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## RE-DESCRIPTION OF *HYSELOBARBUS LITHOPIDOS* (TELEOSTEI: CYPRINIDAE), BASED ON ITS REDISCOVERY FROM THE WESTERN GHATS, INDIA, WITH NOTES ON *H. THOMASSI*

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**Abstract:** In recent times, though the genus *Hypselobarbus* has been studied substantially, the identities of individual species remain ambiguous. *Hypselobarbus lithopidos* has been assessed as Data Deficient in the IUCN Red List of Threatened Species with a speculation that it could possibly be extinct as there has not been any validated record of this species since 1941 from its known range. In this work we report a population of this species from its type locality and re-describe this little known species to clear any taxonomic ambiguity that surrounds the identity of this species. We also attempt to clear the taxonomic ambiguity that surrounds the identity of the Critically Endangered *H. thomassi* with fresh collections from the type locality.

**Keywords:** *Barbus*, Critically Endangered, Extinct, *Gonoproktopterus*, large barbs, *pulchellus*, South Canara, Wallacean shortfall.

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**Author Contribution:** JDMK and AR carried out the study; AR and RKPD carried out field surveys and collected the lost species.

**Author Details:** DR. J.D. MARCUS KNIGHT is a naturalist based in Chennai. Amongst others, his interest is in exploring the freshwater habitats and is currently documenting the diversity of freshwater fish in southern India. DR. ASHWIN RAI is a Research Associate with the department of fisheries microbiology, College of Fisheries and is involved in the study of Aquatic Ecology and Biodiversity. In addition he is involved studies on the endemic fish species of Western Ghats using DNA Barcoding. RONALD K.P. D'SOUZA is currently doing his PhD at Mangalore University in the Department of Applied Zoology; his area of research is brood stock development, induced breeding and nursery rearing of selected species of *Hypselobarbus* with focus on *H. Jerdoni*, *H. lithopidos* and *H. thomassi*.

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## INTRODUCTION

The genus *Hypselobarbus* Bleeker, 1860 has always interested ichthyologists and though there has been substantial work carried out on this genus (Mukerji 1931; Raj 1941; Jayaram 1997; Arunachalam et al. 2012; Pethiyagoda et al. 2012), the identities of individual species remain ambiguous beginning with the identity of *H. mussullah* (Sykes, 1839), which is the type species of *Hypselobarbus*. Currently, the genus includes at least 11 other species namely, *Hypselobarbus curmuca* (Hamilton, 1807), *H. dobsoni* (Day, 1876), *H. dubius* (Day, 1867), *H. micropogon* (Valenciennes, 1842), *H. jerdoni* (Day, 1870), *H. kolus* (Sykes, 1839), *H. kurali* (Menon & Rema Devi, 1995), *H. lithopidos* (Day, 1874), *H. periyarensis* (Raj, 1941), *H. pulchellus* (Day, 1870), and *H. thomassi* (Day, 1874) all endemic to the freshwater systems of peninsular India. The identity of certain other species such as *H. mysorensis* (Jerdon, 1849) is ambiguous with some considering it a valid species (Mukerji 1931) while others consider it a synonym of *H. micropogon* (Menon, 1999). Similarly, a few other species such as *Gobio canarensis* Jerdon, 1849, *Barbus gracilis* Jerdon, 1849, *Barbus conirostris* Günther, 1868 and *Barbus guentheri* Day, 1869 are either buried in synonymy or lost in time. In spite of the ambiguity, recent authors have even highlighted the possibility of undescribed species being concealed within this genus (Arunachalam et al. 2012). Of the known species, *Hypselobarbus lithopidos* is listed as Data Deficient in the IUCN Red List of Threatened Species (Raghavan & Ali 2011), *H. pulchellus* is listed as Critically Endangered (possibly extinct) (Devi & Ali 2011a) and *H. thomassi* as Critically Endangered (Devi & Ali 2011b). It is important to fill in knowledge gaps on the identity and the current status of the already known species before additional species are described under *Hypselobarbus*.

As there was an urgent need to do a complete taxonomic reassessment of this species, we carried out fresh surveys in the type locality (South Canara = Dakshina Kannada). During these surveys specimens of *H. lithopidos* which fit the original description by Day (1874) were collected. This highlighted the fact that this enigmatic fish was not extinct as thought previously (Ali & Raghavan 2011; Molur et al. 2011; Arunachalam et al. 2012). Incidentally, *H. thomassi* a very similar congener (type locality Canara) was also collected during these surveys. There is a certain amount of taxonomic ambiguity surrounding the identity of this species (Devi & Ali 2011b) with the population found below the Palghat/Palakkad gap being speculated as a different

taxon.

In this paper, we confirm the presence of *H. lithopidos* in its type locality, and redescribe it thereby clearing any ambiguity that may surround its identity. The identity of *H. thomassi* which is the closest resembling congener is also discussed in this paper.

## MATERIALS AND METHODS

The materials used in the present study are based mostly on collections from the Phalguni River, Mangalore and Kempu Hole River, a tributary of Netravathi in southern Karnataka. The specimens used in this study are registered in the Collections of the Zoological Survey of India, Southern Regional Centre, Chennai (ZSI/SRS) and the private collections of J.D. Marcus Knight (MKC). Measurements were taken using a digital caliper to the nearest 0.1mm. The standard length (SL) was measured using a foot ruler to the nearest 1.0mm. Quantification of characters follows Devi et al. (2010). Subunits of the head are also expressed in proportions of head length (HL). Numbers in parenthesis after a count denote the frequency of that count. Photographs of the syntypes of both *H. lithopidos* and *H. thomassi* from the Natural History Museum, London (BMNH), the Australian Museum, Sydney (AMS) and the Museum of Comparative Zoology, Harvard, (MCZ) were used to compare the general body shape and the lateral line scale count. All specimens used in this study were collected from the type locality (Dakshina Kannada) and are putative topotypes.

### Material examined

*Hypselobarbus lithopidos*: ZSI/SRC F 8663, 14.x.2012, 2 exs., 105.0 – 135.0 mm SL, Phalguni River, (12°59'55"N & 75°01'40"E) Mangalore, Karnataka, India, coll. Ashwin Rai; MKC 403, 14.x.2012, 1 ex., 169.0mm SL, Phalguni River, (12°59'55"N & 75°01'40"E), Mangalore, Karnataka, India, coll. Ashwin Rai.

*Barbus lithopidos* (Syntype photos): BMNH 1889.2.1.554-8 (Image 1A); AMS B.8374 (Image 1B).

## DESCRIPTION

### *Hypselobarbus lithopidos* (Day, 1874)

Synonyms: *Barbus lithopidos* Day, 1874, *Puntius lithopidos* (Day, 1874), *Gonoproktopterus lithopidos* (Day, 1874).

Morphometric and meristic data are given in Table 1.



Image 1. A - *Barbus lithopidos* (Syntype) BMNH 1889.2.1.554-8 (© <http://www.nhm.ac.uk>); B - *Barbus lithopidos* (Syntype) AMS B.8374 (© Amanda Hay, Australian Museum, Sydney); C - *Barbus thomassi* (Syntype) MCZ 4270 (© Creative Commons) President and Fellows of Harvard College)

General body shape and appearance as in Images 1A, 1B, 2A, 2B & 2C. Body elongate, moderately deep, laterally compressed; dorsal contour ascending gradually, with an indentation at nape and tapering gradually posterior to dorsal-fin insertion; ventral profile equally convex, curving gently up to anal-fin origin, thence sloping upward towards caudal peduncle; caudal peduncle narrow, its depth a little less than its length, concave in both dorsal and ventral profiles. Head long, snout rounded with an indentation at the end. Mouth inferior, lips thick, lateral fold on the snout present. Barbels 4, a maxillary pair and a rostral pair. Eye large, placed on the upper half of the head, approximately 32–36 % HL. Dorsal-fin with three simple and 9½ branched rays, the

last simple ray weak. Dorsal-fin origin slightly behind pelvic-fin origin, inserted midway between tip of snout and base of caudal fin. Pelvic fin with one simple and 8(1)–9(2) branched rays. Anal fin with three simples and 5½ branched rays. Pectoral fin with one simple and 15 branched rays. Pectoral and pelvic fins short, not reaching pelvic and anal-fin origins respectively. Caudal fin with 19 (1+9+8+1) rays, deeply forked with the principal rays white in colour. Lateral line complete, with 37(1) - 38(2) scales + 1 scale on the caudal fin base. Transverse scales from dorsal-fin origin to ventral fin origin ½ 6/1/ 3 ½ (1) - ½ 6/1/4 (2). Predorsal scales 13(1), 14(2), prepelvic scales 12; and 15 circumpeduncular scales. Pelvic axillary scale present. Gill rakers 5 (1), 6 (2)

**Table 1.** Biometric and meristic data of *Hypselobarbus lithopidos* (ZSI/SRC F 8663, 2 exs. and MKC 403, 1 ex.) from Phalguni River, Mangalore, Karnataka and *Hypselobarbus thomassi* from Kempu Hole River, Karnataka (ZSI/SRC F 8664, 2 exs. and MKC 404, 1 ex.) and Athirapally Falls, Chalakudy River, Kerala (ZSI/SRC F 8665, 1 ex.)

Morphometrics	<i>H. lithopidos</i> ZSI/SRC F8663 MKC 403		<i>H. thomassi</i> ZSI/SRC F8664 MKC 404		<i>H. thomassi</i> ZSI/SRC F 8665
	Range	Mean±SD	Range	Mean±SD	
Standard length (in mm)	105–169		133–213		132
<b>In percent SL</b>					
Head length	21.4–22.3	21.9±0.4	23.3–24.4	23.8±0.5	23.6
Head depth	15.1–16.1	15.8±0.6	16.5–18.4	17.3±0.9	17.1
Pre-dorsal length	48.8–50.4	49.7±0.7	48.4–51.2	49.7 ± 1.3	49.3
Pre-pelvic length	47.0–49.1	48.0±1	49.2–49.3	49.2±0.1	49.3
Caudal peduncle length	14.3–17.8	16.0±1.7	15.8–17.6	16.7±0.9	16.5
Caudal peduncle depth	12.6–14.2	13.6±0.9	15.2–15.7	15.5±0.2	15.4
Body depth	26.0–28.5	27.5±1.2	27.8–28.7	28.3±0.4	28.4
Dorsal fin height	25.2–26.4	25.8±0.6	26.1–26.3	26.2±0.1	26.1
Length of dorsal fin base	13.9–15.6	14.8±0.8	12.8–15.7	14.6±1.5	15.3
Anal-fin depth	15.6–17.4	16.3±0.9	17.1–18.2	17.8±0.5	18.1
Length of anal fin base	7.8–8.4	8.2±0.3	7.7–8.2	8.0±0.2	8.2
Pectoral-fin length	17.0–19.2	17.9±1.1	18.2–18.4	18.3±0.1	18.2
Pelvic fin length	18.0–20.1	18.9±1.1	17.8–18.6	18.2±0.3	18.2
Dorsal-hypural distance	49.2–52.8	50.8±1.8	49.2–51.9	50.8±1.4	51.4
<b>In percent HL</b>					
Snout length	32.1–37.0	35.1±2.6	36.9–39.5	38.1±1.3	37.8
Eye diameter	31.8–36.1	34.1±2.1	28.2–33.1	30.3±2.5	29.8
Interorbital width	41.0–43.1	42.2±1.1	36.6–37.2	37.0±0.3	37.1
Internarial width	21.7–24.3	22.9±1.3	19.5–23.4	21.7±1.9	22.1
Length of rostral barbel	10.1–11.1	10.7±0.5	11.7–13.5	12.5±0.9	12.5
Length of maxillary barbel	15.3–17.3	16.3±0.9	18.3–20.7	19.2±1.3	18.5
<b>Meristics</b>					
Lateral line scales	37(1)–38(2)+1 (3)		32(1)–33(2)+1 (3)		32+1
Lateral transverse	⅔ 6/1/ 3 ½ (1) – ⅔ 6/1/4 (2)		⅔ 5/1/2 ½ (1) – ⅔ 5/1/3 (2)		⅔ 5/1/3
Dorsal fin	iii, 9 ½		iii, 9 ½		iii, 9 ½
Pelvic fin	i, 8(1)–9(2)		i, 8(1)–9(2)		i, 9
Pectoral fin	i, 15		i, 15(2)–16(1)		i, 15
Anal fin	iii, 5 ½		iii, 5 ½		iii, 5 ½
Caudal fin	1+9+8+1		1+9+8+1		1+9+8+1
Pre-dorsal scales	13(1), 14(2)		10 (1), 11 (2)		11
Gill rakers	5 (1), 6 (2)+14 (1), 15 (2)		4+11 (1), 12 (2)		4+12

+ 14 (1), 15 (2) on first gill arch.

### Coloration

Formalin-fixed and alcohol-preserved specimens are dark grey at the back progressively becoming lighter at the abdomen with the fin edges becoming black. The

outer edges of each scale has scattered pigments. In life, juveniles below the size of 50mm SL are grey with each scale having a dark outer edge. Pelvic fins are bright red in juveniles, which slowly lose colour as the fish ages (Images 2A,B & C). Adult specimens silvery grey with all fins grey, the principal rays of the caudal fin are white in



Image 2. *Hypselobarbus lithopidos*: A - Phalguni River, Mangalore, Karnataka (ZSI ZSC F 8663); B - Phalguni River, Mangalore, Karnataka, unregistered specimen; C - Phalguni River, Karnataka (MKC 403); *Hypselobarbus thomassi*: D - Chalakudy River, Kerala (ZSI ZSC F 8665); E - Kempu Hole River, tributary of Netravathi, Karnataka (MKC 404). © J.D.M. Knight

colour.

#### Distribution

*Hypselobarbus lithopidos* was collected only from Phalguni River of Dakshina Kannada along the southern Western Ghats.

#### DISCUSSION

*Barbus lithopidos* currently designated to the Genus *Hypselobarbus* (Rainboth 1989; Menon 1992; Arunachalam et al. 2012; Yang et al. 2012) was described by Day (1874) from South Canara, India. *Hypselobarbus lithopidos* is endemic to the southern Western Ghats

(Shaji et al. 2000; Dahanukar et al. 2004). The currently known range of this species is based on reports made in the early half of the last century (1929–1941): drainages in Trivandrum District (Pillai 1929, John 1936); Periyar National Park and Tiger Reserve as well as River Chaliyar at Nilambur (Raj 1941). For additional details see Raghavan & Ali (2011).

Though *Hypselobarbus lithopidos* has been assessed as Data Deficient (Raghavan & Ali 2011) stating that there are no confirmed records of this species from its range since 1941, there have been sporadic reports of this species from the Western Ghats (David 1956; Indra & Devi 1990; Yazdani et al. 2001; Cherian et al. 2001; Vijaykumar et al. 2008; Vijaylaxmi & Vijaykumar 2011; Ahmad et al. 2011). Indra & Devi (1990) report *H. lithopidos* from Thekkady. Though their voucher specimens (ZSI/SRC F 1873 collected in 1975) were untraceable, the photograph of the fish provided in the paper (Fig. 2 in Indra & Devi 1990) portrayed a very deep bodied fish unlike the elongated streamlined fish that *H. lithopidos* is, raising doubts on the identity of the specimens they had examined. The other reports of *H. lithopidos* (David 1956; Vijaykumar et al. 2008; Vijaylaxmi & Vijaykumar 2011) were as a part of pollution studies or ichthyofaunal surveys and lacked the description or the voucher specimen of the fish identified as *H. lithopidos* thereby providing no clarity on the identity of this enigmatic barb. The recent report of this species by Ahmad et al. (2011), also needs verification as the record of this species fails to find mention in a subsequent phylogeny study of the genus by the same authors (Arunachalam et al. 2012) and has been stated to be different (M. Arunachalam pers. comm.: in Raghavan & Ali 2011). The other reports (Cherian et al. 2001; Yazdani et al. 2001) were merely based on reports prior to 1941.

Other than these unverified sporadic reports there have not been any confirmed records of this species from Kerala, Karnataka and Tamil Nadu parts of Western Ghats, although this area has been comprehensively explored (Easa & Basha 1995; Chandrashekhariah et al. 2000; Gopi 2000; Kurup et al. 2004) leading to the species being presumed extinct (Raghavan & Ali 2011)

During our surveys, specimens of *H. lithopidos* which fit the original description of Day (1874) were collected from Phalguni River in Dakshina Kannada, highlighting the fact that this enigmatic fish is not extinct as previously thought.

*Hypselobarbus lithopidos* can be distinguished from its closest resembling congener, i.e., *H. thomassi* by a higher lateral line scale count of 37–38 + 1 (vs. 32–33 + 1) and transverse scale row  $\frac{1}{2}$  6/1/ 3  $\frac{1}{2}$  - 4 (vs.  $\frac{1}{2}$  5/1/2  $\frac{1}{2}$

- 3). It can further be distinguished from *H. thomassi* by a higher number of pre-dorsal scales 13–14 (vs. 11–12) and higher number of gill rakers 5–6 + 14–15 (vs. 4 + 11–12) in the first gill arch.

*Hypselobarbus lithopidos* can also be distinguished from *H. micropogon*, *H. periyarensis* and *H. dubius* by having its last simple dorsal ray weak and articulated vs. strong osseous (Jayaram 1991). It can be distinguished from *H. curmuca* and *H. kurali* by the presence of a thin keratinized covering on the inside of the lower jaw vs. absence of the thin keratinized covering in the other two species. It can also be distinguished from the latter by the white principal rays of the caudal fin which is absent in *H. curmuca* and *H. kurali* (Talwar & Jhingran 1991). Moreover it can be further distinguished from *H. curmuca* by the presence of two pairs of barbels vs. one pair of barbel in the latter. *H. lithopidos* can be further distinguished from *H. kolus* by the presence of two pairs of barbels and 38–39 lateral line scales vs. one pair of barbel and 40–43 lateral line scales. *H. lithopidos* can also be distinguished from *H. jerdoni*, *H. dobsoni* and *H. pulchellus* by a higher lateral line scale count of 38–39 scales vs. 27–32 scales in the other three species (Jayaram 1991).

It is relevant to note that Jayaram (1991) has also reported *H. lithopidos* from Thekkady, Kerala (ZSI/SRC F 2088) with a lateral line scale count of 38–40. As we could not locate these specimens, their identity remains unclear. Evidently the range of these enigmatic barbids is quite large. Dams and hydro-electric projects with other anthropogenic factors such as over exploitation and use of destructive fishing practices could be a reason for the decline in the population of these barbids in its historic range. Wallacean shortfall also plays a part in species being presumed extinct (Knight 2010) which in this case is clear, with the record of *H. lithopidos* from its type locality from where it was presumed extinct.

*Hypselobarbus thomassi* has been reported from several drainages north and south of Palghat Gap in the Western Ghats. However, only in Netravathi and Kabini rivers (part of the Cauvery catchment in Karnataka and Kerala) north of the Palghat Gap, are the reports of this species confirmed while the southern Western Ghats populations are considered a different taxon (Devi & Ali 2011b). Though recent surveys in the two areas have only reported one specimen from Netravathi (Devi & Ali 2011b) we recorded this species in the Kempu Hole river, a tributary of the Nethravathi-Kumaradhara river systems. *Hypselobarbus thomassi* is consumed locally as a prized food fish and was observed to grow to more than 600mm in length and weighing more than 4kg. The

adults are deep red in colour with all fins becoming red. The scales are also red with the outer edges becoming dark; the coloring is true to the name given by Day (1874) as the 'red mahseer' of Canara (local name is Kempu Pervaul = Red Mahseer) (Image 2E).

It is relevant at this point to note that Arunachalam et al. (2012) have illustrated a *Hypselobarbus* sp. from Rosemala, Kerala [=Rosemalai (also spelt as 'Rusewalai' in pg. 70 and 71 of Arunachalam et al. 2012)], which they identify as *H. lithopidos* in figure 4 of pg. 71. However, the image of this species provided by the authors in pg. 66 (fig. 3A of Arunachalam et al. 2012) clearly shows a species with approximately 34 lateral line scales on the body. This species which they speculate to be *H. lithopidos* could very well be *H. thomassi*. Interestingly, there is no mention of *H. thomassi* in that paper.

Incidentally, we examined one specimen of *H. thomassi* collected below Athirapally Falls, Chalakudy River, Kerala (ZSI/SRC F 8665) (Image 2D). We could not observe any valid differences between this specimen and the *H. thomassi* collected in Dakshina Kannada to warrant this specimen as a different taxon (morphometrics and meristics provided in Table 1). Therefore, the contention that the southern Western Ghats population below the

Palghat gap is a different taxon (Devi & Ali 2011b) needs further validation and substantiation.

Interestingly, *Hypselobarbus pulchellus*, another species which is listed as 'Critically Endangered' and possibly extinct (Devi & Ali 2011c), was also collected during our surveys. We collected specimens with a lateral line scale count ranging from 32–35 + 1–2 from Sita River in Dakshina Kannada (Images 3A & B). Interestingly, there is a very recent report of a '*Puntius pulchellus*' in a newspaper (Shrivana 2013). However, the common name given in the report being 'Hullugende' or 'Haragi' is used for either the cultured grass carp (*Ctenopharyngodon idella*) or *Hypselobarbus dobsoni* and not for *H. pulchellus*, which is called 'Katladi' by the local people. Moreover, the photograph given in the report clearly shows a fish with the dorsal fin tipped with black, which is a characteristic of *H. dobsoni* and not *H. pulchellus*. As the report does not mention any voucher specimens, the identity of the fish reported as *H. pulchellus* needs verification. Such reports not only hamper organized taxonomic work but also add to the ambiguity that surrounds such little known fish (Raghavan et al. 2013). We propose to elucidate the identity of *H. pulchellus* in a subsequent paper.



Image 3. *Hypselobarbus pulchellus*: A - Sita River, Karnataka, unregistered live specimen; B - Sita River, Karnataka, formalin fixed specimen (MKC 405). © J.D.M. Knight

## Comparative material

*Hypselobarbus thomassi*: ZSI/SRC F 8664, 13.i.2013, 2 exs., 133–135 mm SL, Kempu Hole River (12°49'52"N & 75°29'60"E), tributary of Netravathi River, Karnataka, coll. Ashwin Rai; MKC 404, 13.i.2013, 1 ex., 213mm SL, Kempu Hole River (12°49'52"N & 75°29'60"E), tributary of Netravathi River, Karnataka, coll. Ashwin Rai; ZSI/SRC F 8665, 11.vii.2012, 1 ex. 132mm SL, below Athirapally waterfalls, Chalakudy River, Kerala, coll. Pushpangathan.

*Barbus thomassi* (Syntype photo): MCZ 4270 (Image 1C)

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