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Discovery of a new cyprinid fish, *Hypselobarbus nitidus*, from Kerala, India

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ABSTRACT

Hypselobarbus nitidus, a new teleost fish is described from a small freshwater stream at Kerala, India. It is a relative species of *Hypselobarbus jerdoni* described from Mangalore in Karnataka. It can be distinguished from its congeners in having higher body, non-osseous, weak and flexible last simple dorsal fin ray, 27-28 lateral line scales, 9 branched rays on the ventral fin, long anal fin, which reaches caudal fin base, red coloured dorsal, ventral, anal and caudal fins, black tipped dorsal fin and upper caudal lobe. *Hypselobarbus nitidus* is both edible and ornamental. The new species is described, scientifically named, taxonomically analyzed and compared with its congeners.

INTRODUCTION

Cyprinids are the members of the carp family Cyprinidae, which includes carps, minnows and barbs. Being native to Africa, Europe and Asia, they are the most abundant freshwater fishes of both lotic and lentic aquatic bodies. More than 1600 species in over than 275 genera made the family Cyprinidae the most speciose of all fish families **(Nelson, 1976)**. During the last two decades, several new fishes have also been added to this family.

Hypselobarbus species are medium- sized fishes that are endemic to India. This species are not uncommon in the freshwater bodies of many south Indian states and are valued as food fishes. **Bleeker (1860)** described the genus *Hypselobarbus*; but taxonomic details of many species of this genus remained in dubiety. Type species of the genus, *H. massullah* was also met with taxonomic ambiguity; **Gunther (1868)** and **Day (1876)** treated it as synonym of '*Barbus tor'*; whereas, **Hora** and **Misra (1942)** synonymised it as '*Barbus curmuca'*. Many species of *Hypselobarbus* granted its distinctiveness after the conformation of *Hypselobarbus masullah* by **Menon (1999, 2004)**, **Knight *et al.* (2013)** and **Arunachalam *et al.* (2014)**. Many serious taxonomic studies were conducted on *Hypselobarbus* during the last decade; some have been resurrected **(Knight JDM *et al.*, 2013; Arunachalam *et al.*, 2014; Arunachalam *et al.*, 2016, 2016a)** from their synonymy with others; many new species have also been

described **(Arunachalam*et al*., 2016b; Arunachalam *et al*., 2016c, 2016d; Knight JDM *et al.*, 2016)**.

These authors could procure a few specimens of *Hypselobarbus* from a water body in the northern part of Kerala, recording characters of *Hypselobarbus* in terms of constitutive taxonomic variables. Nevertheless, those fish individuals could not be linked with any previously published names. Consequently, the current work identified it as a new species: *Hypselobarbus nitidus.*

MATERIALS AND METHODS

Fish were collected using gill nets and preserved in 10% formalin. Methods used were those of **Jayaram (2002)**; measurements were made point to point with digital calipers and data recorded to tenths of a millimetre. Length of head and other measurements of body parts were given as percentage of standard length (SL). Parts of head were presented as percentage of head length (HL). Measurements and counts were made on the left side of specimens. The specimens of new fish described in this article were deposited in the Zoological Survey of India Museum at Pune, Maharashtra. Congeners of the new fish deposited in different Zoological Survey of India museums were examined and compared with the new species.

RESULTS

***1.Hypselobarbus nitidus* sp. nov.**

1.1.Type Specimens Examined

Holotype: ZSI /WRC/P/5543,122.00 mm SL, India: Kerala, a water stream at Pallangod, Kasargod, coll. Mathews Plamoottil and Vineeth K, 30 June 2019.

Paratypes**:** FBRC/ZSI/VS/13, 2, 103-104 mm SL, other details same as HT.

2. **Diagnosis**

Hypselobarbus nitidus differs from its congeners in having a higher body, non-osseous, weak and flexible last simple dorsal fin ray, 9 branched rays on ventral fin, red coloured dorsal, ventral, anal and caudal fins and black tipped dorsal and upper caudal lobes.

Fig. 1. A fresh specimen of *Hypselobarbus nitidus*, Holotype, ZSI /WRC/P/5543

3. Description

Body deep and laterally compressed; dorsal profile more convex than ventral side; a considerable rise to the commencement of dorsal fin; head short and compressed, 25.2-26.9 % of SL; height of head lesser than its length; eyes moderate; its upper edge reaches the dorsal profile of head and cannot be seen from below ventral side; snout short, 28.8-37.5 % HL. Mouth sub-terminal; maxilla extends under anterior margin of orbit; upper jaw longer than lower one and latter fits into former when closed. Lower labial fold interrupted. A pair of nostrils located closer to orbit than to snout tip. Barbels two pairs; maxillaries extend a little beyond lower border of orbit; rostral barbels shorter and never reach orbit; both barbels reach nostrils. Angle of mouth reaches considerably below lower border of orbit. Outer opercle extends out as a thin flap which reaches base of pectoral fin. Dorsal fin located half orbit diameter in front of ventral fin insertion; first 2-5 rays of dorsal fin extend considerably beyond its outer edge; last branched ray also longer than preceding rays; last simple dorsal ray non osseous, weak and flexible; last branched ray single and not divided to root. Outer margin of dorsal fin concave. Pectoral fin never reaches ventral fin, reaching 2 scales in front of it. Pelvic fin with 9 branched rays; its tip never reaches anal fin or vent, reaching 2 scales in front of it. Vent closely located to anal fin; the latter long and its tip fairly reaches caudal fin base. Caudal fin lobes strongly bifurcated with upper lobe, a little longer than lower one. Scales moderate and easily deciduous, those on breast a little smaller than other scales. 7-8 small scales below dorsal fin. Lateral line distinct and concave up to origin of ventral fin which then ascends a bit before going straight to caudal fin base immediately after ventral fin tip.

4. Colour

Body silvery; ventral fin, anal fin, caudal fin and proximal half of the dorsal fin reddish; pectoral fin hyaline; distal half of both dorsal fin and upper caudal lobe deep black.

Fig. 2. A preserved specimen of *Hypselobarbus nitidus*, FBRC/ZSI/VS/13

Table 1. Morphometric characters of *H. nitidus* (ZSI /WRC/P/5543 &FBRC/ZSI/VS/13)

Sl. No	Measurement	Holotype	Range	mean
1	Total length (mm)	160.0	139.0-160.0	146.6
2	Standard Length (mm)	122.0	103.0-122.0	109.6
3	Head Length(mm)	32.0	26.0-32.0	28.6
	Percent of Standard Length			
4	Head length	26.2	25.2-26.9	26.1
5	Head depth	21.3	20.3-23.0	21.5
6	Head width	16.3	15.5-18.2	16.6
7	Body depth at dorsal origin	37.7	36.4-37.7	36.8
8	Body depth at anal origin	22.1	21.8-23.0	22.3
9	Body width at dorsal origin	17.2	16.9-18.2	17.4
10	Body width at anal origin	9.8	9.8-10.6	10.3

11	Pre-dorsal length	50.8	50.8-52.4	51.7
12	Post-dorsal length	56.5	54.3-56.4	55.5
13	Pre-pelvic length	54.0	54.0-55.8	54.8
14	Pre- anal length	81.9	80.5-81.9	81.3
15	Length of dorsal fin	28.6	28.1-29.8	28.8
16	Length of pectoral fin	22.1	22.1-24.3	23.1
17	Length of pelvic fin	21.3	21.3-23.0	22.2
18	Length of anal fin	20.4	20.4-22.3	21.6
19	Length of caudal fin	34.4	34.4-38.4	36.5
20	Length of base of dorsal fin	17.2	17.2-17.4	17.3
21	Length of base of anal fin	8.0	8.7-9.6	9.1
22	Length of caudal peduncle	17.2	13.5-17.3	16.0
23	Depth of caudal peduncle	13.1	11.6-13.4	12.7
24	Width of caudal peduncle	6.5	4.7- 6..5	5.7
25	Distance between pectoral fin and pelvic fin	24.5	24.5-27.8	24.4
26	Distance between pelvic fin and anal fin	27.8	26.9-27.8	27.2
27	Distance between anal fin and caudal fin	20.4	20.1-21.3	20.6
28	Distance from ventral to vent	24.5	24.0-24.5	24.3
29	Distance from anal to vent	2.0	1.0- 2.0	1.3
	Percent of Head Length			

30	Head depth	81.2	80.7-85.7	82.5
31	Head width	62.5	61.5-67.8	63.9
32	Eye diameter	31.2	30.7-32.1	31.3
33	Pre-orbital distance	68.7	65.3-68.7	67.2
34	Post-orbital distance	40.6	38.4-40.6	39.4
35	Pre-occipital distance	84.3	82.1-84.6	83.6
36	Post-occipital distance	112.5	110.7-120.7	114.6
37	Inter orbital width	37.5	37.5-39.2	38.3
38	Inter narial width	25.0	25.0-26.9	25.6
39	Snout length	37.5	28.8-37.5	34.0
40	Width of gape of mouth	25.0	25.0-28.8	26.2
41	Length of maxillary barbels	31.2	23.0-32.1	28.7
42	Length of rostral barbels	21.8	15.3-21.8	19.5

Table 2. Meristic counts of *H. nitidus* (ZSI /WRC/P/5543 &FBRC/ZSI/VS/13)

Sl. No	Characters	Holotype	Range
1	Lateral line scales	30+1	29-30+1
2	Pre-dorsal scales	12	11-12
3	Dorsal fin origin to lateral line	6.5	5.5-6.5
4	Ventral fin origin to lateral line	3.5	3.5
5	Anal fin origin to lateral line	4.5	4.5
6	Circumpeduncular scales	5	5-6
	Fin ray count		
7	Dorsal fin rays	ii.9	ii.9
8	Pectoral fin rays	i.15	i.14-15

9	Pelvic fin rays	i.9	i.9
10	Anal fin rays	ii.5	ii-iii.5
11	Caudal fin rays	iii.17.iii	iii.17.iii
12	Number of barbels	4	4

***5.* Etymology**

The specific epithet '*nitidus*' means beautiful in Latin; it denotes its magnificent appearance.

***6.* Common Name**

Since it is a fascinating fish, the common name 'Kerala Beauty' is given to it.

DISCUSSION

1. Comparisons (Figs. 3- 9 & Table 3)

The new species differs from its relative species (except *H. jerdoni*) in having a higher body, 29-30 lateral line scales, 3 ½ scales between lateral line and ventral fin, 9 branched rays in ventral fin, last undivided dorsal ray non- osseous and weak, red coloured dorsal, ventral, anal and caudal fin, distal half of dorsal fin and upper caudal lobe are black; longer anal fin- which reaches the caudal fin. *Hypselobarbus jerdoni* **(Day, 1870)** (Fig. 3) is, undoubtfully, the close congener of the new species. Distal half of both the dorsal fin and upper caudal lobe are black coloured in both of these species. *Hypselobarbus nitidus* differs from *H. Jerdoni* in having non- osseous and flexible (vs. osseous and rigid) last simple dorsal fin ray, 9 (vs. 8) branched rays in ventral fin, red coloured (vs. hyaline or light yellow) dorsal, ventral, anal and caudal fins and higher (36.4- 37.7 % SL vs.31.9-33.3) body. A comparison of meristic and morphometric characters of *Hypselobarbus jerdoni* and *H. nitidus* is enlisted in Table (3).

Hypselobarbus nitidus is not closely related to any other species, except *H. jerdoni*. Red coloured fins (except pectoral fin) and black stained distal half of dorsal fin and upper caudal lobe distinctly demarcate the new species from all other species. *Hypselobarbus nitidus* is related to *Hypselobarbus carnaticus* **(Jerdon 1849)**, the Carnatic Carp, in many meristic and morphometric features. Many confusions existed in the features of Carnatic carp; nevertheless, it is not an uncommon fish in the south Indian freshwater bodies. Recently, **Plamoottil (2021)** clarified the confusions in the identity of this fish, based on the collection from its type locality.

Table 3. Comparison of meristic and morphometric characters of *Hypselobarbus jerdoni* and *H. nitidus*

SL.NO	Character	*H. jerdoni* (V/F/NERC/ZSI/5330)	*H. nitidus* (ZSI /WRC/P/5543 &FBRC/ZSI/VS/13)
	Morphometric characters		
	% of SL		
1	Body Height	31.9-33.3	36.4- 37.7
2	Pre- dorsal	49.4-52.2	50.8-52.6
3	Pre- pelvic	51.8-53.4	54.0-55.8
4	Pre- anal	76.2-79.8	80.5- 81.9
5	Length of dorsal fin	24.7-28.0	28.1- 29.8
6	Length of pectoral fin	19.8-22.5	22.1- 24.3
7	Length of pelvic fin	18.8-21.3	21.3-23.0
8	Length of anal fin	17.8-20.4	20.4-22.3
9	Length of caudal fin	30.6-35.4	34.4-38.5
10	Distance between pelvic fin and anal fins	25.7-28.3	26.9-27.8
11	Distance between anal fin and caudal fins	19.8-22.4	20.1-21.3
12	Distance from ventral to vent	21.5-26.2	24.0-24.5
13	Distance from anal to vent	1.68-4.30	1.0- 2.0
	% HL		
14	Head depth	73.4-79.1	80.8- 85.7
15	Eye diameter	37.1-41.6	30.7-32.1
16	Pre-occipital distance	77.5-81.6	82.1- 84.6
17	Post-occipital distance	100.0-111.0	110.7- 120.7
18	Inter orbital width	34.6-40.4	37.5-39.3
19	Snout length	26.9-31.0	29.0-37.5
	Meristic counts		
20	Lateral line scales	28-29+1-2	29-30 +1-2
21	Pre-dorsal scales	9-11	11-12
22	Dorsal fin origin to lateral line	6.5	5.5-6.5
23	Ventral fin origin to lateral line	4.5	3.5
24	Ventral fin rays	i, 8	i, 9
	Other Characters		
25	Last unbranched dorsal ray	Osseous	Non osseous
26	Anal fin	Never reach caudal fin	Reach caudal fin
27	Dorsal, ventral, anal and caudal fins	Hyaline or yellowish	Red coloured
28	Dark spot	Present in front of each scale	Absent

The new fish could be distinguished from *H. carnaticus* **(Jerdon, 1849)** in having 9 (vs. 8) branched ventral fin rays, 29-30 (vs. 30-32) lateral line scales and in possessing reddish fins (except pectoral) (vs. hyaline or yellowish) and black tipped (vs. plain) dorsal and caudal fins. On th other hand, *Hypselobarbus nitidus* can be distinguished from *H.*

basavarajai **Arunachalam *et al.* (2016**) in having 29-30 (vs. 32-34) lateral line scales, 3½ (vs. 4½) scales between lateral line and ventral fin and 9 (vs. 8) branched rays in ventral fin. The new species differs from *H. pulchellus* in having a higher (36.4- 37.7 % SL vs. 30.8- 33.7) body and longer (25.2- 26.9 % SL vs. 20.55- 21.34) head. The new species differs from *H. dobsoni* described by **Day (1876)** from Deccan, in having 29-30 (vs.31-32) lateral line scales, and 3 ½ (vs. 2 ½) scales between lateral line and ventral fin and anal fin reaching (vs. not reaching) caudal fin. On the other hand, *Hypselobarbus nitidus* can be distinguished from *H. maciveri* **(Annandale, 1919)** in having fewer (29-30 vs. 32-33) lateral line scales and lesser scales between lateral line and ventral fin (3 ½ vs.4 ½). In addition, the new species differs from *H. kushavali* (**Arunachalam *et al.*, 2016a**) in having a shorter (36.4- 37.7 % SL vs. 40.19-42.38) body, lesser (29-30 vs. 31-32) lateral line scales and in possessing black tipped dorsal and upper caudal lobes (vs. plain fin tips). Moreover, *Hypselobarbus nitidus* differs from *H. micropogon* in having a deeper (36.4 -37.7% SL vs. 25.1- 30.7) body, 29-30 (vs. 33 in the latter) lateral line scales, 3.5 (vs. 4.5) scales between lateral line and ventral fin, 10 (vs. 9) ventral fin rays and shorter (28.1- 29.8% SL vs. 30.4- 39.7) dorsal fin.

Fig. 3. A fresh specimen of *Hypselobarbus jerdoni*, **V/F/NERC/ZSI/5330**

Fig. 4. A fresh specimen of *Hypselobarbus carnaticus*, GCC/DOZ 55

Fig. 5. *Hypselobarbus basavarajai*, ZSI/SRC/F8756.

Fig. 6. *Hypselobarbus pulchellus*, ZSI/SRC/8737

Fig. 7. *Hypselobarbus dobsoni*, ZSI/SRC/8738.

Fig. 8. *Hypselobarbus micropogon*, MSU MNH 244.

Hypselobarbus procerus **Plamoottil (2021)** (Fig. 9), described from Bhavani River at Attappady, is the recent addition to *Hypselobarbu*s species of Kerala. *Hypselobarbus nitidus* differs from *H. procerus* in having 9 (vs. 8 in *H. procerus*) branched dorsal fin rays, 9 (vs. 7-8) ventral fin rays, 11- 12 (vs. 9- 10) pre dorsal scales, shorter (body depth at dorsal fin origin 36.4- 37.7 % SL vs. 39.5- 44.9) body and shorter (28.1- 29.8 % SL vs. 30.3- 39.2) dorsal fin.

Hypselobarbus nitidus further differs from *H. procerus* in possessing reddish fins (except pectoral) (vs. hyaline or light yellowish) and black tipped (vs. plain) dorsal and caudal fins.

Fig. 9. *Hypselobarbus procerus*, Paratype, ZSI/ANRC/M/27757

2. Habitat

The Payaswini River (Figs. 10, 11) at Pallangod, Kasaragod is the type locality of *Hypselobarbus nitidus;* it has a width of 30.0-40.0 m and a depth of 5-6 m. The area is blanketed by moderate riparian vegetation. *Delonix regia, Hopea parviflora, Syzygium cumini, Tamarindus indica, Tectona grandis, Corypha umbraculifera, Santalum album, Ziziphus aenoplia, Moringa oleifera* etc. are some of the major plant components of the area. Whereas, *Dawkinsia filamentosa, Puntius ocellus, Haludaria fasciatus, Dawkinsia assimilis, Barilius malabaricus, Hypselobarbus curmuca, Systomus subnasutus, Devario malabaricus, Anguilla bengalensis, Rasbora dandia, Pethia punctatus, Labeo rohita, Garra mullya, Mystus montanus, Ompok malabaricus, Heteropneustes fossilis, Xenentodon cancila, Aplocheilus lineatus, Etroplus suratensis, Pseudetroplus maculatus, Glossogobius giuris, Channa marulius* etc. are some of the co-occurring fish species

Fig. 10. Payaswini River at Pallamkod, the type locality of *H. nitidus.*

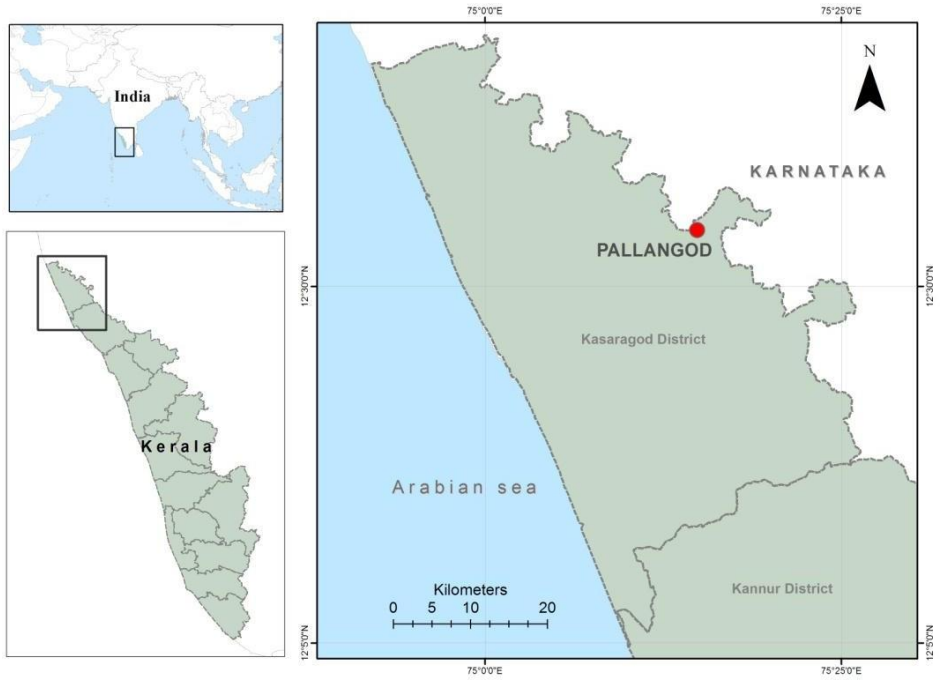

Fig. 11. A map showing the location of the type locality of *H. nitidus*

CONCLUSION

Day (1870) described *Hypselobarbus jerdoni* from Mangalore in Karnataka. But description in his later volumes **(Day, 1878, 1889)** were markedly different from his original description. In the original description, he stated that the last simple dorsal fin ray is osseous; but in the later descriptions he overlooked this key diagnostic feature of the fish. He described (in the original description) the colour of the fish as 'silvery; fins tipped with black'. However, the author in his succeeding volumes **(Day, 1878, 1889**) modified the description as '..silvery, fins which have an orange tint, tipped with black'. There had no mention of 'orange colour' in the original description. This orange finned '*Jerdoni'* is a distinct species or a colour variant of *H. nitidus*. Molecular level studies must be conducted between *H. nitidus* and the orange finned *Hypselobarbus* to confirm the identity of the latter. Due to unavailability of the orange finned *Hypselobarbus*, no effort was taken to validate its identity. Meristic counts in the original description of *H. jerdoni* (pectoral fins rays- 17; lateral line scales- 28) were amended in his subsequent volumes **(Day, 1878; 1889)** (pectoral fins rays- 15; lateral line scales- 27- 28). For the original description **(Day, 1870)**, 4 scales occur between lateral line and ventral fin, but in his later volume **(Day, 1870)** he modified it as 2 ½ - 3 ½. Later

taxonomists also made many confusions in its details. **Hora and Misra (1942)** synonymised *H. jerdoni* with *H. Pulchellus* (Day) and *H. dobsoni* (Day). **Menon (2004**) followed **Day (1878, 1889**) for the figure and details of *H. jerdoni*. It is interesting to note that the figure of *H. Jerdoni* in **Day (1889)** mismatches with his original description; he wrote that fins are black tipped, but no such marks on the fins are detected in the figure. Consequently, all later researchers and authors excluded this feature from their descriptions. *Jerdoni* was originally described from Mangalore **(Day, 1870)**. However, the collection of this species from the type locality is very rare. **Jayaram (1991**) gave a detailed account of *H. jerdoni*, but all his specimens were from Maharashtra, away from the type locality. Many similar meristic counts and morphological features were incompatible with the original description. The number of the lateral line scales were referred to as 27-32 instead of 27-28 in the study of **Day (1870)**. **Kumar *et al.* (2013**) reported *H. jerdoni* from the Achankovil River but could not deposit it in any recognised museum with valid registration numbers. Most probably their identification may be erroneous. The report of *Jerdoni* from Karnataka and the northern parts of Kerala in the study of **Arunachalam*e et al*. (2016)** is justifiable compared to Day's later volumes **(1878, 1889)**, but as the original description **(Day, 1870)** and later works (**Day, 1878, 1889**) of the discoverer shows substantial inconsistency. Hence, in this work, the former alone is kept in upholding the identity of *H. jerdoni*. We havecompared the new species with the *H. jerdoni* collected from an area near to its type locality.

Hypelobarbus nitidus is a distinct species showing marked differences from *H. jerdoni*. The new species is a pretty fish which can be utilized for ornamental purposes. It is worthy to mention that, the aquatic bodies of northern parts of Kerala and southern parts of Karnataka host several similar rare *Hypselobarbus* species; it is expected that many new *Hypselobarbus* species will be described in near future.

Comparative materials examined

Hypselobarbus basavaraji: Holotype: ZSI/SRC F 8756, 280.9 mm SL; The Bhadra River at Bhadravathi, Karnataka, (13°83'N, 75°69'E), M. Arunachalam and team, 10 September 2009.

Hypselobarbus pulchellus: ZSI/SRC F 8737, 20.iv.2013, 3 exs.,107.0–118.0 mm SL, The Sita River, Karnataka, India, coll. Ronald D'souza.

*Hypselobarbus jerdoni:*V/F/NERC/ZSI/5330, 2, 93- 101, a water stream at Chikamagalure, Coll. Mathews PlamoottilVineethKunnath, 22 /02/2020.

Hypselobarbus dobsoni: ZSI/SRC F8738, 1, 145.05mm SL; India: The Thunga River, Karnataka, A. Rai, 12 May 2013; MSU MNH 79; 1ex, 182.24 mm SL, NR. Pura market, The Bhadrariver, coll. M Arunachalam: 13.04.2007.

Hypselobarbus maciveri: ZSI/F9576, 2, Holotype and Paratype, 121.17-123.55 mm SL; The Krishna River near Mahuli, 3 km from Satara, N. Annandale.

Hypselobarbus carnaticus: GCC/DOZ 55, 2, 103- 132 mm SL, The Bhavani River in Palakkad, coll. Mathews Plamoottil, 20/01/2020.

*Hypselobarbus kushavali:*Holotype: MSUMNH246, 273.95 mm SL; India: The Kali River at Dandeli, Karnataka, 15º16'0.01"N 74º 37'0.01"E; M. Arunachalam and team, 9 January 2001.

Hypselobarbus micropogon: MSU MNH 244, 1ex, 136.95 mm SL, The Pillur Dam, coll. Dr. M Arunachalam and team on 10-03-2001.12

Hypselobarbus procerus: Holotype: ZSI/ANRC/M/27756, 112.1 mm SL, India: Kerala, Bhavani River at Attappady, Palakkad, coll. Mathews Plamoottil, 18 December 2020, Paratypes: ZSI/ANRC/M/27757, 3, 83.5- 102.0 mm SL. Remaining details same as HT

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