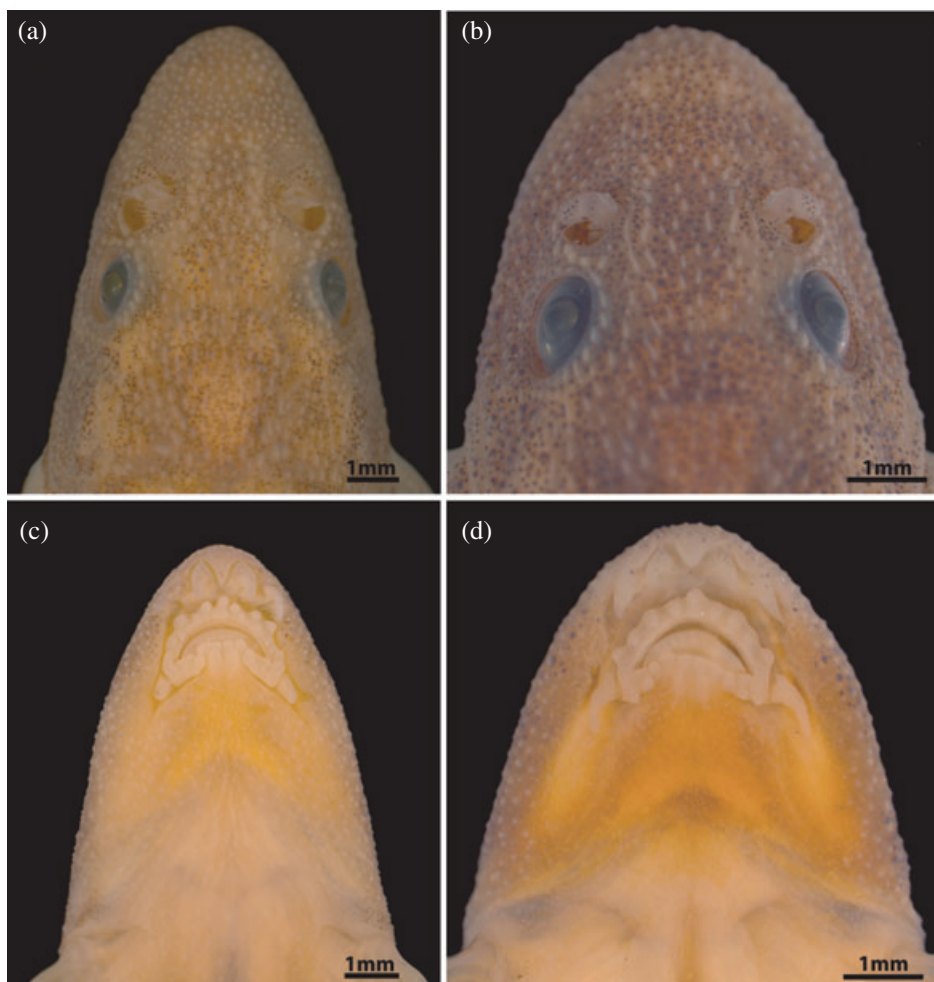


FIG. 2. (a) Dorsal and (b) ventral view of the head of *Balitora eddsi*, paratype, KU 40277, 42.8 mm standard length (L_S) and dorsal (c) and ventral (d) view of the head of *Balitora brucei*, KU 28883, 31.6 mm L_S .

rays. Pectoral fins large, horizontally placed, posterior margin rounded. Pelvic fins short, not reaching to anus, posterior margin straight. Dorsal-fin origin slightly posterior to pelvic-fin origin. Anal fin short. Caudal fin emarginate, lower lobe longer than upper lobe. Uppermost and lowermost three or four principal caudal rays without interradial membranes and tightly associated.

Body covered in small scales, 66(2*) or 67(1) along course of lateral line (+3 on base of caudal fin). Each scale with a prominent longitudinal keel along centre. Lateral-line scales with two additional smaller keels along posterior edge, above and below principal longitudinal keel. Ventral surface, anterior to midpoint between pelvic-fin origin and anus, without scales. Dorsal surface of head between orbits with numerous longitudinal tubercles, similar in general appearance to scale keels. Lateral and ventral surface of head, dorsal surface of snout, base of pectoral fin and ventral

surface between pectoral fins covered in small, wart-like tubercles. Anus position slightly anterior to anal-fin origin.

COLOUR OF PRESERVED SPECIMENS

Specimens originally fixed in 10% formalin solution and stored in 70% alcohol for preservation (D. R. Edds, pers. comm.). In alcohol: body background colour light brown laterally and creamy-yellowish dorsally and ventrally. Dorsal midline with faint brown stripe extending from posterior margin of occiput to caudal-fin base. Dorsal surface of unbranched pectoral-fin rays with dark brown markings. Dorsal surface of branched pectoral-fin rays with dark brown markings proximally, hyaline distally. Dorsal surface of pelvic fins with irregular dark brown markings distally, hyaline proximally. Dorsal and anal fins with dark brown markings along central portion of rays, forming oblique stripe across centre of each fin. Dorsal fin with additional dark brown markings along distal edge. Entire lower lobe of caudal fin dark brown. Upper lobe of caudal fin with dark brown blotch midway along its length. No distinct markings on body.

DISTRIBUTION AND HABITAT

Known only from the type locality, a stretch of the Gerwa River, between the towns of Chisapani and Kothiaghat, south-western Nepal. The new species was collected during a rafting trip down the Gerwa River, and the precise collection points of the type series cannot be pinpointed with any further accuracy. The rafting trip occurred between 1000 and 1700 hours, and collections were made with a cast-net and 15 foot long straight seine (D. R. Edds, pers. comm.).

ETYMOLOGY

The new species is named in honour of D. R. Edds, who collected the type series, in recognition of his contribution to the knowledge of the fish fauna of Nepal.

REMARKS

According to Rajbanshi (1982), *B. brucei* was first recorded from Nepal by Taft (1955) and then later by DeWitt (1960) and Menon (1962). According to Kottelat (1988) *B. brucei* is the most widespread species of the genus; it has been collected to date from both the Karnali and Narayani (Gandaki) River drainages of Nepal (Shrestha, 1990, 2008). *Balitora eddsi* is known only from a small stretch of the Gerwa River, between the towns of Chisapani and Kothiaghat, south-western Nepal. The type series was collected, together with specimens of *B. brucei*, at one of five possible locations, sampled along the Gerwa River between Chisapani and Kothiaghat by researchers travelling by raft along the western boundary of the Bardiya National Park. All fish specimens collected from these five localities were combined under a single collection (D. R. Edds, pers. comm.), and it is unclear as to whether specimens of both *B. brucei* and *B. eddsi* were actually collected from the same locality. The new species is easily distinguished from *B. brucei* by the characters listed in the diagnosis.

The small size (largest paratype specimen 45.7 mm L_S) and reduced tuberculation of the only available specimens of the *B. eddsi* suggest that the type series of this new species may be composed of immature individuals (due to the small number of available specimens gonadal examination was not conducted). Many species of hillstream loach are known to undergo spectacular colour pattern changes during their ontogeny (Kottelat, 2000; DePing *et al.*, 2008). Though ontogenetic colour pattern changes have not yet been documented for *Balitora*, the dark circles present along the dorsal surface of adult specimens of *B. brucei* appear to be derived from a faint longitudinal stripe present along the dorsal midline of small specimens <30 mm L_S (e.g. KU 28783). A similar faint longitudinal stripe is present along the dorsal midline of *B. eddsi* and the possibility that *B. eddsi* may also exhibit a series of dark circles or irregular dark blotches along the dorsal midline at larger sizes should not be discounted.

Like other hillstream loaches, species of *Balitora* are reported to inhabit the benthic region of fast flowing water bodies (Hora, 1932; Kottelat, 1988; Chen *et al.*, 2005). It is likely that the new species has similar habitat requirements to congeners. Future ichthyological surveys of this area may provide additional information on the habitat preferences of the new species.

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APPENDIX. Comparative material examined

Balitora brucei (neotype of *B. brucei* not available for loan): ANSP 89752, one specimen, 80.1 mm standard length (L_S); India: BMNH 1928.9.17.1–3, 2 specimens, 78.0–80.0 mm L_S ; India: Assam, Khasi hills, Nangpiang. BMNH 1889.2.1.1469–1470, two specimens, 55.0–53.0 mm L_S ; India: Darjeeling. BMNH 1872.4.17.41, six specimens, 66.0–92.5 mm L_S ; India: Assam, Khasi hills. BMNH 1872.4.17.42, two specimens, 87.0–95.0 mm L_S ; Indian: Assam. KU 28636, one specimen, 34.3 mm L_S ; Nepal: Rautahat/Sarlahi, Bagmati River Raj-Marg hwy. KU 28711, three specimens, 25.2–29.2 mm L_S ; Nepal: Kanchanpar, Chaudhar River at Raj-Marg hwy, east of Mahendranagar. KU 28783, four specimens, 26.0–30.6 mm L_S ; Nepal: Bardiya, Gerwa River between Chisapani and Kothiaghat. KU 28883, two specimens, 30.0–31.6 mm L_S ; Nepal: Nawalparasi, Narayani River downstream from Tribeni barrage. KU 28866, two specimens, 24.9–27.6 mm L_S ; Nepal: Chitwan–Nawalparasi, Narayani River at Kanahaa River confluence. KU 29072, one specimen, 55.2 mm L_S ; Nepal: Tanahun, Seti River at Khairenitar. KU 29504, one specimen, 29.5 mm L_S ; Nepal: Nawalparasi, Narayani River downstream from Tribeni barrage. KU 29622, one specimen, 89.4 mm L_S ; same as KU 29072. *Balitora burmanica*: BMNH 1893.2.16.46–49, four specimens, 66.0–92.5 mm L_S ; Myanmar: Meekalan, Tenasserim. BMNH 1920.9.8.11, one specimen, holotype of *B. brucei melanostoma*, 80.5 mm L_S ; Myanmar: Thaungyin, Thaungyin river (Megla Stream), at border with Thailand. *Balitora meridionalis*: ANSP 179834, five specimens, 51.9–67.1 mm L_S ; Thailand: Kanchanaburi, Ulong River, at route 323 bridge, c. 5–10 km north-east of Thong Pha Phum. *Balitora cf. meridionalis*: ANSP 178677, five specimens, 38.5–42.7 mm L_S ; Thailand.