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Additional Record Of *Hypselobarbus Kushavali* From Thunga River And The Description Of New Species Of *Hypselobarbus* (Cypriniformes: Cyprinidae) From Bhadra River, Karnataka, India

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Abstract

The additional record of *Hypselobarbus kushavali* is reported from Thunga River, Karnataka, India and a new species of *Hypselobarbus* from Bhadra River, Karnataka is described herein. *Hypselobarbus arunachalami* sp. nov. is diagnosed from all its congeners in the genus by having fewer lateral-line scales and fewer circumferential scale rows.

Key words: Cyprinidae, Hypselobarbus kushavali, New distributional record, Hypselobarbus arunachalami, Taxonomy.

INTRODUCTION

There are currently 24 recognized species in this genus (Arunachalam et al. 2014, 2016a,b,c,d; Knight et al. 2013a,b,c, 2016) including the related species, *H. bicolor* Knight, Rai, D'souza, Philip & Dahanukar 2016, *H. maciveri*, (Annandale,1919), *H. basavarajai* Arunachalam, Chinnaraja & Mayden 2016f and *H. kushavali* Arunachalam, Chinnaraja, Sivakumar & Mayden 2016e. The distribution of *H. kushavali* was known only from its type locality, Kali River, Karnataka (Arunachalam et al.2016e) and the recent survey in Thunga River during November 2016 yielded a specimen of 333.42 mm SL, showed much similarities to *H. kushavali*. This showed its range of distribution to the east flowing Thunga River. In addition we also collected one specimen in the recent survey and another during 2009 from Bhadra River, with a lateral line count of 26 showed that those two specimens belong to an undescribed species. Herein we describe this as *Hypselobarbus arunachalami.*

MATERIAL AND METHODS

Fish collections were made between 2021 and 2024. Measurements were made point to point using digital calipers. Methods used for the meristic and morphometric characters are based on Hubbs & Lagler (1964). Morphometric characters from landmarks 9, 18-26, 29-31 and 34-35 (Table 1) were the additional truss measurements (Strauss & Bookstein 1982). Preanal scales (Jayaram 1991) are the scales from the anus to the isthmus. Body measurements are expressed as percentage of Standard Length (%SL); head measurements are expressed as percentage of Head Length (%HL). Total length (TL) was also used for comparison. The following abbreviations were used for museums: ZSI/SRC- (Zoological Survey of India, Southern Regional Centre, and Chennai), MSUMNH (Manonmaniam Sundaranar University Museum of Natural History). MCMNH (Madura College Museum of Natural History).

RESULTS

Hypselobarbus kushavali

Arunachalam, Chinnaraja, Sivakumar & Mayden, 2016
MSUMNH 348, 1ex, 333.42 mm SL, Thunga River, Karnataka, collected by M. Arunachalam and Sivakumar, 26 November 2016.

Figure 1. *Hypselobarbus kushavali*, MSUMNH 348, 333.42 mm SL: Thunga River, Karnataka, collected by M. Arunachalam and Sivakumar, 26 November 2016.

Description:

General appearance of body is shown in Figure 1, and the morphometric data are given in Tables1-2. Body deep and compressed 41.25 %SL, dorsal profile more convex than ventral profile. Dorsal fin slightly anterior to vertical from pelvic-fin origin by 1.5 scales rows; fin base is 14.43 %SL. Pre-dorsal length 50.21 %SL, pre-pelvic length 52.20 %SL, and pre-anal length 76.79 %SL. Pelvic-fin insertion to anal-fin origin 26.93 %SL and pectoral-fin insertion to anal-fin origin 59.79 %SL. Nape convex posterior to concavity at occiput margin; anterior third of pre-dorsal strongly convex. Venter more or less curved and caudal peduncle deep, its length 13.63 %SL.

Head and cranium short, 22.21 %SL and 16.12 %SL, respectively. Head depth at naris 38.21 %HL, at pupil 62.23 %HL, and at occiput 85.26 %HL. Head compressed, head width at pre-opercle narrow, 68.27 %HL and interorbital width narrow, 46.85 %HL. Eyes moderately large, 24.88 %HL. Snout short, 35.32 %HL, mouth subterminal. Upper jaw length 31.20 %HL, gape width 30.86 %HL. Lower lip with a well-developed groove separating lip and mandibular sheath continuous nearly to angles of mouth. Lower jaw with keratinous covering, not sharp. Upper lip distinct from jaw. Barbels long, maxillary pair 18.21 %HL and rostral pair 15.21 %HL. No tubercles on snout and cheek.

Dorsal-fin with 4simple and 9(1) branched rays, anal-fin with 3 simple and 5(1) branched rays, pelvic-fin with 2 simple and 8(1) branched rays, pectoral-fin with 1simple and 14(1) branched rays. Distal margin of the last branched ray of dorsal fin equal to spinous ray and the first branched ray; dorsal fin length 24.76 %SL. Unbranched dorsal spinous ray weak and dorsal spinous height 24.42 %SL, anal fin length 19.20 %SL, pectoral fin moderate in length, extending 4 scale rows anterior to pelvic fin origin, pectoral fin length 18.20 %SL and pelvic fin length 18.12 %SL. Caudal fin deeply forked, length 26.12 %SL; marginated rays of lower lobe longest, slightly but 3.5 times median rays; marginal rays of both lobes evenly produced.

Lateral-line scales 32(1), pre-dorsal scales 12(1), upper transverse scale rows 6(1), lateral line to pelvic scale rows 4.5(1), lower transverse scale rows 5.5(1), circumferential scale rows 26(1), circumpeduncular scale rows 13(1), transverse breast scale rows 11(1) and pre anal scale rows 30(1).

Coloration:

In live condition body silvery white and with slightly darker fins. Scale rows of lateral line and the rows above and below are tinged with golden color. Scales from two rows above lateral line to dorsum with broad and darkly colored distal margins; margins of other scales white or with very narrow dark line. Fins are without coloration but are strongly melanistic, appearing light to dark gray. Head region and predorsal area, especially nuchal region, gray to dark gray; opercle with some golden hue. Body and fins of formalin-fixed and EtOH preserved specimens brownish.

***Hypselobarbus arunachalami* sp. nov.**
Holotype: MSUMNH105, 426.30 mm SL, (N 13.83 E 75.69) Bhadra River at Bhadravathi, Karnataka, collected by M. Arunachalam and P.Sivakumar 10 September 2009.

Paratype: MCMNH106, 1ex, 321.94 mm SL, Bhadra Dam, Karnataka, collected by P. Sivakumar and Chinnaraja, 27 November, 2024.

Diagnosis:
Hypselobarbus arunachalami is distinguished from all other congeners in the genus in having lateral-line scales of 26. *Hypselobarbus arunachalami* can be distinguished from its closest congener, *H. jerdoni* by having fewer lateral-line scales (26 vs. 27-29), fewer circumferential scale rows (20-21 vs. 23-24) and the morphometric characters of shorter caudal fin length (23.96-28.14 vs. 34.96-37.80 %SL), greater pre anal length (80.74-81.04 vs. 76.87-77.27 %SL) and shorter orbit width (15.58-17.41 vs. 28.71-33.19 %HL). It can be distinguished from *Hypselobarbus kushavali* by having fewer lateral-line scales (26 vs. 31-32), fewer circumferential scale rows (20-21 vs. 26).

Figure 2. *Hypselobarbus arunachalami* MSUMNH105, Holotype, 426.30 mm SL: Bhadra River at Bhadravathi, Karnataka, collected by M. Arunachalam and P. Sivakumar, 10 September 2009.

Description:
General appearance of body is shown in Figures2-3, and the morphometric data are given in Tables1-2. Body deep and compressed 35.91-40.12 %SL, dorsal profile more convex than ventral profile. Dorsal fin slightly anterior to vertical from pelvic-fin origin by 1-1.5 scales rows; fin base is 14.18-14.45 %SL. Pre-dorsal length 49.19-52.28 %SL, pre-pelvic length 50.18-53.80 %SL, and pre-anal length 80.74-81.04 %SL. Pelvic-fin insertion to anal-fin origin 25.11-27.09 %SL and pectoral-fin insertion to anal-fin origin 54.49-54.63 %SL. Nape convex posterior to concavity at occiput margin; anterior third of pre-dorsal strongly convex with a hump. Venter more or less curved and caudal peduncle deep, its length 13.15-14.69 %SL.
Head short and cranium, 24.15-29.46 %SL and 16.98-20.72 %SL, respectively. Head depth at naris 32.99-35.54 %HL, at pupil 48.45-50.72 %HL, and at occiput 69.72-72.24 %HL. Head compressed, head width at pre-opercle narrow, 69.46-69.98 %HL and interorbital width narrow, 37.25-37.98 %HL. Eyes moderately large, 15.58-17.41 %HL. Snout short, 36.32-38.02 %HL, mouth subterminal. Upper jaw length 33.85-34.62 %HL, gape width 30.76-32.70 %HL. Lower lip with a well-developed groove separating lip and mandibular sheath continuous nearly to angles of mouth. Lower jaw with keratinous covering, not sharp. Upper lip distinct from jaw. Barbels long, maxillary pair 20.55-22.55 %HL and rostral pair 15.90-18.90 %HL. No tubercles on snout and cheek.
Dorsal-fin with 4simple and 9(2) branched rays, anal-fin with 3 simple and 5(2) branched rays, pelvic-fin with 2 simple and 8(2) branched rays, pectoral-fin with 1simple and 14(2) branched rays. Dorsal fin length 23.79-26.55 %SL. Unbranched dorsal spinous ray weak and dorsal spinous height 23.06-25.92 %SL, anal fin length 21.99-24.62 %SL, pectoral fin moderate in length, extending 1.5-2 scale rows anterior to pelvic fin origin, pectoral fin length 19.25-24.96 %SL and pelvic fin length 17.47-21.49 %SL. Caudal fin deeply forked, length 23.96-28.14 %SL; marginated rays of lower lobe longest, slightly but 3 times of median rays; marginal rays of both lobes evenly produced.
Lateral-line scales 26(2), pre-dorsal scales 10(1) or 11(1), upper transverse scale rows 4.5(1) or 5(1), lateral line to pelvic scale rows 3.5(2), lower transverse scale rows 4.5(2), circumferential scale rows 20(1) or 21(1), circumpeduncular scale rows 12(2), transverse breast scale rows 8(2) and pre-anal scales 22(1) or 23(1)

Figure 3. *Hypselobarbus arunachalami*, MCMNH106 Paratype, 321.94 mm SL, Bhadra Dam, Karnataka, collected by P. Sivakumar and Chinnaraja, 27 November, 2024.

Table 1. Morphometric characters of *Hypselobarbus kushavali* and *Hypselobarbus arunachalami* sp.n. Body character measurements are represented as % standard length and head character measurements are represented as % head length.

Measurements from point to point (identified by numbers and names)	***H. kushavali*** **MSUMNH 348 n=1**	***H. arunachalami***	
		MSUMNH105. n=1 Holotype	**MCMNH106 n=1 Paratype**
1. Standard length (mm)	333.42	426.30	321.94
% of standard length			
2. Snout to urocentrum	97.21	92.96	94.58
3. Pre-anal length	76.79	80.74	81.04
4. Pre-dorsal length	50.21	49.19	52.28
5. Pre-pelvic length	52.20	50.18	53.80
6. Pre-pectoral length	21.32	25.33	28.32
7. Pre-occipital length	16.12	16.98	20.72
8. Caudal peduncle length	11.46	15.89	16.47
9. Dorsal-fin origin to pelvic-fin insertion	37.92	33.71	38.90
10. Dorsal spinous height	24.42	23.06	25.92
11. Anal fin height	19.20	21.99	24.62
12.Depth of caudal peduncle	13.63	13.15	14.69
13.Caudal fin length	26.12	23.96	28.14
14. Dorsal fin height	24.76	23.79	26.55
15. Pectoral fin length	18.20	19.25	24.96
16. Pelvic fin length	18.12	17.47	21.49
17. Pelvic axillary scale length	7.59	7.10	7.83
18. Occiput to dorsalfin origin	36.01	32.27	34.22
19. Occiput to pectoral-fin insertion	22.18	20.32	25.84
20. Occiput to pelvic-fin insertion	47.41	43.27	47.85
21. Dorsal insert to pelvic-fin insertion	35.21	30.86	33.25
22. Dorsal origin to pectoral-fin insertion	40.24	35.00	39.82
23. Dorsal origin to anal-fin origin	45.21	40.02	44.84
24. Dorsal fin-insertion to caudal fin	37.18	31.70	31.79
25. Dorsal fin insertion to anal fin origin	34.07	28.67	31.15
26. Dorsal-fin insertion to anal fin insertion	33.17	27.52	28.11
27. Dorsal-fin base length	14.43	14.18	14.45
28. Anal-fin base length	8.21	7.53	9.09
29. Pectoral-fin insertion to pelvic fin insertion	34.96	29.19	30.60

30. Pectoral-fin insertion to anal-fin origin	59.79	54.49	54.63
31. Pelvic-fin insertion to anal-fin origin	26.93	25.11	27.09
32. Post-dorsal length	53.92	42.61	44.80
33. Body depth	41.25	35.91	40.12
34. Distance between pectoral-fin insertion and vent	59.73	52.45	54.36
35. Distance between pelvic-fin insertion and vent	27.88	25.20	29.17
36. Head length (mm)	22.21	24.15	29.46
% of Head length			
37. Snout to opercle	68.27	69.46	69.98
38. Upper jaw length	31.20	33.85	34.62
39. Snout length	35.32	36.32	38.02
40. Pre-nasal length	24.23	26.10	26.22
41. Orbit width	24.88	15.58	17.41
42. Interorbital width	46.85	37.25	37.98
43. Internasal width	28.35	22.29	23.71
44. Head width	65.31	63.33	66.81
45. Gape width	30.86	30.76	32.70
46. Lower jaw to isthmus	59.27	56.42	57.09
47. Head depth at nostril	38.21	32.99	35.54
48. Head depth at pupil	62.23	48.45	50.72
49. Head depth at occiput	85.26	69.72	72.24
50. Maxillary barbel length	18.21	20.55	22.55
51. Rostral barbel length	15.21	15.90	18.90

Table2. Meristic characters of *Hypslobarbus kushavali* and *Hypselobarbus arunachalami* sp.n.

Meristic characters	***H. kushavali* MSUMNH 348, n=1**	***H. arunachalami***	
		MSUMNH105. n=1 Holotype	**MCMNH106 n=1 Paratype**
1.Dorsal fin rays	iv.9	iv.9	iv.9
2. Anal fin rays	iii.5	iii.5	iii.5
3. Pelvic fin rays	ii.8	ii.8	ii.8
4. Pectoral fin rays	i.14	i.14	i.14
5. Caudal fin rays	10+9	10+9	10+9
6. Upper transverse scale rows	6	4.5	5
7. Lower transverse scales rows	5.5	4.5	4.5
8. Lateral line to pelvic scale rows	4.5	3.5	3.5
9. Lateral-line scales	32	26	26
10. Pre-dorsal scales	12	10	11
11. Circumpeduncular scale rows	13	12	12
12. Circumferential scale rows	26	20	21
13. Transverse breast scale rows	11	8	8
14. Pre anal scale rows	30	22	23

Coloration:
Body silvery with scales on lateral line and five rows above lateral line with golden tinge. Fins are dark grayish.

Etymology:
The specific name is a noun in apposition, paying tribute to the renowned Indian freshwater fish taxonomist, Dr. Muthkumarswamy Arunachalam.

Distribution:
This species is currently known only from Bhadra River, Karnataka

DISCUSSION:

Hypselobarbus arunachalami sp.nov. is diagnosed from all its congeners in the genus by having fewer lateral-line scales and fewer circumferential scale rows. The closest species *H. jerdoni* with lateral line scale count of 27-29 (vs.26) and circumferential scale rows of 23-24 (vs. 20-21) and also *H. thomassi* by having circumferential scale rows of 22-24 and lateral line scale count of 33-35 showed the range with the new species. *Hypselobarbus arunachalami* sp.nov. is distinguished from other groups of species, such as *Hypselobarbus pulchellus, H. dobsoni, H. maciveri, H. kushavali* and *H. basavarajai* with a range of lateral line scale counts of 30-34 (vs.26) and the range of 24-26 (vs.20-21) circumferential scale rows. The other group of species, *Hypselobarbus dubius, H. micropogon, H. periyarensis, H. gracilis, H. nilgiriensis, H. kurali H. tamiraparaniei, H. vaigaiensis, H. menoni, H. keralaensis, H. lithopidos, H. mussullah, H. pseudomussullah, H. nasutus, H. curmuca, H. kolus* and *H. bicolor* showed a range of lateral line scale counts of 35-45 (vs.26) and the range of 23-40 (vs.20-21) circumferential scale rows.

Comparison materials

Hypselobarbus jerdoni: ZSI/SRC F8739, 1ex, 165.52 mm SL: India: Netharavathi River, Karnataka, collected by Ronald D'souza, 6 January 2013. MSUMNH80, 1ex, 65.23 mm SL; India: Sishila River, tributary of Nethravathi River, collected by M. Arunachalam and Sivakumar, 27 March 2002.

Hypselobarbus kushavali MSUMNH246, **(**Holotype) 273.95 mm SL; India: Kali River at Dandeli, Karnataka, collected by M. Arunachalam and Sivakumar, 9 January 2001. MSUMNH 301, 3ex, 287.56-309.92 mm SL; same data as holotype.

Details of other samples examined are provided in Arunachalam et al. (2014 &2016a,b,c,d,f) for *Hypselobarbus curmuca, H. kolus, H. kurali, H. tamiraparaniei, H. vaigaiensis, H. menoni, H. keralaensis, H. mussullah, H. pseudomussullah, H. lithopidos, H. thomassi, H. dubius, H. micropogon, H. nilgiriensis, H. periyarensis. H. pulchellus, H. dobsoni, H. maciveri* and *H. basavarajai.*

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