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Identity of *Labeo nigrescens* Day, 1870 with descriptions of two new *Labeo* species from the Southern Western Ghats

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Abstract

The identity of *Labeo nigrescens* Day, 1870 is established based on examination of syntypes and a topotype from South Canara. *L. nigrescens* can be distinguished from congeners by its distinct colour pattern and a unique lateral line feature. A population from the Chalakkudy River basin in Kerala, formerly considered conspecific with *L. nigrescens,* is described here as *Labeo chekida,* a new species. In addition, a species from the Chandragiri River basin in Northern Kerala and South Canara, characterised by dramatically elongated finnage, is recognised as a new species distinct from *L. nigrescens* and *L. filiferus* and is described here as *Labeo uru* sp. nov.

Introduction

Francis Day (1870) described *Labeo nigrescens* on the basis of material from Mangalore in South Canara in Peninsular India. Day described the colour of the fish as "deep brown, each scale with a black spot at its base, fins black". No specimens of this species have been collected from the type locality in recent years, despite its name being frequently mentioned in the literature. Hora (1927) referred a drawing in the Mackenzie collection at the Asiatic Society, based on a specimen from Bellary (likely the Tungabhadra River) to this species. Menon (1999) treated it as a synonym of *Labeo calbasu* without assigning any reasons. Jayaram and Dhas (2000) treated it as a valid species, but their material other than a syntype was from the Krishna River basin. John and John (2004) assigned 4 specimens collected from the Pamba River in central Kerala to *L. nigrescens*. Plamoottil and Zupancic (2017) described a new species, *L. filiferus*, from the Pamba River which is conspecific with the fish previously listed as *L. nigrescens* from this river. Sudhasinghe *et al.* (2018) listed two specimens from the Chalakkudy River as *L. nigrescens*.

Efforts to obtain fresh specimens of *L. nigrescens* yielded samples from several west-flowing river basins in South Canara and Kerala. Specimens from the Chandragiri River basin, possess extremely elongated anterior dorsal fin rays which superficially resemble *L. filiferus*. They however, proved distinct from the latter species, based on comparisons with a topotype. One specimen, from the Kumaradhara River in South Canara is identical to Day's description and syntypes of *L. nigrescens* in various museums. Specimens from the Chalakkudy River also proved distinct from the topotypical *L. nigrescens*. We therefore describe here, the specimens from the Chandragiri and Chalakkudy river basins as new species, and provide a redescription for *L. nigrescens*. We also discuss the identity of *L. filiferus*.

Materials and methods

Live specimens were obtained from ornamental fish collectors and transported to the laboratory in Kochi, photographed live, euthanised with an overdose of clove oil and fixed in 10% formalin. Counts and measurements were taken on the left side of specimens following Sudasinghe *et al.* (2018). The last branched fin ray, which is split to the base, is counted as 1½.

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Measurements were taken with digital callipers, with those less than 100 mm recorded to the nearest tenth of a millimetre, while those greater than 100 mm were recorded to the nearest millimetre. The description of tuberculation followed that of Reid (1985). Vertebral counts were obtained from X-rays. The Weberian apparatus is counted as 4 vertebral elements and the hypural complex as 1. The first caudal vertebra is the first one with a haemal spine that overlaps an anal fin pterygiophore. The material examined is deposited in the collections of ICAR-National Bureau of Fish Genetic Resources (ICAR-NBFGR), Lucknow, India and the Western Ghats Regional Station of the Zoological Survey of India (ZSI-WGRC), Calicut, India. Syntypes (AMS B.7703) from the Francis Day collections at the Australian Museum (AMS), the Museum of Comparative Zoology at Harvard University (MCZ) and the Naturhistorisches Museum, Wein (NMW) were examined through photographs and radiographs.

Results and discussion

Labeo uru, New species

Class: Teleostei

Order: Cypriniformes

Family: cyprinidae

Genus: *Labeo* Cuvier, 1816

Species: *Labeo uru* sp. nov. Kumar, Ravi & Basheer

Material examined

Holotype: NBFGR/CYPLURU, 417 mm SL, Chandragiri River near Sullya on the Kerala-Karnataka Border, India, Date of collection: 10 June 2019.

Paratypes: NBFGR/CYPLURU.1-2, 2 specimens, 155-163 mm SL, same location as holotype; ZSI-WGRSxxxx, 1 specimen, 272 mm SL, same location as holotype.

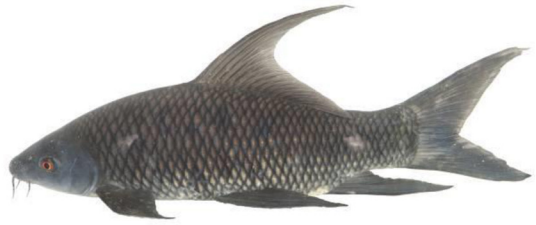
Diagnosis

Labeo uru is distinguished from all other species of *Labeo* from Peninsular India and Sri Lanka except *L. filiferus* in the anterior most rays of the dorsal, pelvic and anal fins being greatly elongated; the adpressed dorsal fin reaching the base of the caudal fin and adpressed anal fin reaching the fork of the caudal fin. *L. uru* is distinguished from *L. filiferus* in a greater pre-dorsal length (46.9-51.8% SL vs. 45.6% SL); a longer caudal peduncle (14.8-16.5% SL vs. 12.4); a shorter snout (38.2-46.7% HL vs. 49.7% HL), 5½ scales between lateral line and pelvic fin origin (vs. 6½).

Description

General appearance as in Fig. 1 and 2; morphometric data are given in Table 1. The body is elongate, its greatest depth 29.0-36.2% SL. The dorsal profile is distinctly convex from the nape to the posterior end of the dorsal fin base, then running more or less in a straight line to the caudal peduncle. The ventral profile is convex, but less so than the dorsal profile, up to the origin of the pelvic fin, then straight to the origin of the anal fin and then slightly concave up to the caudal peduncle. The caudal peduncle is nearly square, its length 14.8-16.5% SL and depth 14.5-15.7% SL.

Head length is less than one-third the standard length, its depth being 69.0-74.6% of its length. The eyes are small (eye diameter 15.5-20.0% HL) and dorso-laterally placed, not visible in ventral view. The rostral fold is well developed, overhanging the upper lip. The upper labial fold has a single row of widely spaced unilobed papillae, the lower labial fold has 1-2 rows of large multi-lobed



(a)

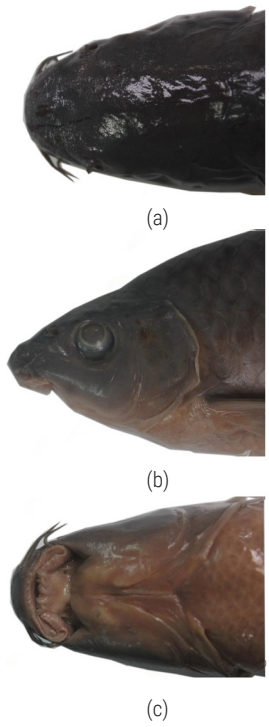
(b)

(c)

Fig. 1. (a) Holotype of *L. uru*, 417 mm SL in life; (b) Non-type, 140 mm SL in life and (c) Paratype, 272 mm SL in formalin

Table 1. Morphometric data for *L. uru*, *L. chekida* and *L. nigrescens*

Morphometric measurements	*Labeo uru*			*Labeo chekida*			*Labeo nigrescens*
	Holotype	Holotype + 3 paratypes	Mean±SD	Holotype	Holotype + 2 Paratypes	Mean±SD	Topotype
Standard length (SL) (mm)	417	155–417		113	113–153		135
% SL							
Pre-dorsal length	216	46.9–51.8	48.9±2.2	55.0	47.3–48.7	48.2± 0.8	65.9
Length of dorsal fin base	116	27.1–29.8	28.0±1.2	33.5	28.0–30.6	29.4± 1.3	42.1
Post-dorsal length	107	25.7–28.7	26.9± 1.5	32.4	27.6–30.2	28.8± 1.3	40.0
Pre-pelvic length	230	47.8–55.2	50.6± 3.2	59.1	51.6–53.9	52.6± 1.1	68.1
Pre-anal length	351	74.8–84.2	77.8± 4.3	87.4	77.1–79.1	77.8± 1.1	105
Body depth	123	29.0–36.2	31.2± 3.4	35.0	27.7–31.4	30.0± 2.0	42.0
Length of caudal peduncle	61.7	14.8–16.5	15.5± 0.7	16.0	14.2–16.2	15.4± 1.1	21.3
Depth of caudal peduncle	61.8	14.5–15.7	15.0± 0.5	19.3	16.0–18.1	17.1± 1.0	24.5
Dorsal fin height	182	43.6–59.5	51.0± 6.5	25.8	22.8–25.1	24.2± 1.2	34.1
Anal fin depth	139	33.3–41.0	37.0± 3.2	31.7	28.1–31.8	29.4± 2.1	41.6
Length of anal fin base	41.6	10.0–10.5	10.2± 0.3	14.2	10.4–12.6	11.3± 1.1	16.0
Pelvic fin length	141	33.8–37.5	35.4± 1.7	28.5	25.0–27.3	25.8± 1.2	37.3
Pectoral fin length	99.0	23.7–28.4	26.3± 1.9	30.8	27.2–28.0	27.5± 0.5	37.0
Head length, HL (mm)	101	22.5–25.5	24.4± 1.4	31.1	25.5–27.5	26.2± 1.1	35.3
% HL							
Head depth	72.3	69.0–74.6	71.3± 2.4	22.4	71.1–74.9	72.7± 2.0	26.6
Snout length	47.2	38.2–46.7	43.3± 3.6	13.6	43.7–45.9	44.7± 1.1	16.4
Eye diameter	15.7	15.5–20.0	18.5± 2.1	5.8	18.6–22.4	20.9± 2.0	7.1
Post orbital length	43.4	40.8–45.4	43.2± 1.9	12.9	37.4–41.8	40.3± 2.4	15.0
Interorbital width	51.4	42.3–50.9	47.4± 3.7	12.2	39.2–42.1	40.4± 1.5	15.4
Internarial width	36.2	32.9–35.8	34.5± 1.2	7.5	24.1–27.6	26.3± 1.9	8.5
Length of rostral barbel	26.5	22.5–29.3	26.0± 3.4	6.5	17.6–20.9	19.3± 1.6	9.3
Length of maxillary barbel	21.4	17.9–22.6	20.6± 2.4	5.2	15.4–16.7	15.9± 0.7	8.1



(a) (b) (c)

Fig. 2. Head of *L. uru* Holotype: NBFGR/CYPLURU, 417 mm SL (a) Dorsal; (b) Lateral and (c) Ventral views

papillae. The inner surfaces of both lips are covered in diagonally arranged rows of papillae. Two pairs of barbels are present, both prominent. The rostral barbel is longer (22.5-29.3% HL), greater than eye diameter; the maxillary barbel (17.9-22.6% HL) is equal to or slightly longer than eye diameter. Acanthoid tubercles are present in the pre-orbital, ethmoid, rhinal and rostral fields. In a paratype, 272 mm SL, the entire head and scales on the body anterior to the dorsal-fin origin are profusely spotted with minute tubercles and body scales posterior to the dorsal-fin origin bear minute tubercles in a vertical line down the middle of each scale.

The dorsal fin is long based, the length of its base (27.1-29.8% SL) being nearly one-third the standard length and bears 3 simple and 16½ branched rays. The first two branched rays are greatly elongated (height 43.6-59.5% SL), reaching the base of the caudal fin when adpressed. The pelvic fin, which has its origin behind the third branched dorsal fin ray, has one simple and 7½ branched rays and reaches past the anal fin base when adpressed. The pectoral fin has one simple and 13 branched rays and reaches the pelvic-fin origin in the paratypes, but falls short by 3 scale rows in the holotype. The anal fin has 2 simple and 6½ branched rays and overlaps the caudal-fin fork when adpressed. The caudal fin is deeply forked, both lobes nearly equal in length with 10+10 branched rays. There are 37 total vertebrae, with 22 (1) or 23 (3) pre-caudal and 15(1) or 14(3) caudal vertebrae (Fig. 6).

The lateral line is complete, with 37 (2) or 38(2) + 3 (2) or 4 (2) pored scales. There are ½7+1+5½ scales in transverse series; 14(1), 15(2), or 16(1) or 18(1) pre-dorsal scales and 20 circum-peduncular scales.

Colouration

Live specimens are a slaty grey to black overall. Specimens under stress turn pale, each scale exhibiting a golden yellow centre with a dark margin. Formalin fixed specimens are slaty grey throughout.

Distribution and ecology

The type series of *L. uru is* found in the upper reaches of the Chandragiri River in Karnataka. We came across a lot of sub-adult specimens at the ZSI, labelled *L. calbasu*, from Panathur on the Chandragiri River at the Kerala-Karnataka border. Other cyprinids sharing the same habitat include *Hypselobarbus thomassi*, *Hypselobarbus jerdoni*, *Dawkinsia assimilis*, *Barilius canarensis* and *Sahyadria denisonii*.

Etymology

An Uru is a type of wooden dhow, handmade for centuries by master craftsmen in the shipyards of Beypore, near Calicut. The elongate median fins of this species are reminiscent of a dhow under full sail. A noun in apposition.

Labeo chekida, New species

Species: *Labeo chekida* sp. nov. Kumar, Ravi & Basheer

Material examined

Holotype: NBFGR/CYPLCHE, 113 mm SL, Chalakkudy River downstream of Athirapilly waterfalls, Kerala, India. Date of collection: 10 December 2018.

Paratypes: NBFGR/CYPLCHE.1, 153 mm SL, same location as holotype; ZSI-WGRSxxxx, 1 specimen, 148 mm SL, same location as holotype.

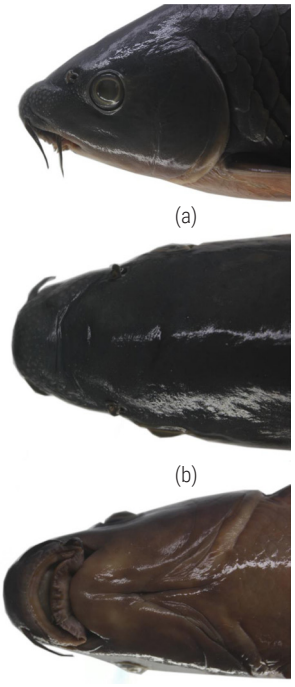
Non-type material (Photographs): WHT 9441, 135 mm SL; Chalakkudy River, Kerala, India; WHT 00405, 87.3 mm SL; Chalakkudy River, Kerala, India.

Diagnosis

L. chekida is distinguished from all other species of *Labeo* from Peninsular India and Sri Lanka in a small adult size (<200 mm SL); a dark brown to black body colour; a dorsal fin with a straight distal margin and no elongated rays; two pairs of barbels; rostral barbel length less than eye diameter.

Description

General appearance as in Figs. 3 and 4; morphometric data are given in Table 1. The body is elongate, its greatest depth 27.7-31.4% SL. The dorsal profile is distinctly convex from the nape to the posterior end of the dorsal fin base, then running more or less in a straight line to the caudal peduncle. The ventral profile is convex, but less so than the dorsal profile, up to the origin of the anal fin, then slightly concave up to the caudal peduncle. The caudal peduncle is deeper (depth 16.0-18.1% SL) than long (14.2-16.2% SL).



(a) (b) (c)

Fig. 4. Head of *L. chekida* Holotype: NBFGR/CYPLCHE, 113 mm SL (a) Dorsal; (b) Lateral and (c) Ventral views

(a) (b)

Fig. 3. Holotype of *L. chekida*, 113 mm SL (a) in Life and (b) in Formalin

Head length (25.5-27.5% SL) is less than one-third the standard length, its depth being 71.1-74.9% of its length. The eyes are moderate (eye diameter 18.6-22.4% HL) and dorso-laterally placed, not visible in ventral view. The rostral fold is well developed, overhanging the upper lip. The upper labial fold has a single row of widely spaced papillae, the lower labial fold has 1-2 rows of large multi-lobed papillae. The inner surfaces of both lips are covered in diagonally arranged rows of papillae. Two pairs of barbels, shorter than eye diameter, are present. The rostral barbel (17.6-20.9% HL) is longer than the maxillary barbel (15.4-16.7% HL). The holotype has minute tubercles distributed all over the head, with a few larger ones in the rhinal and rostral fields. Scales on the body have a row of minute tubercles along their outer margins. An ethmoid furrow is present.

The dorsal fin is long based, the length of its base (28.0-30.6% SL) being nearly one-third the standard length and bears 3 simple and 15½ branched rays. The outer margin of the dorsal fin is nearly straight. The pelvic fin, which has its origin behind the third branched dorsal fin ray, has one simple and 7½ branched rays, and reaches the anal fin origin when adpressed. The pectoral fin has one simple and 13 branched rays and just reaches the pelvic-fin origin. The anal fin has 2 simple and 6½ branched rays and reaches the caudal-fin base when adpressed. The caudal fin is deeply forked, both lobes nearly equal in length with 9+9 branched rays. There are 35 total vertebrae, with 22 pre-caudal and 13 caudal vertebrae (Fig. 6).

The lateral line is complete, with 35 (3) or 36 (2) + 3 (3) or 4 (2) pored scales. There are ½6+1+4½ (4) or ½6+1+5½ (1) scales in transverse series; 12 (1), 13 (1), or 14 (1) pre-dorsal scales and 20 circum-peduncular scales.

Colouration

Live specimens are a slaty grey to black overall. Formalin fixed specimens are a dark brown throughout, with some specimens exhibiting a dark centre to each scale.

Distribution and ecology

All known specimens of *L. chekida* come from the middle reaches of the Chalakkudy River in Kerala. The habitat in this stretch of the river has a predominantly rocky bottom with rapid water flow and occasional deep pools. Other species sharing this habitat include *Sahyadria chalakkudiensis*, *Dawkinsia assimilis*, *Dawkinsia filamentosa*, *Barilius bakeri*, *Salmostoma* sp., *Garra surendranathanii*, *Garra* cf. *mullya*, *Horabagrus nigricollaris*, *Horabagrus obscurus* and *Batasio travancoria*.

Etymology

Chekida (sometimes "kaka chekida", literally "crow chekida") is the name under which this species is known to locals. A noun in apposition.

Labeo nigrescens

Species: *Labeo nigrescens* Day, 1870

Material examined

Syntypes: (Photographs and Radiographs) AMS-B.7703, 160 mm SL; Mangaluru, Karnataka, India; ZMB-Pisces-11031, 237mm SL; Mangaluru, Karnataka, India. Topotype: NBFGR/CYPLNIG.1, 135 mm SL; Kumaradhara River near Uppinangadi; Date of collection: 23 February 2021.

Diagnosis

L. nigrescens is distinguished from all other species of *Labeo* from Peninsular India and Sri Lanka in possessing a unique colour pattern of a dark brown base colour with a black spot on each scale producing the appearance of longitudinal stripes, and a distinct kink in the lateral line, which curves upwards posterior to the pelvic fin base around the 17 pored scales. It can additionally be distinguished from *L. filiferus* and *L. uru* in lacking extensions to the dorsal and anal fins (*vs*. extensions present); from *L. chekida* in both rostral and maxillary barbels being longer than eye diameter (*vs*. shorter) and 21 abdominal vertebrae (*vs*. 22); and from *L. kaage* in the pectoral fin reaching the pelvic-fin origin (*vs*. falling short by 3-4 scales) and in possessing 34-35 total vertebrae (*vs.* 37-38).

Description

General appearance as in Fig. 5; morphometric data are given in Table 1. The body is elongate, its greatest depth not exceeding one-third standard length. The dorsal profile is distinctly convex from the nape to the posterior end of the dorsal fin base, then running more or less in a straight line to the caudal peduncle. The ventral profile is more or less straight up to the origin of the anal fin, and then slightly concave up to the caudal peduncle. The caudal peduncle is deeper (18.1% SL) than long (15.8% SL).

(a)

(b)

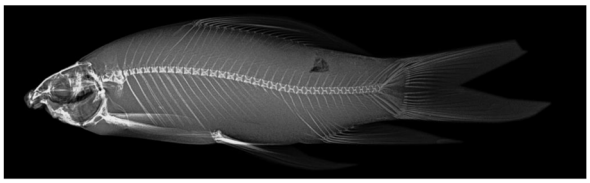
(c)

Fig. 5. *L. nigrescens*, Topotype, 135 mm SL (a) in Life; (b) in Formalin; (c) Syntype AMS-B.7703,160 mm SL, in Ethanol

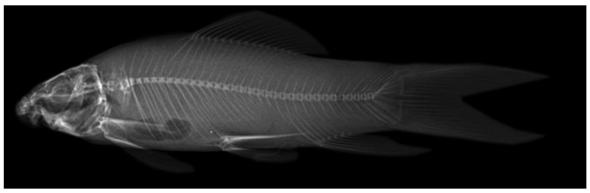
The head is roughly triangular in lateral view, its depth being 75.4% of its length. The eyes are of moderate size (20.1% HL) and dorso-laterally placed, not visible in ventral view. The rostral fold is well developed, overhanging the upper lip. The upper labial fold has a single row of widely spaced papillae, the lower labial fold has 1-2 rows of large multi-lobed papillae. The inner surfaces of both lips are covered in diagonally arranged rows of papillae. Two pairs of barbels are present, both longer than eye diameter; the rostral barbel (26.3% HL) is longer than the maxillary barbel (22.9% HL). The topotype and ZMB-Pisces-11031 have minute tubercles distributed over the head, on the outer margin of scales on the body and on the pectoral, pelvic and anal fins. Larger tubercles are present on the pre-orbital, ethmoid, infraorbital, rhinal and rostral fields. An ethmoid furrow (Reid, 1985) is present.

The dorsal fin is long based, its greatest height (25.3% SL) being less than the length of its base (31.2% SL) and bears 3 (3) simple and 15½ (3) branched rays. The distal margin of the dorsal fin is more or less straight. The pectoral fin has one simple and 18½ branched rays and reaches the pelvic-fin. The pelvic fin, which has its origin beneath the third branched dorsal fin ray, has one simple and 8½ branched rays and reaches the anal fin when adpressed. The anal fin has 2 simple and 6½ branched rays and overlaps the caudal-fin base when adpressed. The caudal fin is deeply forked, with 8+9 branched rays, both lobes being nearly equal. There are 34(1) or 35(2) total vertebrae, with 21 pre-caudal and 13(1) or 14(2) caudal vertebrae (Fig. 6).

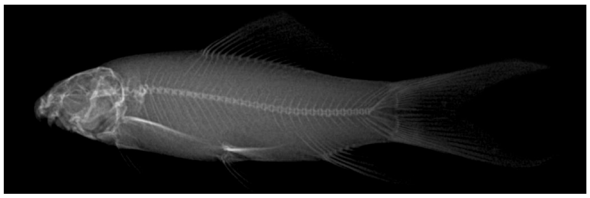
The lateral line is complete, with 35 + 2 (3) pored scales. The lateral line rises dorsally at the 17th scale before continuing straight to the caudal-fin base. There are ½6+1+5½ (3) scales in transverse series; 14(2), or 15(1) pre-dorsal scales and 18 (3) circum-peduncular scales.



(a)



(b)



(c)

Fig. 6. X-ray images of *Labeo* species. (a) *L. uru;* (b) *L. chekida* and (c) *L. nigrescens*

Colouration

In life a dark brown overall, each scale with a dark centre, producing the appearance of longitudinal stripes along the body; iris orangish, mixed with black; fins dark grey. Syntypes preserved in ethanol have faded to a pale beige, with the dark centres of the scales faded but still clearly discernible.

Distribution and ecology

L. nigrescens is apparently restricted to the Kumaradhara-Nethravathi River basin in South Canara. The fish is rarely encountered by fishermen, but it is likely more abundant in the upper reaches of the system, which falls in a reserve forest and is not accessible to fishers.

References to *L. nigrescens* in the ichthyological literature post-Day appear to have fixated on the specific epithet and assumed it referred to a predominantly dark coloured species. Both Day's original description (Day, 1870) and the text in his Fishes of India (Day, 1878) refer to a fish with a predominantly brown colour and dark centres to the scales, which is also borne out by the syntypes and a topotype collected in this study. This colour pattern is similar to that exhibited by some African species of *Labeo*, such as *L. lineatus*, and to a lesser extent, *Labeo dussumieri*.

Another interesting feature of *L. nigrescens* is the nature of the lateral line which, in all 3 examined specimens, rises dorsally around the 17th pored scale. This is a unique feature within the genus and does not appear to have been reported in any other species. The significance is presently unknown and deserves further studies.

Plamoottil and Zupancic (2017) described *L. filiferus* on the basis of a single specimen from the Pamba River in Central Kerala. This species had previously been reported as *L. nigrescens* (John and John, 2004). We were unable to locate the 4 specimens examined by Thomas John and John at the ZSI, but were able to obtain a fresh specimen from the type locality (Fig. 7). Morphometric data for this specimen, along with data taken from Plamoottil and Zupancic (2017) and John and John (2004) are given in Table 2.

Fishers on the Pamba River at Kurumbanmoozhy report *L. filiferus* used to be regularly available in the catch prior to the construction

(a)

(b)

Fig. 7. *L. filiferus*, Topotype, 340 mm SL, (a) when Fresh and (b) in Formalin

Table 2. Morphometric data for *L. filiferus* (Data on holotype taken from Plamoottil and Zupancic, 2017)

Morphometric measurements	Topotype	Holotype
Standard length, SL (mm)	340	200
% SL		
Predorsal length	45.6	48.5
Length of dorsal fin base	29.4	26.5
Postdorsal length	25.1	
Prepelvic length	51.2	53.0
Preanal length	80.0	81.6
Body depth	32.4	33.0
Length of caudal peduncle	12.4	13.5
Depth of caudal peduncle	15.2	15.5
Dorsal fin height	49.1	48.5
Anal fin length	32.9	34.0
Length of anal fin base	10.9	10.0
Pelvic fin length	28.0	33.0
Pectoral fin length	21.8	24.5
Head length, HL (mm)	23.0	25.0
% HL		
Head depth	74.3	80.0
Snout length	49.7	47.6
Eye diameter	15.3	18.0
Post orbital length	41.5	48.0
Interorbital width	51.0	54.0
Internarial width	36.7	46.0
Length of rostral barbel	25.0	16.0
Length of maxillary barbel	20.2	30.0

of a small hydel project at Perumthenaruvi, but has since become rare and is now primarily encountered at the start of the south-west monsoon. The Pamba River upstream of this region flows through protected forests and we are hopeful that a healthy population of this species is present there. There are now five species of dark coloured *Labeo* adapted to high flow habitats in the southern Western Ghats; *L. nigrescens*, *L. filiferus*, *L. kaage*, *L. chekida* and *L. uru*, each apparently endemic to a single river system. Their discovery highlights the need for continued exploration of freshwater habitats in the Western Ghats and the need for detailed environmental assessments prior to approval for development projects with the potential to modify flow regimes.

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