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Note

Range extension of the red-tipped halfbeak *Hyporhamphus xanthopterus* (Valenciennes, 1847) in the Cauvery River, Western Ghats of India: Integrative taxonomy and resolution of taxonomic misidentifications

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Abstract

This study reports a noteworthy range extension of the freshwater halfbeak *Hyporhamphus xanthopterus* (Valenciennes, 1847) from the Western Ghats of India, with the first confirmed record from the Cauvery River in Tamil Nadu. This discovery significantly expands the known distribution of the species within Indian freshwater ecosystems. This study presents the first molecular validation of *H. xanthopterus* from Indian waters, integrating mitochondrial DNA data with detailed morphometric and meristic analyses. The findings contribute to resolving taxonomic ambiguities within the genus *Hyporhamphus*, provide refined diagnostic criteria for accurate species identification and offer new insights into the biogeographical distribution of this poorly understood taxon. These results establish a valuable baseline for future taxonomic, phylogenetic and conservation-oriented research on freshwater halfbeaks in South Asia..

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The Western Ghats (Great Escarpment of India), a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site and global biodiversity hotspot (Myers *et al.,* 2000), extend parallel to India's western coast across Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra and Gujarat (Gadgil, 1996). The region is particularly notable for its exceptional freshwater fish diversity and a high degree of endemism (Kottelat and Whitten, 1996; Dahanukar *et al.* 2004). The red-tipped halfbeak *Hyporhamphus xanthopterus* (Valenciennes, 1847), which is endemic to the freshwater systems of the Western Ghats (Talwar and Jhingran, 1991; Ponniah and Gopalakrishnan, 2000; Jayaram, 2010), is currently listed as 'vulnerable' in the International Union for Conservation of Nature (IUCN, 2011) Red List due to various anthropogenic threats (Venkataraman *et al.,* 2013).

H. xanthopterus, belongs to the family Hemiramphidae (Order: Beloniformes), commonly known as halfbeaks, characterised by an elongated lower jaw that is longer than the upper jaw (Collette and Su, 1986). The family comprises primarily marine species (Parin *et al.,* 1980), with a few freshwater representatives, particularly within the genus *Hyporhamphus*. Globally, Hemiramphidae includes 8 genera and 62 recognised species, while Indian waters are home to 15 species across 5 genera. Within the genus *Hyporhamphus*, approximately 38 species have been described worldwide and from Indian waters 9 species have been reported (Froese and Pauly, 2024). *H. xanthopterus* is a freshwater halfbeak originally described from Vembanad Lake, Kerala (Talwar and Jhingran, 1991). It inhabits lakes, rivers and low-salinity estuarine zones, preferring shallow, slow-moving waters with vegetation (Collette,

2004). *H. xanthopterus* is found mostly in the Vembanad Lake of Kerala but recently reported from the Vembanad-Kole Wetland, Bhrathapuzha, Ashtamudi Lake and Chalakkudy River in Kerala (Harikrishnan *et al.,* 2011; Roshni and Renjithkumar, 2021; Renjithkumar *et al.,* 2021, 2025; Bella *et al.,* 2022; George and Mathew, 2022; Kumar *et al.,* 2023, 2024; Roshnath *et al.,* 2023; Renjithkumar and Roshni, 2024; Sudhakaran and Amalnath, 2024; Thomas *et al*., 2024,2025). *H. xanthopterus* was also recorded from the Cauvery River and other locations in Karnataka (Bharadwaj and Prasad, 2021; Sreenivasan *et al.,* 2021; Roshith *et al.,* 2022), Pechipparai Reservoir, Kanyakumari District of Tamil Nadu (Prateek *et al.,* 2016) and Palair Reservoir in Telangana (Sajina *et al.,* 2021). However, the reports of this species from Indian waters remain uncertain, as most records are derived from checklists with limited or no supporting morphological data. Only a few studies provide photographs or morphometric details, and molecular confirmation is entirely lacking. Without comprehensive evidence, these records may represent misidentified congeners with similar external features.

Based on integrative taxonomic approach employed in this study, *H. xanthopterus* is confirmed as a novel record from the Cauvery River, Erode, Tamil Nadu, extending its known distribution. Previous limitations in Indian hemiramphid taxonomy, primarily relying on checklists and regional reports lacking detailed morphological and molecular characterisation, have contributed to taxonomic uncertainties (Behera *et al.,* 2020). This research addresses these ambiguities by providing comprehensive morpho-meristic data and molecular evidence for *Hyporhamphus* species. The findings of this study offer critical insights into the systematics, distribution and phylogenetic relationships within the genus *Hyporhamphus* in Indian waters, thereby contributing significantly to future taxonomic revisions, ecological investigations and conservation strategies for these ecologically and economically relevant fishes.

During the study of the taxonomy of the genus *Hyporhamphus*, seventy specimens of *H. xanthopterus* were obtained from the rivers and lakes of Western Ghats of India (Fig. 1 **,** Table 1) during January 2021 to December 2024. The species is mostly caught using a specialised gill net with 18 mm mesh size, operating at a depth of 0-5 m by local fishermen. Specimens were photographed in fresh condition and subsequently brought to the laboratory for detailed morphological examination. Fresh fin tissue samples were collected at the sampling sites and preserved in 95% ethanol for subsequent molecular analyses.

Morpho-meristic data were recorded following the standard method given by Fischer (2014); Haedrich (1967) and Hubbs and Lagler (1958). A digital vernier calliper with an accuracy of 0.1 mm was used to obtain the morphometric measurements, and a weighing scale with an accuracy of 1 g was used to determine the total body weight. Nearly 25 morphometric measurements and 10 meristic counts were taken. The specimens were identified based on the standard key given by Collette and Su (1986). The percentage in head length (% in HL) and the percentage in standard length (% in SL) were used to tabulate morphometric measurements. Colour pattern was recorded in freshly collected specimens. The vertebral counts comprised both precaudal and caudal vertebrae, with the urostyle included, following the method described by Jawad and Jig (2017) and sagittal otoliths were extracted and high-resolution digital images were captured (Nikon SMZ1270) for image analysis as suggested by Abdussamad(2015). For future reference, representative specimen collected from Cauvery River was preserved in formalin and deposited in the National Marine Biodiversity Museum at ICAR-Central Marine Fisheries Research Institute (ICAR-CMFRI), Kochi, India.

DNA was isolated from the tissue sample using the customised marine animal DNA isolation kit, according to the manufacturer's instructions (Origin Inc.). The quality and quantity of DNA were tested by Bio Spectrometer (Eppendorf Pvt. Ltd). Fragments of the mitochondrial cytochrome oxidase subunit I (COI) gene were amplified using universal primer set WARD 1 (Ward *et al.* 2005). The PCR products were sequenced at Genspec, Kochi, India. The sequence quality was checked for quality using the ABI sequence scanner (V 1.0) and good quality sequences were chosen for further analyses. COI sequences of closely related species were

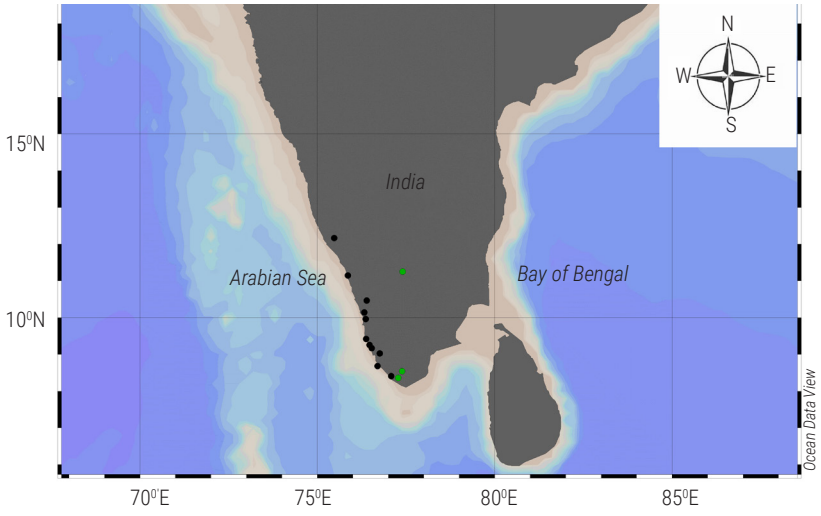

Fig. 1. Map showing collection localities of *H. xanthopterus* during the present study.

Table 1. Samples collected from different locations during the present study

Sl. No	Collection site	District and State	Lat/Long
1	Valapattanam River, Sreekandapuram	Kannur, Kerala	12°02'36.6"N 75°30'34.8"E
2	Chaliyar River, Koolimad	Kozhikode, Kerala	11°16'09.2"N 75°58'27.4"E
3	Bharathappuzha River, Ottappalam	Palakkad, Kerala	10°46'04.9"N 76°22'33.2"E
4	Chalakkudy River, Athirappally	Thrissur, Kerala	10°17'19.2"N 76°30'46.5"E
5	Periyar River, Malayattoor	Ernakulam, Kerala	10°10'58.9"N 76°29'53.4"E
6	Vembanadu Lake, Vaikom	Kottayam, Kerala	9°43'05.8"N 76°23'08.6"E
7	Vembanadu Lake, Kumarakom	Kottayam, Kerala	9°36'42.7"N 76°25'18.5"E
8	Vembanadu Lake, Aryad	Alappuzha, Kerala	9°32'04.1"N 76°21'18.3"E
9	Ashtamudi Lake, Munroe Island	Kollam, Kerala	8°59'21.0"N 76°36'16.7"E
10	Shasthamkotta Lake, Shasthamkotta	Kollam, Kerala	9°02'15.3"N 76°37'48.5"E
11	Neyyar Dam, Amboori	Thiruvananthapuram, Kerala	8°30'17.8"N 77°11'58.0"E
12	Cauvery River, Pallipalayam	Erode, Tamilnadu	11°21'56.7"N 77°44'25.6"E
13	Thamirabarani River, Tirunelveli	Tirunelveli, Tamilnadu	8°43'39.5"N 77°42'49.5"E
14	Kodayar Lake, Pechiparai	Kanyakumari, Tamilnadu	8°27'11.6"N 77°18'55.4"E

retrieved from GenBank and aligned together with the newly generated sequences using the Clustal W algorithm in BioEdit (Hall, 1999). Phylogenetic relationships were inferred using the maximum likelihood (ML) method and Kimura-2-parameters (K2P) based genetic distances (Kimura, 1980) were calculated in MEGA 11 (Tamura *et al.,* 2021). Species delimitation within the species complex was evaluated using ASAP (Assemble Species by Automatic Partitioning) (https://bioinfo.mnhn.fr/abi/public/asap/#) (Puillandre *et al.,* 2021) using default parameters and genetic distances were computed based on the K80 substitution model.

Hyporhamphus xanthopterus (Valenciennes, 1847)
Common name: Red-tipped halfbeak

Materials examined: A total of seventy specimens collected in gill net, from Cauvery River (at 0-5 m depth), Pallipalayam, Erode, Tamil Nadu (11°21'56.7"N; 77°44'25.6"E) by Toji Thomas on 10 October, 2024. One representative specimen (8.2-10.9 cm SL) was deposited in the National Marine Biodiversity Museum at ICAR-CMFRI, Kochi (DNR.No. GB.10.4.7.27.1; Fig. 2 and Table 2).

Diagnosis: Closely resembles other Indo-West Pacific species of the genus, such as *H. limbatus* and *H. sindensis*. However, it can be distinguished by a unique combination of characteristics, including a high gill-raker count (43–45), a relatively short lower jaw (104–114% of HL), yellowish fins and its exclusive occurrence in freshwater habitats

Description: Elongate and cylindrical body, greatest body depth 12.6-13.7% in SL, head small (20.5-23.8% in SL), lower jaw short (104 to 114 % in HL). Upper jaw (20.5 to 25.5 % in HL) triangular, scaly and of width between 0.95 to 1.2 times in length. Teeth small, tricuspid and arranged in a row. Inter-orbital width 29-31% in HL and eye diameter 23-27% in HL. Fan-shaped nasal papillae and nostrils with an oval-shaped nasal fossa. Pre-orbital ridge present, pre-orbital canal narrow and slightly enlarged ventrally, no posterior branch, median pore in the centre of the canal or at the anterior margin. Pre-orbital 36-42% in HL and post-orbital (38-42) are equal in length.

Pre-dorsal distance 73.6-79.7% in SL and pre-anal distance 74.6-80.2% in SL; dorsal and anal fins opposite and equal in length;

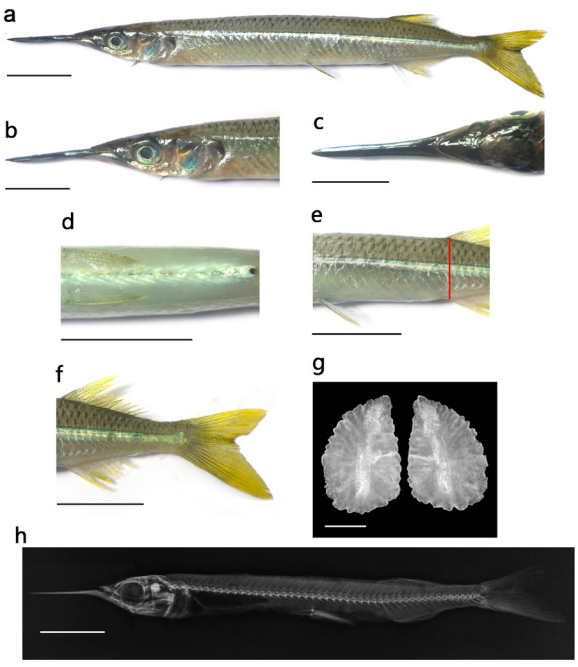

Fig. 2. Morphology of *H. xanthopterus* (a) Lateral view (scale bar = 2 cm); (b) Head (scale bar = 2 cm); (c) Upper head (scale bar = 2 cm); (d) Pelvic to anus (scale bar = 2 cm) , (e) DF-AF origin (Scale bar = 2 cm) , (f) Fin shape (scale bar = 2 cm) , (g) Sagittal otolith (scale bar = 2 mm) and (h) Vertebrae (scale bar = 2 cm)

dorsal fin 8.7-12.4% in SL, rays 14 to 15; anal fin 9.9-12.6% in SL, rays 14 to 15. Anal fin originates under the second or third ray of the dorsal fin; dorsal base length about 14.7-15.9% in SL and anal base length 14.7-15.8% in SL; anal fin base 1.0-1.2 times in the base of the dorsal fin. The anterior lobe of the dorsal and anal fins well developed and the anterior part covered with scales. Pre-pectoral distance 22.4-25.8% in SL, pectoral-fin longer than all fins (12.9-14% in SL) and has 10 to 12 rays, not reaching past the nasal pit when folded forward. Pre-pelvic distance 54-58% in SL and located mid-way of the body, pelvic-fin short (8-10.1% in SL), and has 6 rays. The greatest number of gill rakers is on the first gill arch (43 to 45). Scales small and ctenoid, lateral line scales 71 to 74; pre-dorsal scales 41 to 43. Caudal fin (19.5-22% in SL) emarginated or not sharply forked; caudal peduncle depth is about 5.5-6% of SL. Vertebrae 47 to 49.

Table 2. Morphometric and meristic data of *H. xanthopterus*

Sl. No.	Characters	*H. xanthopterus* (N=7)
Morphometry		
1	Total weight (g)	7-35
2	Total length (TL) (cm)	11.3-16.9
3	Fork length (FL) (cm)	10.6-15.9
4	Standard length (SL) (cm)	8.18-12.65
5	Head length (HL) (cm)	1.85-2.6
In % of SL		
1	Head length	20.5-23.8
2	Eye diameter	4.7-6.1
3	Pre-pectoral length	22.4-25.8
4	Prepelvic length	54-58
5	Predorsal length	73.6-79.7
6	Preanal length	74.6-80.2
7	Dorsal base length	14.7-15.9
8	Anal base length	14.7-15.8
9	Pectoral length	12.9-14
10	Pelvic length	8-10.1
11	Dorsal height	8.7-12.4
12	Anal height	9.9-12.6
13	Caudal length	19.5-22
14	Caudal peduncle depth	5.5-6
15	Depth at pelvic fin origin	12.6-13.7
In % HL		
1	Eye diameter	23-27
2	Interorbital width	29-31
3	Pre-orbital length	36-42
4	Post-orbital length	38-42
5	Upper jaw length	20.5-25.5
6	Lower jaw length	104-114
Meristic data		
1	Dorsal fin rays	14-15
2	Anal fin rays	14-15
3	Pelvic fin rays	6
4	Pectoral fin rays	10 -12
5	Gill rakers	43-45
6	Lateral line scales	71-74
7	Pre-dorsal scales	41-43
8	Vertebrae	47-49

Colouration: The ventral side of the body appears silvery, while the dorsal region exhibits a greenish-yellow hue. Dark green stripe above them extending to the base of the caudal fin. When fresh, the lower jaw has a faint blue tint that later darkens to black, whereas the upper jaw remains black. A distinct orange-red marking is present at the tip of the lower jaw. The fins are yellow, while the pectoral axil is black.

Otolith shape: The sagittal otolith is almost pear-shaped, characterised by a broader posterior region and a gradually tapering, pointed anterior. Dorsal margin is almost straight, while the ventral margin deeply convex, and the posterior almost rounded. The dorsal, ventral, and posterior are distinctly serrated**.**

Distribution: Rivers and lakes of Kerala and Tamil Nadu

Meristic formula: DF 14-15, AF 14-15, Pect F 10-12, Pel F 6, Gill rakers 43-45, Vertebrae 47-49, Lateral line scales 71-74, Predorsal scales 41-43.

Molecular taxonomy: In this study, the sequences PV 231890 and PV 239868 were identified as *H. xanthopterus* and confirmed through morpho-meristic evidence. Phylogenetic analysis of four closely related *Hyporhamphus* species revealed that some sequences previously misidentified as *Hyporhamphus quoyi* (ON721110, OR921585, ON721103), are more accurately assignable to *H. xanthopterus*. In contrast, multiple sequences of *H. quoyi* formed distinct clusters, indicating the taxonomic complexity or cryptic speciation within the species. Bootstrap support values for *H. quoyi* clades varied, with some showing strong support (100%) and others moderate (93% and 61%) (Fig. 3). *H. xanthopterus* showed a genetic difference of 14-15% from other species of the genus *Hyporhamphus* present in the region (Table 3). The ASAP analysis divided the species complex into four operational taxonomic units (OTUs). The highest ASAP score revealed six subsets, comprising four clades within the species complex, *Rhynchorhamphus georgii,* and the outgroup. The clustering of *R. georgii* formed a distinct cluster separate from the *Hyporhamphus* species complex, whereas sequences attributed to *R. malabaricus* (MW967299.1, MK359930.1, KJ641744.1, MF170953.1), clustered within the *Hyporhamphus* clade, confirming their misidentification. *Ablennes hians* (MT323766.1) was placed as the outgroup, providing a reference point to root the tree and infer evolutionary relationships among the species.

Since the late 20th century, three new species of fishes have been described in the genus *Hyporhamphus* from the Atlantic and Pacific Oceans (Banford and Collette, 2001; Banford, 2010; Bannikov *et al.,* 2016). Early reports documenting species of the genus *Hyporamphus* from different parts of the world (Kinzelbach, 2007; Matamoros *et al.,* 2007), were often based on limited diagnostic characters. Studies from Indian waters is scarce and most available records lack detailed morphological descriptions, quality photographic documentation, or molecular evidence, making their occurrence and identity of various species in the region uncertain. This highlights the need of detailed integrative taxonomic studies to address existing knowledge gaps and resolve the taxonomical ambiguities within the genus. *H. xanthopterus* was previously known only from the Vembanad Lake system, with occurrences restricted to the freshwater regions of Alappuzha, Kottayam and Ernakulam districts of Kerala. The present study provides the first

Table 3.Inter and intra-species genetic distances based on mitochondrial COI sequences

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
PV231890.1_*Hyporhamphus_xanthopterus*																				
PV239868_*Hyporhamphus_xanthopterus*	0																			
ON721110.1_*Hyporhamphus_quoyi*	0	0																		
OR921585.1_*Hyporhamphus_quoyi*	0	0	0																	
ON721103.1_*Hyporhamphus_quoyi*	0	0	0	0																
MZ577242.1_*Hyporhamphus_affinis*	0.14	0.14	0.14	0.14	0.14															
KJ013045.1_*Hyporhamphus_affinis*	0.14	0.14	0.14	0.14	0.14	0.01														
OR113913.1_*Hyporhamphus_quoyi*	0.14	0.14	0.14	0.14	0.14	0.01	0													
GU674305.1_*Hyporhamphus_quoyi*	0.14	0.14	0.14	0.14	0.14	0.01	0	0												
MW578373.1_*Hyporhamphus_quoyi*	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.14											
MK988540.1_*Hyporhamphus_quoyi*	0.14	0.14	0.14	0.14	0.14	0.15	0.14	0.14	0.14	0										
MN083114.1_*Hyporhamphus_quoyi*	0.14	0.14	0.14	0.14	0.14	0.15	0.14	0.14	0.14	0	0									
MN083114.1_*Hyporhamphus_quoyi*	0.14	0.14	0.14	0.14	0.14	0.15	0.14	0.14	0.14	0	0	0								
KJ641744.1 *Rhynchorhamphus_malabaricus*	0.14	0.14	0.15	0.15	0.14	0.14	0.14	0.14	0.14	0.06	0.06	0.06	0.06							
MW967299.1Rhynchorhamphus_*malabaricus*	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.06	0.06	0.06	0.06	0.01						
MK359930.1Rhynchorhamphus_*malabaricus*	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.06	0.06	0.06	0.06	0.01	0					
MF170953.1_*Rhynchorhamphus_malabaricus*	0.15	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.06	0.06	0.06	0.06	0.01	0	0				
MN855093.1_*Rhynchorhamphus_georgii*	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17			
MN855092.1_*Rhynchorhamphus_georgii*	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0		
MN855091.1_*Rhynchorhamphus_georgii*	0.17	0.17	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0	0	
MT323766.1_*Ablennes_hians*	0.2	0.2	0.2	0.2	0.2	0.21	0.2	0.2	0.2	0.21	0.2	0.2	0.2	0.22	0.22	0.22	0.22	0.21	0.21	0.21

molecular confirmation of *H. xanthopterus* beyond its previously known range, offering a clearer understanding of its geographic distribution and aiding in resolving taxonomic uncertainties within this group.

H. xanthopterus shows distinct morphological features that differentiate it from other Indo-West Pacific species of the genus *Hyporhamphus* (Parin *et al.,* 1980), most notably a higher number of gill rakers in the first gill arch (43-45 *vs* 19-37 in congeners), yellowish fins and a preference for freshwater or low saline habitats. However, it shares certain morphological similarities with *H. sindensis* and *H. limbatus*. *H. sindensis* resembles *H. xanthopterus* in several characters such as proportion of lower jaw length to head length (0.9-1.8 in HL), upper jaw width relative to its length (0.69-1.1) and eye diameter in head length (1.1- 2.1). *H. limbatus* which is widely distributed in marine and estuarine waters of India from Gujrat to West Bengal, differs from *H. xanthopterus,* in having the lower jaw nearly equal to head length (0.7-1.2 in HL), whereas in *H. xanthopterus,* the lower jaw is consistently shorter than the head length (1.23-1.77 in HL). In addition, *H. xanthopterus* possesses, on average, one more dorsal and anal fin ray than *H. limbatus*, although the number of vertebrae overlaps between the two species (47-49). Several earlier records of *H. xanthopterus* were later shown to be misidentifications, largely due to the reliance on superficial external similarities and the absence of detailed morphological and meristic assessments. *H. limbatus* was reported as *H. xanthopterus* from Sri Lanka and the Gulf of Mannar (Kirtisinghe, 1933; Munro, 1955), while *H. picarti* was misidentified as *H. xanthopterus* along the Mediterranean coast of Israel (Fowler, 1956). The record from the Sind coast of Pakistan (Qureshi, 1958) was subsequently recognised as *H. sindensis*. *H. limbatus* was again misidentified as *H. xanthopterus* in the Indo-China region (Kuronuma, 1961). These taxonomic revisions underscore the importance of rigorous morphological and meristic evaluation for accurate species identification within the genus. The specimens in the present study were identified as *H. xanthopterus* based on detailed morpho-meristic parameters, with most meristic counts and proportional morphometric characters closely aligning with previous authoritative descriptions (Table 4), further confirmed by molecular evidence.

This study provides the first molecular confirmation of *H. xanthopterus* from the Cauvery River, Tamil Nadu, signifying a notable range extension within the freshwater ecosystems of the Western Ghats. This integrative taxonomic approach, employing both morphological and molecular data, strengthens species validation and aids in resolving taxonomic uncertainties within *Hyporhamphus*. Phylogenetic analysis of four closely related *Hyporhamphus* species revealed that sequences previously identified as *Hyporhamphus quoyi* from Cauvery region of Tamil Nadu are more accurately assignable to *H. xanthopterus*. The analyses also indicate a species complex within *H. quoyi*, suggesting cryptic diversity and correct a misidentification of one *Hyporhamphus* species as *Rhynchorhamphus malabaricus*. When

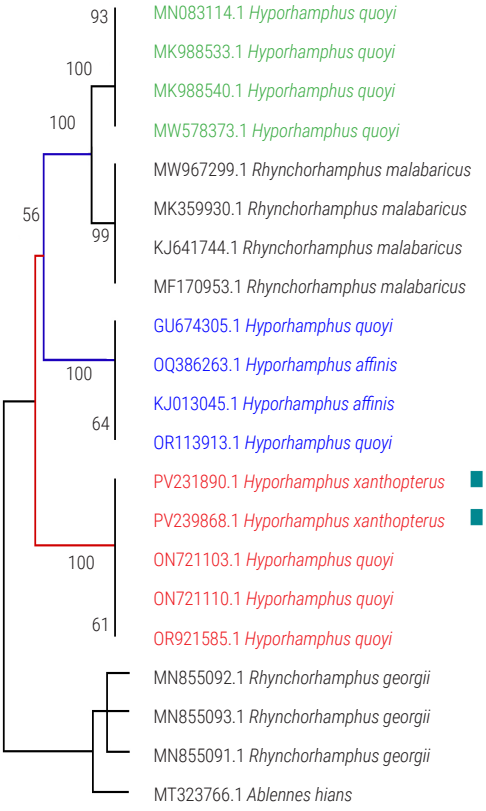

Fig. 3. Maximum Likelihood (ML) phylogenetic tree using mitochondrial COI gene

the genus *Rhynchorhamphus* was used as an outgroup in the phylogenetic reconstruction, *R. malabaricus* clustered within the *H. quoyi* clade confirming its misidentification. These molecular findings shed light upon *Hyporhamphus* taxonomy, improving species level identification and classification. The confirmed occurrence of *H. xanthopterus* from the Cauvery River expands its known biogeographic range in Indian waters, highlighting the necessity for continued taxonomic surveys in freshwater and estuarine environments. Considering the previous report from Telangana (Sajina *et al.*, 2021), outside the presumed Western Ghats endemism, further research is crucial to accurately define the species' distribution. Future investigations should focus on population genetics, ecological requirements and conservation assessment to inform evidence-based management and ensure the long-term sustainability of this taxon.

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Table 4. Morpho meristic confirmation of species in comparison with the specimens used in the present study

Sl. No	Characters	*Hyporhamphus xanthopterus* (Collette, 1981)	*Hyporhamphus xanthopterus* (Varghese, 2005)	*Hyporhamphus xanthopterus* (Present study)
	Morphometry			
1	Head in SL	21.3-24	13.74-43.33	20.5-23.8
2	Lower Jaw in times of HL	1.2-1.8		1-1.4
3	Upper Jaw Width in Length	.73-.97	.8-1	.95-1.2
4	Pre-orbital distance in ED	1.4-1.9		1.4-1.8
5	Body depth in SL	11.2-14.5	4.44-17.34	12.76-13.7
6	Body width in SL	8.6-11.9		9-11.1
7	Dorsal fin in its Base	1-1.2		1.2-1.5
8	Pectoral Length in SL	12.4-14.8	7.52-15.08	12.9-14
9	Pelvic Length in SL	8.2-11.6	5.56-10.67	8-10.1
	Meristic			
1	Dorsal fin Rays	14-16	14-16	14-15
2	Anal fin Rays	14-17	14-17	14-15
3	Pectoral fin Rays	12-13	10	10-12
5	Vertebrae	47-49		47-49
6	Predorsal Scales	33-38	34-38	41-43
7	Gill Rakers	41-53	41-53	43-45
8	Color (in Fins)	Yellowish	Yellow	Yellow
9	Habitat	Freshwater	Freshwater	Freshwater

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