

## ***Pethia sanjaymoluri*, a new species of barb (Teleostei: Cyprinidae) from the northern Western Ghats, India**

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*Pethia sanjaymoluri*, a new cyprinid, is described from the Pavana and Nira tributaries of Bhima River, Krishna drainage, Maharashtra, India. It can be distinguished from congeners by a combination of characteristics that includes an incomplete lateral line, absence of barbels, upper lip thick and fleshy, 23–25 lateral series scales, 7–12 lateral-line pored scales, 10 predorsal scales, 11–14 prepelvic scales, 17–20 pre-anal scales, 4½ scales between dorsal-fin origin and lateral line, four scales between lateral line and pelvic-fin origin, 8–15 pairs of serrae on distal half of dorsal-fin spine, 12–14 branched pectoral-fin rays, 4 + 26 total vertebrae, 4 + 5 predorsal vertebrae, 4 + 13 abdominal vertebrae, 13 caudal vertebrae and a unique colour pattern comprising a humeral spot positioned below the lateral line and encompassing the third and fourth lateral-line scales and one scale below, one caudal spot on 17th–21st lateral-line scales with a yellow hue on its anterior side and apical half of dorsal fin studded with melanophores making the fin tip appear black. Genetic analysis based on the mitochondrial cytochrome b gene sequence suggests that the species is distinct from other known species of *Pethia* for which data are available.

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Key words: barbel; freshwater cyprinid; Maharashtra; molecular phylogeny; osteology; taxonomy.

### **INTRODUCTION**

Freshwater barbs of the genus *Pethia* Pethiyagoda, Meegaskumbura & Maduwage 2012 are endemic to the Indian subcontinent and Myanmar (Pethiyagoda *et al.*, 2012). Currently, the genus comprises 38 species occurring across India, Sri Lanka, Bangladesh, Nepal, Pakistan, Bhutan and Myanmar (Pethiyagoda *et al.*, 2012; Dishma & Vishwanath, 2013; Gurung *et al.*, 2013; Knight, 2013; Kottelat, 2013; Katwate

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*et al.*, 2014a, b, c; Atkore *et al.*, 2015). In India, the genus is represented by 26 species, of which nine are endemic to the southern region of the peninsula. With the description of several new species, clarifications on the identity of species described in the 19th century and delimitation of species distributional ranges (Knight *et al.*, 2012; Dishma & Vishwanath, 2013; Katwate *et al.*, 2013, 2014a, b, c, 2015; Knight, 2013; Lalramliana *et al.*, 2014; Atkore *et al.*, 2015; Batuwita *et al.*, 2015), the genus has recently been of interest to fish taxonomists. It has been suggested that there could be several more undescribed species within this genus, especially in the northern part of the Western Ghats, from where relatively few studies are available (Dahanukar *et al.*, 2011; Katwate *et al.*, 2014b, c). While exploring the ichthyodiversity of this region, a population of *Pethia* was encountered in the Pavana and Nira tributaries of the Bhima River, a major tributary of Krishna River system, Maharashtra, with distinctive morphological characteristics. A subsequent taxonomic and phylogenetic study revealed that it represents a new species, which is here described as *Pethia sanjaymoluri*.

## MATERIALS AND METHODS

### STUDY SITE AND SAMPLING

Specimens were collected from the Pavana River at Rawet [18° 38' 30" N; 73° 45' 13" E; 561 m above sea level (a.s.l.)] and Nira River at Bhor (18° 10' 08" N; 73° 52' 12" E; 597 m a.s.l.). Both are tributaries of the Bhima River, Krishna Drainage, in the northern part of the Western Ghats mountain range, Maharashtra State, India. Putative topotypes of *Pethia conchoni* (Hamilton 1822) were collected from Beri Baor, Ramnagar, Kolkata, West Bengal (22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l.) and Bhagalpur, Bihar (25° 15' 47" N; 86° 59' 27" E; 31 m a.s.l.), India. The specimens were anaesthetized using clove oil and fixed in 10% formalin and transferred to 70% ethanol for storage. One specimen of *Pethia padamya* (Kullander & Britz 2008) was obtained from the aquarium trade.

### MORPHOLOGY, MORPHOMETRY AND OSTEOLOGY

Measurements were taken point to point to the nearest 0.1 mm using Mitutoyo CD-15CPX dial callipers ([www.mitutoyo.co.jp](http://www.mitutoyo.co.jp)). Subunits of the body are presented as per cent standard length ( $L_S$ ) and subunits of the head as per cent head length ( $L_H$ ). Pored lateral-line scales were counted and the same scale row followed to the base of the caudal fin for the lateral scale count. Methods for taking counts and measurements follow Kullander (2008) and Pethiyagoda *et al.* (2012). Values in parentheses after a count represent the frequency of that count. One paratype of the new species, BNHS FWF 144 (♂), as well as a specimen of *P. conchoni*, BNHS FWF 163 (♂), were cleared and stained for osteology following the procedure described by Potthoff (1984). Osteological nomenclature follows Conway (2011) and the description of osteology follows Pethiyagoda *et al.* (2012) for easy comparison with other related taxa. Illustrations were made from images captured by a digital camera fitted to a Leica S8 APO stereo-zoom light microscope ([www.leica-microsystems.com](http://www.leica-microsystems.com)). Vertebral count includes four Weberian vertebrae and compound centrum.

### VOUCHER SPECIMENS AND MUSEUM ABBREVIATIONS

Voucher specimens are deposited in the museum collections of the Bombay Natural History Society (BNHS), Mumbai, India; the Wildlife Information Liaison Development (WILD) Society, Coimbatore, India; the Western Regional Center of the Zoological Survey of India (ZSI-WRC), Pune, India. Other materials examined are in the museum collections

of the Zoological Survey of India, Kolkata, India (ZSI-K), the Natural History Museum (BMNH), London, U.K. and the Museum of Comparative Zoology (MCZ), Harvard University, Cambridge, U.S.A.

## PHYLOGENETIC ANALYSIS

Gills were harvested from four fresh specimens of the new species (BNHS FWF 145, WILD-15-PIS-200, WILD-15-PIS-201 and WILD-15-PIS-203), three specimens of *P. conchoni* (WILD-15-PIS-193, WILD-15-PIS-195 and WILD-15-PIS-196) and one specimen of *P. padamya* (WILD-15-PIS-197) and preserved in 99% ethanol. DNA extraction, PCR amplification for cytochrome b (*cytb*) gene sequences and sequencing protocols follow Katwate *et al.* (2013). Sequences were checked in basic local alignment search tool (BLAST; Altschul *et al.*, 1990) to find the closest sequences available in the GenBank ([www.ncbi.nlm.nih.gov](http://www.ncbi.nlm.nih.gov)). Sequences generated as part of the study are deposited in GenBank under accession numbers KT159938–KT159945 (see Appendix for the GenBank accession numbers for sequences used for comparison). Gene sequences were aligned using MUSCLE (Edgar, 2004) and the best fit nucleotide substitution model was selected from 56 models available in PhyML (Guindon *et al.*, 2010) using TOPALi (Milne *et al.*, 2008) based on minimum Akaike information criterion (AIC) value (Posada & Buckley, 2004). The best nucleotide substitution matrix was used to perform maximum likelihood analysis using PhyML (Guindon *et al.*, 2010). Reliability of the phylogenetic tree was estimated using bootstrap values run for 1000 iterations. The phylogenetic tree was edited in FigTree (Rambaut, 2009). Raw *p*-distances between pairs of sequences were calculated in MEGA 6 (Tamura *et al.*, 2013).

## RESULTS

### *PETHIA SANJAYMOLURI* SP. NOV. (FIGS 1–3)

#### *Holotype*

BNHS FWF 138, 29.5 mm  $L_S$ , India, Maharashtra, Pune District, Pavana River near Rawet, 18° 38' 30" N; 73° 45' 13" E; 561 m a.s.l., U. Katwate, S. Jadhav, P. Kumkar and N. Dahanukar, 27 June 2014.

#### *Paratypes*

BNHS FWF 139, one specimen, 30.5 mm  $L_S$ , India, Maharashtra, Pune District, Nira River near Bhor, 18° 10' 08" N; 73° 52' 12" E; 597 m a.s.l., U. Katwate, P. Kumkar and N. Dahanukar, 1 February 2015; BNHS FWF 144–145, two specimens, 20.5–30.5 mm  $L_S$ ; same data as holotype; BNHS FWF 146, one specimen, 23.2 mm  $L_S$ , India, Maharashtra, Pune District, Nira River near Bhor, 18° 10' 08" N; 73° 52' 12" E; 597 m a.s.l., U. Katwate, P. Kumkar and N. Dahanukar, 1 February 2015; WILD-15-PIS-198–200, three specimens, 29.5–33.2 mm  $L_S$ ; same data as holotype; WILD-15-PIS-201–203, three specimens, 22.2–24.5 mm  $L_S$ , India, Maharashtra, Pune District, Nira River near Bhor, 18° 10' 08" N; 73° 52' 12" E; 597 m a.s.l., U. Katwate, P. Kumkar and N. Dahanukar, 1 February 2015; ZSI-WRC P/4357–4359, three specimens, 27.8–30.1 mm  $L_S$ , same data as holotype; ZSI-WRC P/4356, one specimen, 25.1 mm  $L_S$ , India, Maharashtra, Pune District, Nira River near Bhor, 18° 10' 08" N; 73° 52' 12" E; 597 m a.s.l., U. Katwate, P. Kumkar and N. Dahanukar, 1 February 2015.



FIG. 1. *Pethia sanjaymoluri*, holotype, male, BNHS FWF 138, 29.5 mm standard length, India, Maharashtra, Pune District, Pavana River near Rawet.

### Diagnosis

*Pethia sanjaymoluri* is distinguished from all other species of *Pethia* by a combination of characteristics that includes an incomplete lateral line; absence of barbels; fleshy upper lip; lateral-line pored scales ceasing after the seventh to 12th lateral-line scale; scales in lateral series 23–25; predorsal scales 10; prepelvic scales 11–14; pre-anal scales 17–20; scales between dorsal-fin origin and lateral-line row  $4\frac{1}{2}$ ; four scales between lateral-line row and pelvic-fin origin; last simple dorsal-fin ray strong, serrated, with 8–15 serrae on its distal half, one serra on its apical half; dorsal fin originating behind pelvic-fin origin; caudal fin with  $8 + 8$  procurent rays and  $9 + 8$  branched caudal-fin rays; four supraneurals; six predorsal neural spines; third infraorbital deep, overlapping preoperculum; gill rakers simple, four on lateral and 11–12 on medial margin of first ceratobranchial and four on medial side of first epibranchial;  $4 + 5$  predorsal vertebrae;  $4 + 26$  total vertebrae, with  $4 + 13$  abdominal and 13 caudal vertebrae. Anal, pelvic and pectoral fins colourless in adults. Body colouration includes a black humeral spot below the lateral line, covering third and fourth lateral-line scales and extending to one scale below the lateral-line row; a caudal spot, covering 17th–19th scales in lateral series; apical half of dorsal-fin membrane between anterior-most five branched rays studded with melanophores, making the tip of the dorsal fin appear dark black.

### Description

General appearance as in Figs 1–4. Morphometric and meristic data for the holotype and 14 paratypes provided in Table I.

Body elongated, deep; compressed; predorsal contour convex, rising gradually up to dorsal-fin origin, thereafter sloping down towards hypural notch. Ventral profile convex up to base of pelvic fin, running almost straight towards anal-fin origin, sloping down sharply from anal-fin origin towards posterior end of anal-fin base, then almost straight to hypural notch. Caudal peduncle elongated, its length 1.2–1.9 times its depth.

Head small, laterally compressed. Snout rounded, smooth, slightly shorter than or equal to eye diameter, with a distinct lateral fold and fleshy overhanging upper lip. Eyes

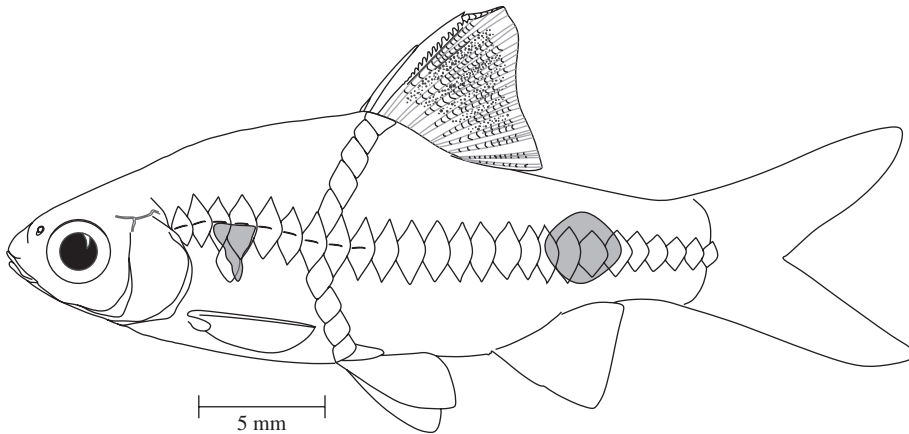


FIG. 2. *Pethia sanjaymoluri*, holotype, BNHS FWF 138, 29.5 mm standard length, showing distribution of prominent body pigmentation and banding pattern with scale rows used for counting lateral and transverse scale rows.

large, dorso-laterally positioned, closer to snout tip than margin of operculum, diameter 1.3–1.7 times interorbital width. Mouth small, subterminal, ventrally U-shaped, angle of gape not reaching to vertical from anterior margin of eye. Upper lip relatively thicker and more fleshy than lower lip, lower lip not interrupted. Barbels absent.

Dorsal fin originating behind pelvic-fin origin, closer to tip of snout than to base of caudal peduncle, its distal margin concave, height less than head length. Dorsal fin with



FIG. 3. *Pethia sanjaymoluri*, holotype in life, photographed immediately after capture.



FIG. 4. *Pethia sanjaymoluri*; paratype, male, BNHS FWF 139, 30.5 mm standard length, in life showing body coloration and prominent black dorsal fin tip.

three simple and eight branched rays, last simple ray strong, densely serrated posteriorly. Pectoral fin with one simple and 12 (3), 13 (4) or 14 (8) branched rays, its tip rounded, reaching one or two scales anterior to pelvic-fin origin. Pelvic fin with one simple and seven branched rays, its tip rounded, not reaching vent when adpressed. Anal fin with three simple and five branched rays, its distal margin weakly concave, with rounded corners. Caudal fin forked, lobes representing more than half of fin length, tips rounded. Branched caudal-fin rays with nine dorsal, eight ventral; dorsal and ventral procurrent rays, eight.

Lateral line incomplete; 23 (1), 24 (5) or 25 (9) scales in lateral series, which runs almost straight to caudal-fin base, piercing anteriormost seven (2), eight (2), nine (7), 10 (1), 11 (1) or 12 (2) scales. Scales in transverse row  $4\frac{1}{2}/1/4$ , predorsal scales 10, prepelvic scales 11 (1), 12 (1), 13 (11) or 14 (11), pre-anal scales 17 (1), 18 (2), 19 (8) or 20 (4), circumpeduncular scales 12. Pelvic axillary scale present, reaching to one-fourth of adpressed pelvic-fin length.

#### *Osteology*

The internal anatomy of a differentially stained and cleared specimen of *Pethia sanjaymoluri*, paratype, BNHS FWF 144, is illustrated in Figs 5–8. Supraneurals, four (1); predorsal neural spines, six (1). First pterygiophore (P-MR) of dorsal fin inserted between ninth and 10th vertebrae (Fig. 5). Weberian apparatus comprises the centra of the first four vertebrae. Predorsal vertebrae including Weberian apparatus, nine (1). Total number of vertebrae 4 + 26, with 4 + 13 abdominal and 13 caudal vertebrae, including compound centrum (1) (Fig. 5). Proximal tip of dentary pointed and exhibits

TABLE I. Morphometric characteristics and meristics of *Pethia sanjaymoluri*

Characteristics	Holotype	Paratypes (n = 14)	
		Mean $\pm$ s.d.	Range
<b>Morphometric</b>			
Total length ( $L_T$ , mm)	37.5	35.1 $\pm$ 4.8	25.3–41.4
Standard length ( $L_S$ , mm)	29.5	27.4 $\pm$ 3.7	20.5–33.2
<b>%<math>L_S</math></b>			
Head length ( $L_H$ )	27.4	29.4 $\pm$ 1.3	27.3–31.6
Head depth	21.4	23.2 $\pm$ 0.8	21.3–24.4
Head width	16.3	16.5 $\pm$ 0.8	15.5–18.4
Body depth	35.9	34.7 $\pm$ 3.3	30.0–40.6
Body width at dorsal-fin origin	15.6	14.9 $\pm$ 2.3	9.5–18.1
Body width at anal-fin origin	10.8	11.6 $\pm$ 2.2	7.7–14.7
Predorsal distance	52.8	51.0 $\pm$ 0.9	49.6–52.7
Dorsal to hypural distance	51.3	52.6 $\pm$ 1.8	47.8–55.3
Prepelvic distance	48.0	49.7 $\pm$ 1.8	45.6–52.0
Pre-anal distance	67.8	69.2 $\pm$ 1.4	67.2–71.8
Prepectoral distance	29.8	29.4 $\pm$ 1.1	27.8–31.0
Dorsal-fin length	25.7	25.3 $\pm$ 2.2	20.4–28.0
Dorsal-fin spine length	18.8	20.3 $\pm$ 3.1	11.8–23.4
Length of dorsal-fin base	15.7	15.5 $\pm$ 1.0	13.6–17.0
Pectoral-fin length	18.4	18.2 $\pm$ 3.3	14.1–24.7
Anal-fin depth	16.4	16.6 $\pm$ 1.6	13.8–19.0
Caudal-peduncle length	18.7	20.7 $\pm$ 1.9	17.4–24.4
Caudal-peduncle depth	14.0	13.6 $\pm$ 0.7	12.7–14.7
<b>% <math>L_H</math></b>			
Head depth	78.1	79.0 $\pm$ 4.7	71.1–86.5
Head width	59.4	56.4 $\pm$ 4.4	50.4–65.9
Snout length	21.5	26.6 $\pm$ 3.7	17.0–32.7
Eye diameter	31.9	32.2 $\pm$ 4.9	16.8–37.6
Interorbital width	43.9	38.4 $\pm$ 4.8	29.2–46.4
<b>Meristics</b>			
Lateral-line scales	25		23–25
Number of lateral-line pores	9		7–12
Dorsal-fin ray serrae	15		8–15
Transverse-scale rows	4 <sup>1</sup> / <sub>2</sub> /1/4		4 <sup>1</sup> / <sub>2</sub> /1/4
Predorsal scales	10		10
Prepelvic scales	13		11–14
Pre-anal scales	19		17–20
Circumpeduncular scales	12		12
Dorsal-fin rays	iii 8		iii 8
Pectoral-fin rays	i 14		i 12–14
Pelvic-fin rays	i 7		i 7
Anal-fin rays	iii 5		iii 5
Caudal-fin rays (procurrent)	8 + 8		8 + 8
Caudal-fin rays (principal)	9 + 8		9 + 8

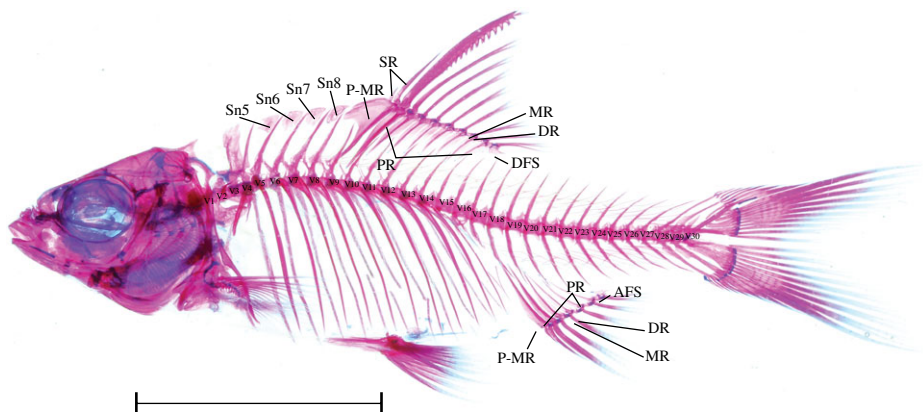


FIG. 5. Cleared and stained specimen of male *Pethia sanjaymoluri*, paratype, BNHS FWF 144, 30.5 mm standard length. AFS, anal-fin stay; DFS, dorsal-fin stay; DR, distal radial; MR, middle radial; P-MR, proximal-middle radial; PR, proximal radial; Sn5–8, supraneural 5–8; SR, simple rays; V1–30, vertebra. Scale bar: 10 mm.

a coronoid process with a blunt end, articulated with the maxilla; coronomeckelian bone well developed, shuttle shaped, a small notch on its posterodorsal side, its length almost equal to or less than the length of the retroarticular bone; Meckel's cartilage rod-shaped; anguloarticular blunt, present on dorsal side, perforated with a small foramen, posterodorsal side almost straight with a deep concavity at the base to articulate with quadrate bone [Fig. 6(a)]. Premaxilla length three times its depth, with a terminal projected tip and posterodorsal process elongated [Fig. 6(b)]. Palatine process of maxilla broad, with pointed projections on dorsal and posterolateral sides [Fig. 6(c)]. Gill rakers simple, four on lateral and 11–12 on medial margin of first ceratobranchial, four on medial side of first epibranchial; first epibranchial relatively broader than second epibranchial, dorsal border with a broad convex projection, ventral side almost flat, without any concavity; second epibranchial with almost straight to low concave dorsal border; third epibranchial with a prominent outer projection on ventral border; fourth epibranchial narrow, elongated, with a small projected arm on ventral side [Fig. 7(a)]. Lateral arm of fifth ceratobranchial narrow, elongated, with three large foramina; proximal half of fifth ceratobranchial marked with three rows of well ossified conical teeth, 2 + 3 + 5 [Fig. 7(b)].

Five infraorbitals, encircling the orbital margin, bear the infraorbital sensory canal. First infraorbital well developed, pentagonal, perforated with minute foramen, orbital margin straight; second infraorbital with a thin tube like infraorbital sensory canal, more elongated than fourth infraorbital, perforated with a median foramen; third infraorbital is broad, deep, with a small notch on its ventral surface; fourth infraorbital is well developed, broader than second infraorbital; fifth infraorbital small; supraorbital large, well ossified, covering orbital cavity dorsally [Fig. 7(c)].

Cleithrum large, narrow, pointed dorsally, concave on posterolateral side. Postcleithrum elongated, rod shaped, articulates with the medial face of the cleithrum, supporting pectoral girdle posteriorly. Coracoid large, conical, devoid of a large foramen, pointed anteroventrally, articulating posteriorly with scapula and pectoral



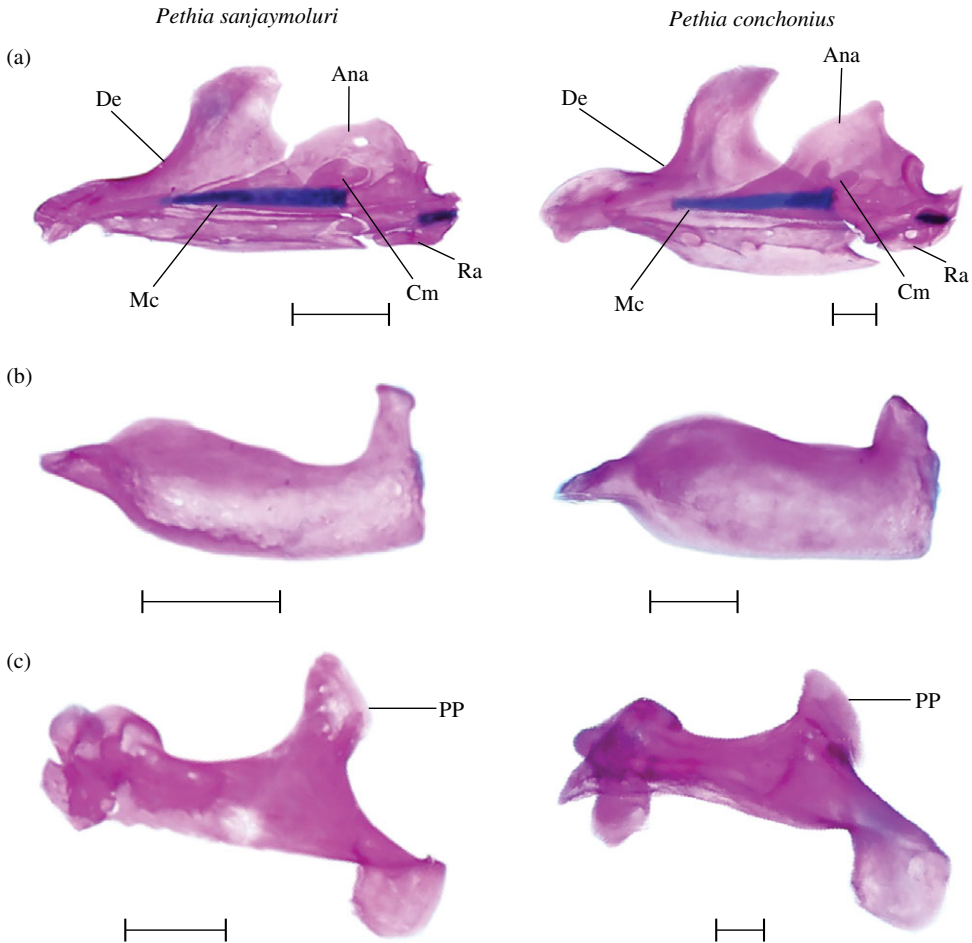


FIG. 6. Male *Pethia sanjaymolori*, paratype, BNHS FWF 144, 30.5 mm standard length ( $L_S$ ) and male *Pethia conchoniui*, topotype, BNHS FWF 163, 56.5 mm  $L_S$ . (a) Left dentary, lateral view, (b) left premaxilla, dorso-lateral view and (c) left maxilla, lateral view. Ana, anguloarticular; Cm, coronomeckelian; De, dentary; MC, Meckel's cartilage; Ra, retroarticular; PP, palatine process. Scale bar: 0.5 mm.

radials. Four large well-ossified pectoral radials present. Two distal radials, with 10 distal radial cartilages; supports a single unbranched and 14 branched (i.13.i) pectoral-fin rays [Fig. 8(a)].

Dorsal fin supported by 12 rays (iii.8.i) and a series of pterygiophores placed between neural spines of vertebrae V9/V10–V14/V15 (Fig. 5). First three pterygiophores constitute a large proximal–middle radial, articulating with two unbranched supernumerary and one serrated last unbranched dorsal-fin ray; distal radial absent. Next three pterygiophores articulate with their respective branched fin rays, distal radial present, middle radials absent. Middle radial appears in articulation with distal radial and dorsal base of the next five pterygiophores. Ten pterygiophores support eight weakly ossified distal radials and five well-ossified middle radials. Four free supraneurals present anterior to dorsal fin.

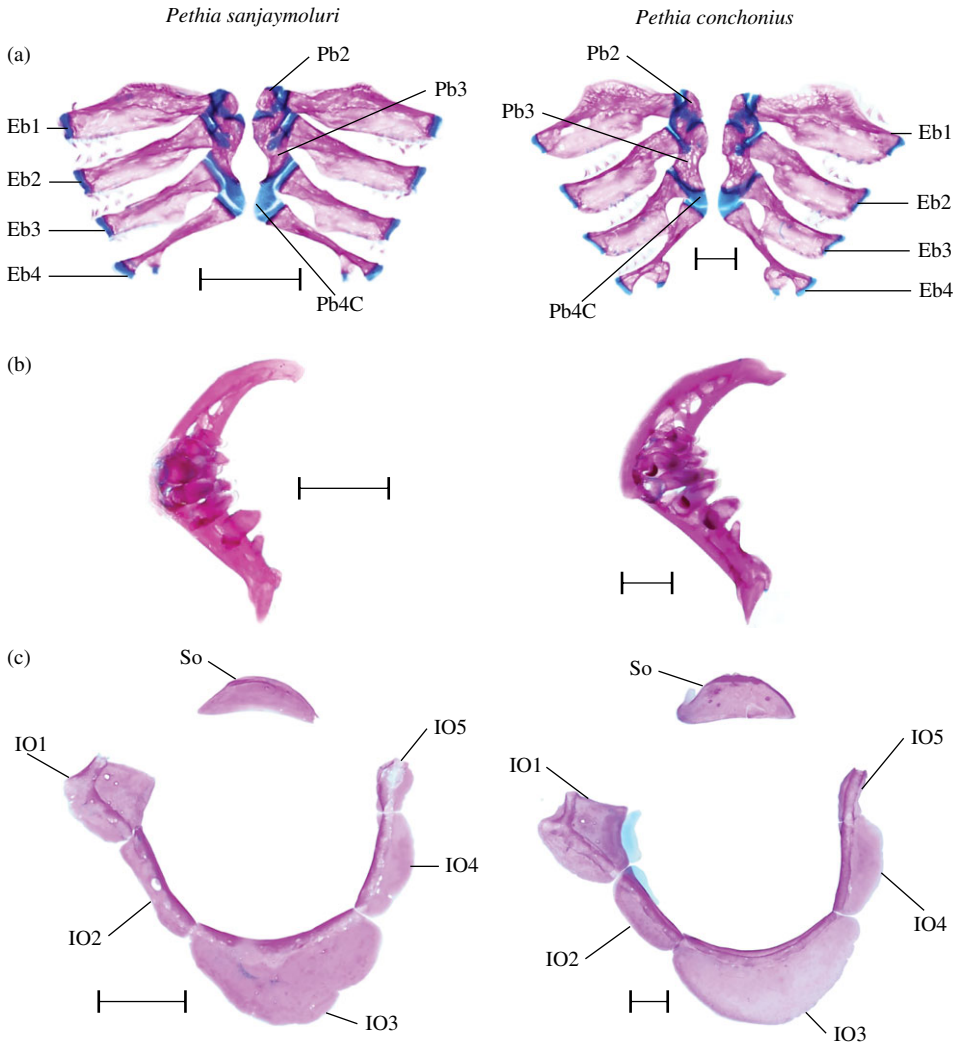


FIG. 7. Male *Pethia sanjaymolori*, paratype, BNHS FWF 144, 30.5 mm standard length ( $L_S$ ) and male *Pethia conchonioides*, topotype, BNHS FWF 163, 56.5 mm  $L_S$ . (a) Dorsal gill arch, ventral view, (b) fifth ceratobranchial, left, latero-ventral view and (c) left infraorbital series, lateral view. Eb1–4, epibranchials 1–4; Pb2–3, pharyngobranchials 2–3; Pb4C, pharyngobranchial 4 cartilage; IO1–5, infraorbitals 1–5; So, supraorbital. Scale bar: 1 mm.

Anal fin constitute nine rays (iii.5.i) supported by a series of anal pterygiophores placed between the haemal spines of vertebrae V17/V18–V21/V22 (Fig. 5). First three pterygiophores constitute elongated proximal–middle radials, articulating with a distal radial, two supernumerary and unbranched anal-fin rays. Middle radial appears in articulation with distal radial and dorsal base of fourth pterygiophore. A total of seven pterygiophores support six weakly ossified distal radials and three well-ossified middle radials. Last fin ray closely united with fifth branched fin ray, articulating with last pterygiophore.

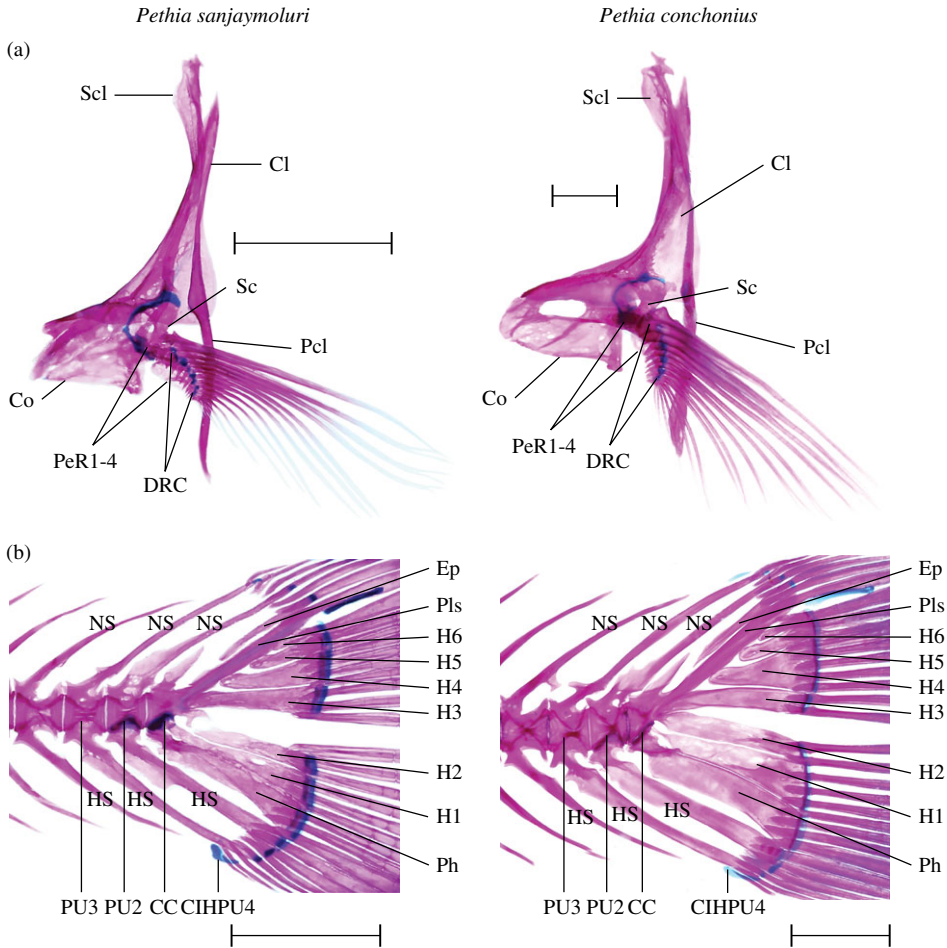


FIG. 8. Male *Pethia sanjaymoluri*, paratype, BNHS FWF 144, 30.5 mm standard length ( $L_S$ ) and male *Pethia conchonius*, topotype, BNHS FWF 163, 56.5 mm  $L_S$ . (a) Pectoral girdle, left, lateral view and (b) caudal skeleton, lateral view. Cl, cleithrum; Co, coracoid; DRC, distal radial cartilage; Pcl, postcleithrum; PeR1–4, pectoral radials 1–4; Sc, scapula; Scl, supracleithrum; CC, compound centrum; CIHPU4, inter-haemal spine cartilage of preural centrum 4; Ep, epural; H1–6, hypurals 1–6; HS, haemal spine; NS, neural spine; Ph, parhypural; Pls, pleurostyle; PU2–3, preural centra 2–3. Scale bar: 2 mm.

Eight dorsal and eight ventral procurent caudal-fin rays. Nine dorsal and eight ventral branched caudal-fin rays. Caudal-fin rays are supported by neural and haemal spines of second and third preural centra and an epural element, pleurostyle, six hypurals and the parhypural [Fig. 8(b)]. A single inter-haemal spine cartilage of fourth preural centrum present, placed anterior to ventral tip of haemal spine of third preural centrum. A single epural runs laterally with anterior margin of pleurostyle on its dorsal half, barely reaching tip of last neural spine of compound centrum. Parhypural broad. First and second hypurals narrow, well ossified. Parhypural and first hypural joining compound centrum on haemal border, second hypural isolated without any connection to compound centrum. Free uroneural absent.

### *Colouration in preservative*

For general appearance, see Fig. 1; body above lateral-line scale row brown; head, dorsum dark brown; lower lip, cheek, opercular region below inferior border of eye cream; ventral region uniformly cream white. A black humeral spot, below lateral line, overlapping third and fourth lateral-line scales, extending one scale below lateral-line row (15); a caudal spot starting vertical from posterior border of caudal-fin base, overlapping 17th and 18th (3), 17th and 19th (3), 17th and 20th (3), 18th and 20th (2), 18th and 21st (3) or 19th and 20th (1) scales of lateral series (Fig. 2). Dorsal fin devoid of any bands, apical half of fin membrane between anterior five branched rays studded with melanophores making the tip of the dorsal fin appear black. Pectoral, pelvic and anal fins sparsely pigmented with melanophores. Caudal fin hyaline, without any bands or spots. Each body scale bordered with melanophores.

### *Colouration in life*

Fresh specimens (Figs 3 and 4) with body iridescent silver, each scale bordered with melanophores. Position of humeral and caudal spots as described for preserved specimens. Dorsal-fin colouration as for preserved specimens. Pectoral, pelvic and anal fins with scattered melanophores. Caudal fin colourless. Iris uniform iridescent silver. Opercular and fourth and fifth infraorbital region studded with black spots.

### *Distribution*

*Pethia sanjaymoluri* is currently known only from two locations (Fig. 9) in the Pavana and Nira tributaries of Bhima River, Krishna River system, of Pune District, Maharashtra, India.

### *Habitat*

At Rawet, *P. sanjaymoluri* was found in the main river channel beneath riparian vegetation and submerged boulders and silt as substratum. Fishes were found among aquatic vegetation. Co-occurring fishes included *Salmostoma boopis* (Day 1874), *Devario aequipinnatus* (McClelland 1839), *Rasbora daniconius* (Hamilton 1822), *Aplocheilus lineatus* (Valenciennes 1846), *Notopterus notopterus* (Pallas 1769), *Mastacembelus armatus* (Lacépède 1800), *Puntius sophore* (Hamilton 1822) and *Rohtee ogilbii* Sykes 1839. At Bhor, *P. sanjaymoluri* was found in ponds and ditches formed by boulders in the main river channel. There was no riparian vegetation and the substratum was made up of basalt bedrock and silt. Co-occurring fishes included *Nemacheilus denisoni* (Day 1867), *R. daniconius*, *Garra mullya* (Sykes 1839), *S. boopis*, *Lepidocephalichthys thermalis* (Valenciennes 1846) and *D. aequipinnatus*.

### *Etymology*

The species is named after Sanjay Molur from the Zoo Outreach Organization, for his contribution to the conservation of threatened taxa in the South Asian region.

### *Common name*

Sanjay's black-tip pethia.



FIG. 9. Type locality and distribution of *Pethia sanjaymouri* in the northern Western Ghats (■, Western Ghats mountain range; ★, holotype and paratype; ●, paratype).

#### *Phylogenetic position*

Model test suggested the best fit nucleotide substitution model to be the General time Reversible (GTR) with gamma distribution (GTR + G, AIC = 25136.20,  $\ln L = -12380.10$ ,  $G = 0.34$ ). *Pethia sanjaymouri* is nested within the clade of *Pethia* (Fig. 10) confirming its generic status, but is genetically distinct from the other *Pethia* spp. for which genetic data are available. The closest congener of *P. sanjaymouri* is *P. conchoni*, from which it differs by a genetic distance of 4.1–4.3%. *Pethia sanjaymouri* also differs from sequences of topotypic *Pethia ticto* (Hamilton 1822) (KP861803 and KP861804) by a genetic distance of 11.3–11.6%.

## DISCUSSION

Nine species of *Pethia* are currently known to be endemic to the drainages originating from the Western Ghats, *Pethia longicauda* Katwate, Paingankar, Raghavan & Dahanukar 2014, *Pethia lutea* Katwate, Raghavan, Paingankar & Dahanukar 2014, *Pethia narayani* (Hora 1937), *Pethia nigripinna* (Knight, Rema Devi, Indra & Arunachalam 2012), *Pethia pookodensis* (Mercy & Jacob 2007), *Pethia punctata* (Day 1865), *Pethia setnai* (Chhapgar & Sane 1992), *Pethia sharmai* (Menon & Rema Devi 1993) and *Pethia striata* Atkore, Knight, Rema Devi & Krishnaswamy 2015. *Pethia sanjaymouri* differs from *P. lutea*, *P. narayani*, *P. punctata*, *P. setnai* and *P. striata* by having an incomplete lateral line (v. complete) (Day, 1865; Hora, 1937; Chhapgar

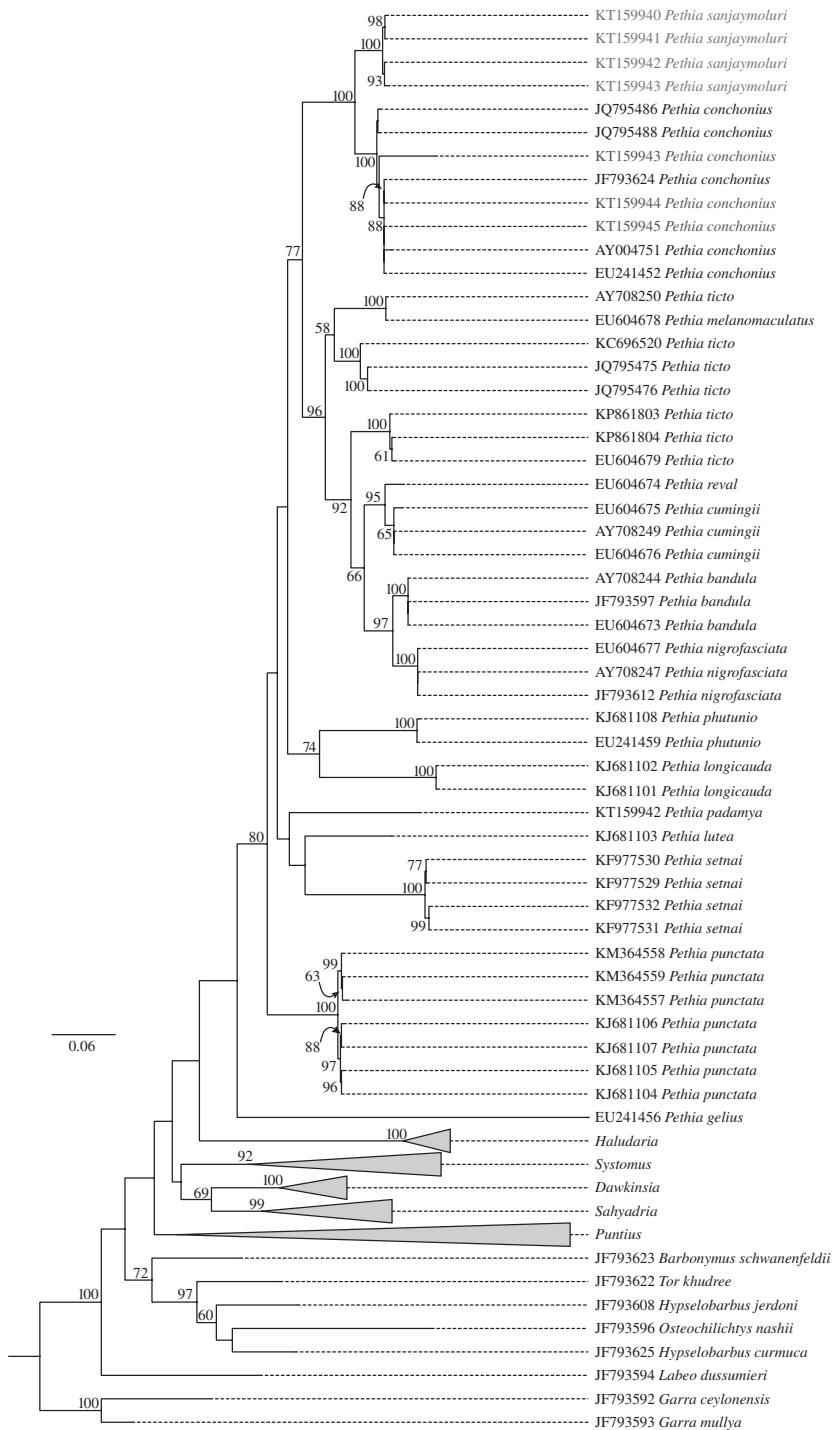


FIG. 10. Phylogenetic position of *Pethia sanjaymoluri* based on maximum likelihood analysis. Values along the nodes are per cent bootstraps for 1000 iterations. Species of *Garra* are used as the out-group.

& Sane, 1992; Menon & Rema Devi, 1993; Katwate *et al.*, 2013, 2014a, b; Atkore *et al.*, 2015). From its remaining Western Ghats endemic congeners, with incomplete lateral line, *P. sanjaymoluri* differs based on characteristics listed in Table II.

*Pethia sanjaymoluri* differs from *Systomus tripunctatus* Jerdon 1849, described from 'a small stream near the coast of Canara' [=southern Karnataka], southern India, in having only two spots on the body, one humeral and one caudal (v. three spots on the body, 'two black spots under end of the dorsal and one at the base of the tail') (Jerdon, 1849).

Genetically, the closest congener of *P. sanjaymoluri* is *P. conchoni*, from which it differs by the presence of a humeral spot (v. absent), two supernumerary rays (v. three supernumerary rays), six predorsal neural spines (v. five), tip of pelvic and anal fins colourless in mature males (v. deep black), iris silver (v. deep yellow) and  $4\frac{1}{2}$  scales between dorsal-fin origin and lateral-line row (v.  $5\frac{1}{2}$  scales between dorsal-fin origin and lateral-line row). Osteologically, *P. sanjaymoluri* differs from *P. conchoni* by the combination of the following characteristics: total vertebrae  $4 + 26$  (v.  $4 + 25$ ); proximal tip of dentary pointed with tip of coronoid process blunt (v. flattened tip of dentary with pointed coronoid process); anguloarticular blunt on dorsal side, perforated by a single foramen, posterodorsal side plain (v. pointed dorsal, foramen absent, posterodorsal side deep, concave) [Fig. 6(a)]; premaxilla with a terminally projected tip, posterodorsal process elongated (premaxilla with ventral tip, posterodorsal process stunted) [Fig. 6(b)]; palatine process of maxilla large, with pointed projection on posterolateral side (v. palatine process short, with plain posterolateral side) [Fig. 6(c)]; gill rakers, four on lateral and 11 or 12 on medial margin of first ceratobranchial (v. five or six on lateral and 10 on medial margin of first ceratobranchial); first epibranchial with shallow convex projection on dorsal border, ventral edge almost flat without any concavity (v. first epibranchial appears wing shaped with deep convex projection on dorsal border, ventral edge with a deep concavity on inner side) [Fig. 7(a)]; orbital margin of first infraorbital straight (v. concave); second infraorbital appears as a narrow tube, perforated by a median foramen, more elongated than fourth infraorbital (v. second infraorbital broad, without a foramen, shorter than fourth infraorbital); fifth infraorbital wide (v. narrow, tube like) [Fig. 7(c)]; cleithrum concave on posterolateral side (v. straight); long postcleithrum (v. relatively broad and short); coracoid conical, devoid of large foramen (v. blunt, perforated by a large foramen) [Fig. 8(a)]; second hypural short and free without any connection to compound centrum (v. long and well developed); second hypural connects with compound centrum on dorsal margin) [Fig. 8(b)].

*Pethia sanjaymoluri* differs from *P. ticto* in having 10 predorsal scales (v. nine), dorsal fin devoid of rows of spots but dense melanophores on the tip of dorsal fin (v. two rows of black spots on dorsal fin), two supernumerary rays (v. three) and six predorsal neural spines (v. five) (Katwate *et al.*, 2015).

*Pethia sanjaymoluri* differs from its Sri Lankan congeners by having 23–25 scales in lateral series, v. 19–21 in *Pethia bandula* (Kottelat & Pethiyagoda 1991), 19–21 in *Pethia cuningii* (Günther 1868), 20–22 in *Pethia nigrofasciata* (Günther 1868) and 18–21 in *Pethia reval* (Meegaskumbura, Silva, Maduwage & Pethiyagoda 2008) (Günther, 1868; Kottelat & Pethiyagoda, 1991; Meegaskumbura *et al.*, 2008). In addition to these species, *P. sanjaymoluri* differs from *Pethia melanomaculata* (Deraniyagala 1956) by having a black-tipped dorsal fin (v. hyaline without any marks), greater number of scales in lateral series 23–25 (v. 20–23) (Batuwita *et al.*, 2015) and a genetic distance of 12.6–12.8%.

TABLE II. Distinguishing characteristics to separate *Pethia sanjaymooluri* from its congeners with incomplete lateral line endemic to the Western Ghats

Characteristics	<i>P. sanjaymooluri</i>	<i>P. longicauda</i>	<i>P. nigripinna</i>	<i>P. pookodensis</i>	<i>P. sharmai</i>
Lateral series scales	23–25	22–24	20–21	22–23	42
Lateral-line pored scales	7–12	5–6	3–5	6–8	7
Transverse scale TOWS	4 1/2/1/4	3 1/2/1/3 1/2	4 1/2/1/2–2 1/2	4 1/2/1/3 1/2	7 1/2/1/6 1/2
Predorsal scales	10	9	8	8–9	15
Barbels	Absent	Absent	Absent	Absent	Pair of maxillary barbels
Spots on caudal peduncle	1	2	1	2	1
Position of humeral spot	Overlapping third and fourth lateral-line scales, extending one scale below lateral-line row	Overlapping third and fourth lateral-line scales, extending one scale above lateral-line row	Overlapping third and fourth lateral-line scales	Overlapping third and fourth lateral-line scales	Absent



*Pethia sanjaymoluri* differs from the other species of *Pethia* occurring in northern and north-eastern India and Myanmar that have an incomplete lateral line. Namely it differs from *Pethia ater* (Linthoingambi & Vishwanath 2007), *Pethia aurea* Knight 2013, *Pethia canius* (Hamilton 1822), *Pethia didi* (Kullander & Fang 2005), *Pethia erythromycter* (Kullander 2008), *Pethia gelius* (Hamilton 1822), *Pethia khugae* (Linthoingambi & Vishwanath 2007), *Pethia manipurensis* (Menon, Rema Devi & Vishwanath 2000), *Pethia meingangbii* (Arunkumar & Tombi Singh 2003), *Pethia nankyweensis* (Kullander 2008), *Pethia ornatus* (Vishwanath & Laisram 2004), *Pethia padamya* (Kullander & Britz 2008), *Pethia phutunio* (Hamilton 1822), *Pethia shalynius* (Yazdani & Talukdar 1975), *Pethia thelys* (Kullander 2008) and *Pethia yuensis* (Arunkumar & Tombi Singh 2003), in having predorsal neural spines six (v. five in *P. ater* and *P. khugae*), 23–25 lateral scale rows (v. 20–22 in *P. canius*, 19–21 in *P. didi*, 18–20 in *P. erythromycter*, 19–21 in *P. padamya* and 21–22 in *P. yuensis*), 4½ transverse scale rows between the dorsal-fin origin and the lateral-line scale row (v. 3½ in *P. manipurensis* and 5½ in *P. meingangbii*), four scales between lateral-line row and pelvic-fin origin (v. 3½ in *P. aurea*, 2½ in *P. gelius*, 2½ in *P. ornata*, three in *P. phutunio*, 2½–3½ in *P. shalynius* and 3½ in *P. thelys*) and 10 predorsal scales (v. eight to nine in *P. nankyweensis*) (Hamilton, 1822; Yazdani & Talukdar, 1975; Menon *et al.*, 2000; Arunkumar & Tombi Singh, 2003; Vishwanath & Laisram, 2004; Kullander & Fang, 2005; Linthoingambi & Vishwanath, 2007; Kullander, 2008; Kullander & Britz, 2008; Knight, 2013).

With the description of *P. sanjaymoluri*, the number of valid species of *Pethia* has reached 39, of which 10 are endemic to southern India. Discovery of yet another new species of freshwater fish from the northern region of the Western Ghats suggests that this biogeographical region is likely to harbour more undescribed species.

#### COMPARATIVE MATERIAL EXAMINED

*Pethia conchonius* ( $n = 5$ ): BNHS FWF 163, one specimen, 56.5 mm  $L_S$ , male, cleared and stained specimen, India, West Bengal, Kolkata, Ramnagar, Beri Baor, 22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l., U. Katwate, R. Raghavan and N. Dahanukar, 6 June 2014; WILD-15-PIS-193–194, two specimens, 39.0–42.4 mm  $L_S$ , India, West Bengal, Kolkata, Ramnagar, Beri Baor, 22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l., U. Katwate, R. Raghavan and N. Dahanukar, 6 June 2014; WILD-15-PIS-195–196, two specimens, 42.5–42.8 mm  $L_S$ , India, Bihar, Bhagalpur 25° 15' 46" N; 86° 59' 27" E; 31 m a.s.l., U. Katwate and N. Dahanukar, 10 May 2014.

*Pethia longicauda* ( $n = 10$ ): Holotype, BNHS FWF 96, 36.0 mm  $L_S$ ; India, Maharashtra, Kolhapur District, Hiranyakeshi River near Gavse-Ajara, 16° 04' 06" N; 74° 05' 30" E; 690 m a.s.l., U. Katwate, M. Paingankar and N. Dahanukar, 11 June 2013; Paratypes, BNHS FWF 97–100, four specimens, 32.0–37.7 mm  $L_S$ ; same data as holotype; Paratypes, WILD-14-PIS-073–075, three specimens, 30.1–35.7 mm  $L_S$ ; same data as holotype; Paratypes, ZSI-WRC P/3950–51, two specimens, 31.4–37.6 mm  $L_S$ ; same data as holotype.

*Pethia lutea* ( $n = 22$ ): Holotype, BNHS FWF 71, India, Maharashtra, Raigad District, Kundalika River, Bhira, 18° 26' 28" N; 73° 16' 01" E; 50 m a.s.l., U. Katwate and C. Katwate, 23 December 2012; Paratypes, BNHS FWF 72, 78 and 79, three specimens, same data as holotype; WILD-14-PIS-061, one specimen, same data as holotype; ZSI-WRC-P/3686, one specimen, same data as holotype; BNHS FWF 73, 80

and 81, three specimens, India, Maharashtra, Raigad District, Ulhas River, Karjat, 18° 55' 19" N; 73° 19' 55" E; 48 m a.s.l., N. Dahanukar and M. Paingankar, 23 June 2012; BNHS FWF 74 and 82, two specimens, India, Maharashtra, Raigad District, Kal River, tributary of Savitri River, Mangaon, 18° 13' 59" N; 73° 15' 22" E; 7 m a.s.l., U. Katwate and C. Katwate, 5 January 2013; BNHS FWF 75, one specimen, India, Maharashtra, Raigad District, Savitri River, Mahad, 18° 05' 28" N; 73° 27' 58" E; 16 m a.s.l., U. Katwate, C. Katwate, R. Pawar and V. Shinde, 23 September 2013; WILD-14-PIS-062, one specimen, India, Maharashtra, Raigad District, Savitri River, Mahad, 18° 05' 28" N; 73° 27' 58" E; 16 m a.s.l., U. Katwate, C. Katwate, R. Pawar and V. Shinde, 23 September 2013; ZSI-WRC-P/3687, one specimen, India, Maharashtra, Raigad District, Savitri River, Mahad, 18° 05' 28" N; 73° 27' 58" E; 16 m a.s.l., U. Katwate, C. Katwate, R. Pawar and V. Shinde, 23 September 2013; BNHS FWF 76, one specimen, India, Maharashtra, Raigad District, Savitri River, Shivathar Ghal, 18° 08' 53" N; 73° 37' 08" E; 145 m a.s.l., U. Katwate, C. Katwate, R. Pawar and V. Shinde, 26 November 2013; WILD-14-PIS-063, one specimen, India, Maharashtra, Raigad District, Savitri River, Shivathar Ghal, 18° 08' 53" N; 73° 37' 08" E; 145 m a.s.l., U. Katwate, C. Katwate, R. Pawar and V. Shinde, 26 November 2013; ZSI-WRC-P/3688, one specimen, India, Maharashtra, Raigad District, Savitri River, Shivathar Ghal, 18° 08' 53" N; 73° 37' 08" E; 145 m a.s.l., U. Katwate, C. Katwate, R. Pawar and V. Shinde, 26 November 2013; BNHS FWF 83–84, two specimens, India, Maharashtra, Raigad District, Savitri River, Poladpur, 17° 58' 59" N; 73° 28' 12" E; 34 m a.s.l., U. Katwate and C. Katwate, 27 November 2013; BNHS FWF 77 and 85, two specimens, India, Maharashtra, Ratnagiri District, Shastri River, Sangameshwar, 17° 11' 13" N; 73° 33' 00" E; 12 m a.s.l., U. Katwate and S. Rane, 16 September 2013; WILD-14-PIS-064, one specimen, India, Maharashtra, Ratnagiri District, Shastri River, Sangameshwar, 17° 11' 13" N; 73° 33' 00" E; 12 m a.s.l., U. Katwate and S. Rane, 16 September 2013.

*Pethia narayani* ( $n = 2$ ): Syntypes, ZSI Kolkata F12180/1, two specimens, India, Karnataka, Cauvery River, Coorg, C. R. N. Rao (only photographs examined).

*Pethia padamyia* ( $n = 1$ ): WILD-15-PIS-197, one specimen, 37.4 mm  $L_S$ , aquarium trade, U. Katwate, 1 December 2014.

*Pethia phutunio* ( $n = 3$ ): BNHS-FWF-95, one specimen, India, Odisha, Sambalpur, S. Jadhav, 7 July 2012; BNHS FWF 93–94, 2 ex., India, West Bengal, Hooghly, R. Pandit, 12 May 2010.

*Pethia pookodensis* ( $n = 2$ ): two specimens, specimens not collected, from India, Kerala, Wayanad, Pookode Lake, R. Raghavan and A. Ali, 14 April 2004 (only photographs examined). Additional data from Mercy & Jacob (2007).

*Pethia punctata* ( $n = 26$ ): Day's material (syntype?), MCZ 4303, one specimen, India, Kerala, Cannanore, on the Malabar Coast, F. Day (only photograph examined); Day's material (syntype?), BMNH 1889.2.1.755, one specimen, India, Kerala, Wayanad, F. Day (only photograph examined); BNHS FWF 107–113, seven specimens, India, Kerala, Vembanad Lake, 9° 54' 35" N; 76° 20' 34" E; 1–2 m a.s.l., U. Katwate and F. Baby, 29 May 2014; WILD-14-PIS-111–114, four specimens, India, Kerala, rivers flowing into the Vembanad Lake, Edathua, 9° 54' 35" N; 76° 20' 34" E; 1–2 m a.s.l., U. Katwate and F. Baby, 29 May 2014; ZSI-WRC-P/4092, three specimens, India, Kerala, rivers flowing into the Vembanad Lake, Edathua, 9° 54' 35" N; 76° 20' 34" E; 1–2 m a.s.l., U. Katwate and F. Baby, 29 May 2014; CRG-SAC-2010.05.01–03, three specimens, India, Kerala, Cochin–Ernakulam, F. Baby, 18 June 2010; BNHS FWF 86–90, 92, six specimens, India, Maharashtra, Sindhudurga District, Gad River,

Bandiwade, U. Katwate and S. Rane, 15 September 2013; BNHS FWF 91, one specimen, India, Maharashtra, Terekhol River, Madkhol, U. Katwate, M. Paingankar and N. Dahanukar, 9 August 2013.

*Pethia setnai* ( $n = 35$ ): Holotype, ZSI Kolkata FF2766, India, Goa, Sanguem, S. R. Sane, 1 March 1985; Paratypes, ZSI Kolkata FF2767, six specimens, India, Goa, Sanguem, 1 March 1985; BNHS FWF 53, 63–70, nine specimens, India, Goa, Sanguem, U. Katwate, M. Paingankar and N. Dahanukar, 10 August 2013; WILD-13-PIS-043–045, three specimens, India, Goa, Sanguem, U. Katwate, M. Paingankar and N. Dahanukar, 10 August 2013; ZSI-WRC-P/3567, two specimens, India, Goa, Sanguem, U. Katwate, M. Paingankar and N. Dahanukar, 10 August 2013; BNHS FWF 54–62, nine specimens, India, Maharashtra, Terekhol River at Madkhol, U. Katwate and N. Dahanukar, 12 June 2013; WILD-13-PIS-046–48, three specimens, India, Maharashtra, Terekhol River at Madkhol, U. Katwate and N. Dahanukar, 12 June 2013; ZSI-WRC-P/3568, two specimens, India, Maharashtra, Terekhol River at Madkhol, U. Katwate and N. Dahanukar, 12 June 2013.

*Pethia ticto* ( $n = 13$ ): BNHS FWF 127–131, five specimens, 37.2–47.2 mm  $L_S$ , India, West Bengal, Kolkata, Ramnagar, Beri Baor, 22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l., U. Katwate, R. Raghavan and N. Dahanukar, 6 June 2014; WILD-15-PIS-145–148, four specimens, 31.9–34.9 mm  $L_S$ , India, West Bengal, Kolkata, Ramnagar, Beri Baor, 22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l., U. Katwate, R. Raghavan and N. Dahanukar, 6 June 2014; ZSI-WRC P/4360, two specimens, 35.0–35.4 mm  $L_S$ , India, West Bengal, Kolkata, Ramnagar, Beri Baor, 22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l., U. Katwate, R. Raghavan and N. Dahanukar, 6 June 2014; DABFUK/FI/223, two specimens, 36.0–36.2 mm  $L_S$ , India, West Bengal, Kolkata, Ramnagar, Beri Baor, 22° 54' 32" N; 88° 51' 14" E; 5 m a.s.l., U. Katwate, R. Raghavan and N. Dahanukar, 6 June 2014.

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## APPENDIX

TABLE AI. National Center for Biotechnology Information (NCBI) accession numbers, locations and voucher numbers for cytochrome b gene sequences

Species	Location	Voucher	GenBank number
<i>Pethia</i> spp.			
<i>P. sanjaymoluri</i>	Pavana River, Rawet, Maharashtra, India	BNHS FWF 145	KT159938
<i>P. sanjaymoluri</i>	Pavana River, Rawet, Maharashtra, India	WILD-15-PIS-200	KT159939
<i>P. sanjaymoluri</i>	Nira River, Bhor, Maharashtra, India	WILD-15-PIS-201	KT159940
<i>P. sanjaymoluri</i>	Nira River, Bhor, Maharashtra, India	WILD-15-PIS-203	KT159941
<i>P. padamya</i>	Aquarium trade	WILD-15-PIS-197	KT159942
<i>P. conchoni</i>	West Bengal, India	WILD-15-PIS-193	KT159943
<i>P. conchoni</i>	Bihar, India	WILD-15-PIS-195	KT159944
<i>P. conchoni</i>	Bihar, India	WILD-15-PIS-196	KT159945
<i>P. conchoni</i>	West Bengal, India	NBFR:PCS18	JQ795488
<i>P. conchoni</i>	West Bengal, India	NBFR:PCS15	JQ795486
<i>P. conchoni</i>	Aquarium collection	WHT8850_AQ4	JF793624
<i>P. conchoni</i>	Aquarium trade	NRM 52524	EU241452
<i>P. conchoni</i>	Aquarium trade	–	AY004751
<i>P. ticto</i>	Beri Baor, India	WILD-15-PIS-145	KP861803
<i>P. ticto</i>	Beri Baor, India	WILD-15-PIS-146	KP861804
<i>P. ticto</i>	Boncron, India	WHT8815_6i	EU604679
<i>P. cf. ticto</i>	Ruili, Yunnan, China	–	KC696520
<i>P. cf. ticto</i>	Lucknow, Uttar Pradesh, India	NBFR:PTO11	JQ795474
<i>P. cf. ticto</i>	Lucknow, Uttar Pradesh, India	NBFR:PTO12	JQ795475
<i>P. cf. ticto</i>	Lucknow, Uttar Pradesh, India	NBFR:PTO13	JQ795476
<i>P. cf. ticto</i>	Lucknow, Uttar Pradesh, India	NBFR:PTO14	JQ795477
<i>P. cf. ticto</i>	Lucknow, Uttar Pradesh, India	NBFR:PTO15	JQ795478
<i>P. punctata</i>	Ernakulam, Kerala, India	BNHS FWF 113	KM364559
<i>P. punctata</i>	Ooramana, Kerala, India	WILD-14-PIS-110	KM364557
<i>P. punctata</i>	Ooramana, Kerala, India	BNSH FWF 120	KM364558
<i>P. punctata</i>	Bandivade, Maharashtra, India	BNHS-FWF-89	KJ681104
<i>P. punctata</i>	Bandivade, Maharashtra, India	BNHS-FWF-90	KJ681105
<i>P. punctata</i>	Madkhol, Maharashtra, India	BNHS-FWF-91	KJ681106
<i>P. punctata</i>	Madkhol, Maharashtra, India	WILD-14-PIS-103	KJ681107
<i>P. longicauda</i>	Azara, Maharashtra, India	BNHS-FWF-100	KJ681101
<i>P. longicauda</i>	Azara, Maharashtra, India	WILD-14-PIS-075	KJ681102
<i>P. lutea</i>	Bhira, Maharashtra, India	BNHS-FWF-78	KJ681103
<i>P. setnai</i>	Madkhol, Maharashtra, India	BNHS-FWF-54	KF977531

TABLE AI. Continued

Species	Location	Voucher	GenBank number
<i>P. setnai</i>	Madkhol, Maharashtra, India	WILD-13-PIS-046	KF977532
<i>P. setnai</i>	Sanguem, Goa, India	BNHS-FWF-53	KF977529
<i>P. setnai</i>	Sanguem, Goa, India	WILD-13-PIS-043	KF977530
<i>P. phutunio</i>	West Bengal, India	NRM 41712	EU241459
<i>P. phutunio</i>	Sambalpur, Odisha, India	BNHS-FWF-95	KJ681108
<i>P. melanomaculata</i>	Kandalama, Sri Lanka	WHT8816_75	EU604678
<i>P. melanomaculata</i>	Kandalama, Sri Lanka	–	AY708250
<i>P. reval</i>	Kelani River, Sri Lanka	WHT8812_1	EU604674
<i>P. nigrofasciata</i>	Mawanana, Sri Lanka	WHT8838_64	JF793612
<i>P. nigrofasciata</i>	Galle, Sri Lanka	–	AY708247
<i>P. nigrofasciata</i>	Sri Lanka	WHT8811	EU604677
<i>P. bandula</i>	Sri Lanka	WHT8810	EU604673
<i>P. bandula</i>	Galapitamada, Sri Lanka	–	AY708244
<i>P. bandula</i>	Galapitamada, Sri Lanka	WHT8823_59	JF793597
<i>P. cumingii</i>	Sri Lanka	WHT8813	EU604675
<i>P. cumingii</i>	Bentota, Sri Lanka	WHT8814_46	EU604676
<i>P. cumingii</i>	Galle, Sri Lanka	–	AY708249
<i>P. gelius</i>	Aquarium trade	NRM 50829	EU241456
<i>Puntius</i> spp.			
<i>P. bimaculatus</i>	Bentota, Sri Lanka	WHT8824_48	JF793598
<i>P. titteya</i>	Kalu River, Sri Lanka	WHT8846_11	JF793620
<i>P. thermalis</i>	Mawanana, Sri Lanka	WHT8826_54	JF793600
<i>P. chola</i>	Boncron, India	WHT8827_24i	JF793601
<i>P. sophore</i>	Boncron, India	WHT8845_217ai	JF793619
<i>P. cf layardii</i>	Gin River, Sri Lanka	WHT8829_69	JF793603
<i>P. kelumi</i>	Gin River, Sri Lanka	WHT8830_70	JF793604
<i>P. dorsalis</i>	Mamallapuram, Sri Lanka	WHT8831_35i	JF793605
<i>P. mahecola</i>	Kottayam, India	WHT8837_16i	JF793611
<i>Dawkinsia</i> spp.			
<i>D. filamentosa</i>	Kottayam, India	WHT8833_27i	JF793607
<i>D. filamentosa</i>	–	–	JX975487
<i>D. singhala</i>	Menik, River, Sri Lanka	WHT8843_33	JF793617
<i>D. srilankensis</i>	Pallegama, Sri Lanka	WHT8844_19	JF793618
<i>D. tambraparniei</i>	–	–	JX975490
<i>D. exclamatio</i>	–	–	JX975489
<i>D. rohani</i>	–	–	JX975488
<i>D. tambraparniei</i>	–	–	JX049981
<i>D. arulius</i>	Aquarium trade	NRM 50830	EU241450
<i>Haludaria</i> spp.			
<i>H. fasciata</i>	Chalakydy, India	WHT8832_20i	JF793606
<i>H. melanampyx</i>	Aquarium trade	NRM 50827	EU241458
<i>H. fasciata</i>	Chengannur, India	–	AY708262
<i>H. fasciata</i>	Pidavoor, Kerala, India	NBFGR:PFA6	JQ795453
<i>Sahyadria</i> spp.			
<i>S. denisonii</i>	Sullya, Karnataka, India	CDR01	GQ247558
<i>S. denisonii</i>	Cherupuzha, Kerala, India	KGD01	GQ247559
<i>S. denisonii</i>	Iritty, Kerala, India	VLP02	JX470421
<i>S. denisonii</i>	Pullooranpara, Kerala, India	CLR02	JX470426
<i>S. chalakkudiensis</i>	Vettilapara, Kerala, India	CHD02	JX470424
<i>S. chalakkudiensis</i>	–	–	JX311437
<i>S. chalakkudiensis</i>	Koruthodu, Kerala, India	PMB11	JX481182

TABLE AI. Continued

Species	Location	Voucher	GenBank number
<i>S. denisonii</i>	Kadakkola, Kerala, India	ACL9	JX470431
<i>Systemus</i> spp.			
<i>S. martenstyni</i>	Pallegama, Sri Lanka	WHT8835_21	JF793609
<i>Systemus</i> sp. WHT8836	Elahera, Sri Lanka	WHT8826_76	JF793610
<i>S. sarana</i>	Boncron, India	WHT8842_21i	JF793616
<i>S. timbiri</i>	Menik River, Sri Lanka	WHT8840_35	JF793614
<i>S. pleurotaenia</i>	Gin River, Sri Lanka	WHT8839_12	JF793613
<i>Tor khudree</i>	Mawanana, Sri Lanka	WHT8848_85	JF793622
<i>Barbonymus schwanenfeldii</i>	Aquarium trade	WHT8849_AQ1	JF793623
<i>Hypselobarbus jerdoni</i>	Srirangapatanam, India	WHT8834_28i	JF793608
<i>Hypselobarbus curmuca</i>	Chalakudy, India	WHT8851_1i	JF793625
<i>Labeo dussumieri</i>	Elahera, Sri Lanka	WHT8820_80	JF793594
<i>Osteochilichthys nashii</i>	Chalakudy, India	WHT8822_29i	JF793596
<i>Garra ceylonensis</i>	Homadola, Sri Lanka	WHT8818_9	JF793592
<i>Garra mullya</i>	Chalakudy, India	WHT8819_31i	JF793593