

Short Communication: A new cyprinid fish *Barilius cyanochlorus* from Kerala, India

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Abstract. *Plamoottil M, Vineeth K. 2020. Short Communication: A new cyprinid fish Barilius cyanochlorus from Kerala, India. Biodiversitas 21: 5389-5394.* A new *Barilius* species is described from a small freshwater stream at Kasargod district of Kerala, India. It can be distinguished from its congeners in having a body with blackish-brown dorsal and upper laterals, greenish-yellow middle part and silvery lower lateral part, 8 vertical bands on mid-lateral region, each of these bands with 2 segments-lower blue part and upper green part, a large round blotch on the caudal base with similar color pattern, dorsal fin with basal 2/3 portion brown and distal 1/3 part orange-red, anal fin orange-red, pectoral fin pale reddish, 14-16 pre-dorsal scales and 37-39 lateral line scales. The new species is taxonomically analyzed, compared with its congeners, scientifically named and described.

Keywords: *Barilius ardens*, *Barilius gatensis*, Kazargod, new description, systematics

INTRODUCTION

Barilius Hamilton (1822) is a large genus of small freshwater cyprinid fishes native to Asia. Species of *Barilius* are generally found in clear, shallow waters of fast-flowing mountain streams. So, they are commonly known as 'Hill trouts'. They can be identified from other cyprinid fishes by their compressed bodies, round bellies, large eyes-superior in the anterior half of the head, round spots or vertical bars on the flanks, dorsal fin with 7-12 branched rays, anal fin with 8-14 rays, lateral line, if present, occurs sub-laterally and pectoral pads present in front of the pectoral fin base (Howes 1980; Rainboth 1996).

Different names have been assigned to this genus by various systematists: *Cyprinus* Hamilton (1822), *Opsarius* M'Clelland (1839), *Barilius* Day {1865, 1870, 1878, 1889} and *Pteropsarion* Günther (1868). Different taxonomists have taken various criteria for identification and classification of Bariline cyprinids; Hamilton (1822) depended on external morphological characters. Day (1878) stressed on character of barbels. Osteological (cranial osteology) and myological features were the criteria for Howes (1980). Regan (1911) considered characters of skull, Weberian apparatus, and the pectoral girdle and prepared a phylogenetic key.

Many taxonomic studies have been done on Bariline species during the last few decades. Several new species have been described (Smith, 1931; Tejavej, 2012a; Knight et al. 2015; Qin 2019); some have been resurrected (Tejavej, 2012b; Coad and Krupp, 1983) from its synonymy; revisions (Howes, 1980, 1983; Chu, 1984, Tejavej, 2010) have also been compiled. Nevertheless,

there exist systematic uncertainty and taxonomic ambiguity/in the identification and nomenclature of many species of *Barilius*. Even though Hamilton (1822), who established the genus, described 12 species from the Gangetic system, most of them are still synonymic due to lack of topotype materials. Menon (1999), in his checklist, mentioned 15 *Barilius* species. As of 2019, there were six distinct species of *Barilius* in the inland water bodies of India.

MATERIALS AND METHODS

Specimen

During various surveys from 2019 to 2020, these authors could collect almost all *Barilius* species from south India. But specimens of *Barilius* collected by these authors from a water stream at Chully, Kasargod, India showed many distinct taxonomical differences from their congeners. After detailed study and comparison with all its relative species, they have been found to be a previously unrecognized species described here as a new species: *Barilius cyanochlorus*.

Procedure

New fish specimens were collected from aquatic body using gill net and were fixed in 10% formalin; they were analyzed taxonomically; measurements were taken using dial calipers and data recorded to tenths of a millimeter. For confirming the identity of the new fish, its relative species collected from their type localities were taxonomically analyzed. Hubbs and Lagler (1964) and Jayaram (2002, 2010) were followed for taxonomic analysis and comparisons; counts and measurements were

made on the left side of specimens. Head length and other parts of body were given as percentages of standard length (SL); parts of the head were given as percentage of head length (HL). Specimens of the new fishes are now deposited in the Zoological Survey of India Museum at Hyderabad (ZSI/FBRC).

RESULTS AND DISCUSSION

Barilius cyanochlorus, sp. nov.

(Figures 1 and 2; Tables 1 and 2)

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Type specimens examined

Holotype: FBRC/ZSI/VS/02, 58.5 mm SL, water stream at Chully, Kasargod, coll. Mathews Plamoottil and

Vineeth. K, 25/05/2020. Paratypes: FBRC/ZSI/VS/03, 6, 52.2-70.00 mm SL, a water stream at Chully, Kasargod, coll. Mathews Plamoottil and Vineeth. K, 25/05/2020.

Diagnosis

Barilius cyanochlorus differs from all its congeners in having 37-39 lateral line scales, 14-16 pre dorsal scales, 11 branched dorsal fin rays, two pairs of minute barbels on snout, body with blackish-brown dorsal and upper laterals, greenish-yellow middle part and silvery lower lateral part, 8 vertical bands on mid-lateral region, each of these bands with two segments-lower blue part and upper green part-a large round blotch on caudal base with same color pattern, upper caudal lobe with a triangular black blotch, dorsal fin with basal 2/3 portion brown and distal part orange-red, anal fin orange-red and pectoral fin pale reddish.



Figure 1. A fresh specimen of *Barilius cyanochlorus*, Holotype (FBRC/ZSI/VS/02)



Figure 2. A preserved specimen of *Barilius cyanochlorus*, Paratype (FBRC/ZSI/VS/03)



Figure 3. *Barilius gatensis*, GCC/DOZ 112, collected from the base of Nilgiri Hills, India



Figure 4. *Barilius malabaricus*, GCC/DOZ 113, from Malom, Kasargod, Kerala, India



Figure 5. *Barilius canarensis*, GCC/DOZ 114, from Panathadi, Kasargod, Kerala, India



Figure 6. *Barilius ardens*, GCC/DOZ 115, collected from Karnataka, India



Figure 7. *Barilius bendelisis*, young one GCC/DOZ 116, collected from Karnataka, India



Figure 8. *Barilius bendelisis* adult GCC/DOZ 117, collected from Karnataka, India



Figure 9. *Barilius bakeri*, GCC/DOZ 118, collected from the Manimala River, India

Description

Body laterally compressed; ventral profile more convex than dorsal aspect; pre-dorsal region not straight; a depression on occipital region. Post-dorsal region in a slanted straight line; snout tip nearly blunt; mouth oblique and upturned; lower jaw a little longer than upper jaw; eyes large, located above and behind the angle of jaws; interorbital region straight; eyes located on the dorsolateral region of head; its dorsal margin reaches to the dorsal profile of head; lower margin of orbit never reaches to the level of angle of mouth; nares located close to the eyes than the snout tip. Two pairs of small barbels, feeble and indistinct. Dorsal fin commences considerably behind and above the ventral fin origin, slightly nearer to snout than caudal-fin base. Outer margin of dorsal fin convex. Pectoral fin tip reach or reach near to ventral fin origin; outer margin of pectoral fin straight; ventral fin tip reaches the anal opening, 1-2 scales in front of anal fin; outer margin of ventral fin roughly straight; one axillary scale present on either side of the ventral fin base which is half the length of the latter. Anal fin commences one orbit diameter behind and below the origin of dorsal fin; anal fin tip reaches 6 scales in front of the caudal fin base; outer margin of anal fin markedly concave as the first six branched rays of anal fin protrudes from the outer margin. Lower lobe of the caudal fin is longer than the upper one; lateral line is moderately concave and distinct throughout. Scales small and distinct.

Table 1. Morphometric characters of *Barilius cyanochlorus* (n=7) (FBRC/ZSI/VS/02 & FBRC/ZSI/VS/03)

Measurement	Holotype	Range	Mean	SD
Total length (mm)	74.5	66.5-89.0	76.5	9.31
Standard Length (mm)	58.5	52.2-70.0	60.1	7.36
Head Length(mm)	16.5	14.5-19.0	16.7	1.84
% SL				
Head length	28.2	26.9-28.8	27.7	0.80
Head depth	23.9	22.1-23.9	22.7	0.91
Head width	15.3	14.9-15.4	15.2	0.25
Body depth at dorsal origin	30.7	30.0-32.3	30.8	0.96
Body depth at anal origin	28.7	25.4-29.2	27.3	1.68
Body width at dorsal origin	14.0	12.6-13.8	13.3	0.61
Body width at anal origin	9.91	8.18-10.0	9.16	0.84
Pre-dorsal length	52.6	49.5-52.6	50.7	1.55
Post-dorsal length	49.5	49.5-54.0	52.0	2.25
Pre-pelvic length	51.2	47.6-51.2	49.9	1.8
Pre-anal length	67.5	64.6-67.5	66.5	1.45
Length of dorsal fin	19.1	18.5-21.6	20.1	1.32
Length of pectoral fin	24.7	23.1-24.7	23.9	0.66
Length of pelvic fin	17.0	15.4-17.0	16.5	0.65
Length of anal fin	20.5	19.3-21.6	20.3	0.93
Length of caudal fin	33.3	30.8-34.2	32.6	1.43
Length of base of dorsal fin	20.1	18.3-20.7	19.7	1.01
Length of base of anal fin	20.5	18.3-20.7	19.7	1.08
Length of caudal peduncle	17.4	17.4-19.9	18.7	1.25
Depth of caudal peduncle	11.9	11.4-12.3	11.9	0.45
Width of caudal peduncle	4.8	4.6-5.7	5.0	0.55
Distance between pectoral fin and pelvic fin	22.2	20.0-24.2	22.4	1.71
Distance between pelvic fin and anal fin	18.8	16.1-20.1	17.8	1.66
Distance between anal fin and caudal fin	30.7	30.6-32.4	31.4	0.82
Distance from ventral to vent	17.0	14.5-17.0	15.7	1.13
Distance from anal to vent	1.7	1.3-2.0	1.7	0.28
% HL				
Head depth	84.8	80.0-84.8	81.8	2.40
Head width	54.5	51.8-57.1	54.8	2.65
Eye diameter	42.4	41.6-43.7	42.4	1.05
Pre-orbital distance	66.6	61.1-68.4	64.4	3.10
Post-orbital distance	40.0	37.1-44.4	40.2	3.00
Pre-occipital distance	84.8	75.8-84.8	79.4	4.50
Post-occipital distance	103.0	101.2-105.7	103.4	1.83
Inter orbital width	36.9	35.1-37.5	36.4	1.01
Inter narial width	23.0	20.0-23.0	21.6	1.50
Snout length	24.2	22.0-26.3	23.5	9.68
Width of gape of mouth	36.3	31.0-36.8	33.5	2.62
Length of maxillary barbels	3.0	2.6-3.4	3.0	0.32
Length of rostral barbels	3.0	2.6-3.4	3.0	0.32

Table 2. Meristic counts of *Barilius cyanochlorus* (n=7) (FBRC/ZSI/VS/02 & FBRC/ZSI/VS/03)

Characters	Holotype	Range
Lateral line scales	37+2	37-39+1-2
Pre-dorsal scales	15	14-16
Dorsal fin origin to lateral line	9.5	9.5
Ventral fin origin to lateral line	2.5	2.5
Anal fin origin to lateral line	2.5	2.5-3.5
Circumpeduncular scales	7	7
Fin ray count		
Dorsal fin rays	ii.11	ii.11
Pectoral fin rays	i.12	i.12-13
Pelvic fin rays	i.8	i.8
Anal fin rays	ii.14	ii.13-14
Caudal fin rays	iii.17.iii	iii.17.iii
Number of barbells	4	4

Color: Dorsal and upper laterals of body blackish brown, middle part greenish-yellow, lower lateral region silvery. Eight vertical bands on mid lateral region, each with lower blue and upper green parts and is up to 6 scales long and 2 scales wide. A large round blotch present on caudal fin base with same color pattern. Dorsal fin with basal 2/3 portion brown, distal part orange-red and anal fin orange-red. Caudal fin brownish-black, with its outer margin and marginal rays white. Terminal knob of lower jaw black.

Etymology

The specific name *Cyanochlorus* was taken from Greek (*kyano*-dark blue; *khloros*-light green) refers to the blue-green mid-lateral color bands of the new fish.

Comparisons

Barilius cyanochlorus differs from *B. ardens* Knight et al. (2015) in having 2 pairs of minute barbels (vs. lacking any barbels), 13-14 (vs.11-12) pectoral fins rays, in the color of body (blackish brown dorsal and upper lateral, greenish-yellow middle part and silvery lower lateral part vs. bright greenish-gold), mid-lateral color spots (8 vertical bands on mid lateral region, each with lower blue part and upper green part, a large round blotch on caudal base with same color pattern vs. 7-9 large, bluish-green, vertically-elongate blotches) and in the color of dorsal fin and anal fin (dorsal fin with basal 2/3 portion brown, distal part orange-red and anal fin orange-red vs. in both dorsal fin and anal fin, base black, margins lined with orange). The new species differs from *B. malabaricus* (Jerdon, 1849) in having 11 (vs. 12) dorsal-fin branched rays, 15-16 (vs. 18-19) anal fin rays, 20-21 (vs. 18-19) pre-anal scales, long pectoral fin (23.1-24.7% SL vs. 22.2), dorsal and upper laterals of body blackish brown, middle part greenish-yellow and lower lateral region silvery vs. dorsal side dusky green and laterals golden), 8 vertically elongated bands on mid-lateral region (vs 9-10 round blue spots), each with lower blue part and upper green part (vs. mid-lateral spots are single-colored) and dorsal fin with basal 2/3 portion brown, distal part orange-red and anal fin orange-red (vs. both dorsal fin and anal fin blackish, margined with orange). It also differs from *B. camarensis* (Jerdon, 1849), in having 37-39 (vs. 35-36) lateral line scales, and in having single row (vs. double rows) of elongated spots on mid-lateral region and dorsal fin with basal 2/3 portion brown, distal part orange-red and anal fin orange-red (vs. base of both dorsal and anal fins black and margin white).

The new species differs from *Barilius bakeri* Day (1865) in having 2 pairs of minute barbels (vs. barbels lacking), fairly elongated (vs. oval or round) 8 (vs. 9) mid-lateral spots formed of two segments (vs. without two segments), orange (vs. white) margined dorsal and anal fin, caudal blotch of blue and green color (vs. black color), 13-14 (vs.12) rays in pectoral fin and higher (18.5-21.6% SL vs. 15.0-17.0) dorsal fin. It differs from *Barilius gatensis* Valenciennes (1844), in having higher (30.0-32.3% SL vs. 27.8-29.3) body and in the color spots on it (8 vertical bands on mid-lateral region, each of these bands with lower blue part and upper green part, a large round blotch on

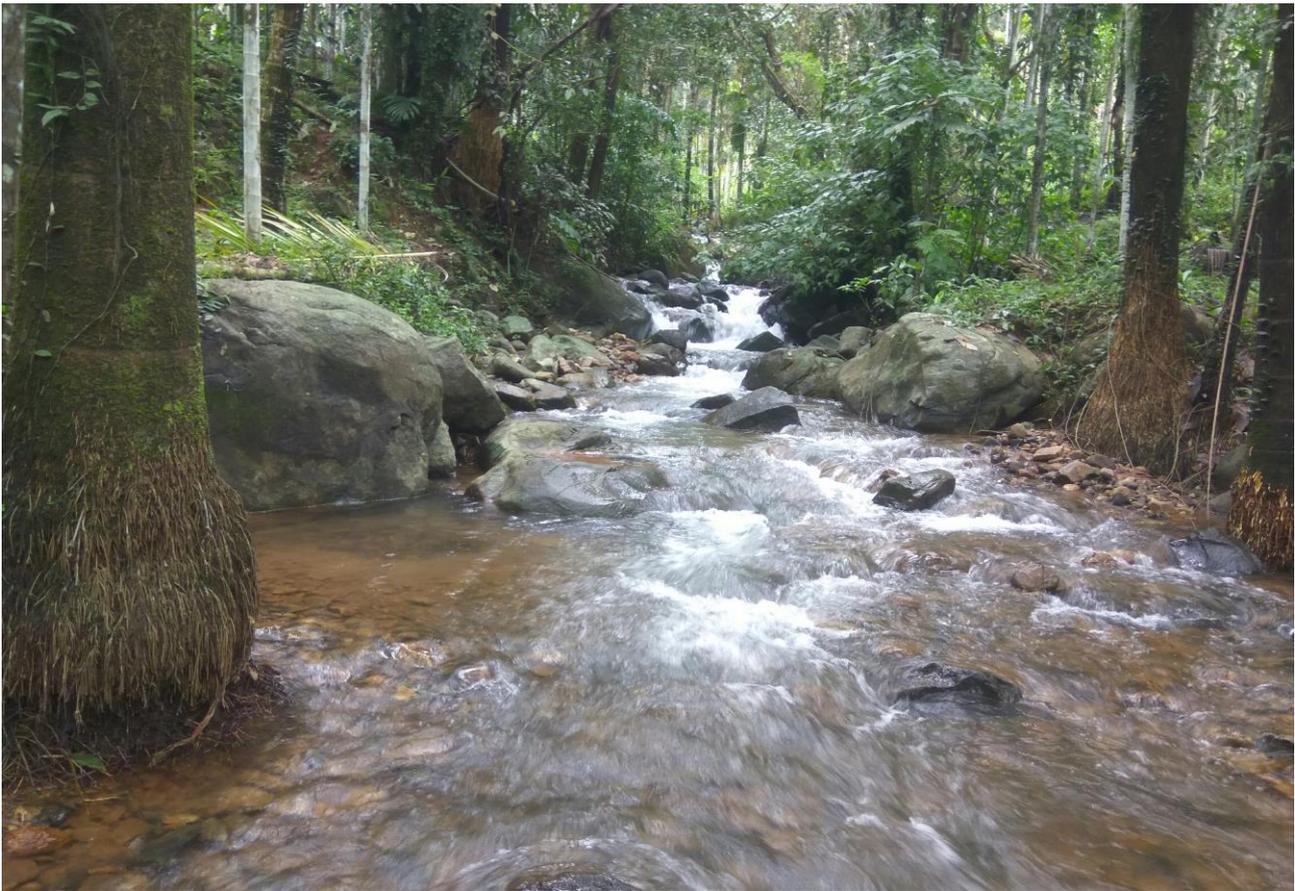


Figure 10. Water stream at Chully, Kasargod, India, the type locality of *Barilius cyanochlorus*



Figure 11. Map showing the type locality of *Barilius cyanochlorus*

in having greater number of dorsal fin branched rays (11 vs. 7) and anal fin branched rays (13-14 vs. 8), higher body (depth at dorsal fin 30.0-32.3% SL vs. 23.2-23.3), lesser pre dorsal length (49.5-52.6% SL vs. 57.1-58.9) and in possessing 8 vertical bands on mid-lateral region (vs. no bands or spots in adults, 9 small stripes occur on dorsolateral region in young ones).

Habitat

The specimens of *B. cyanochlorus* was collected from a fast-flowing water stream named Eramkunnuchaal (Figures 10 and 11) in Chully, Kasargod, Kerala; India. It has a width of 2-5m and depth of 5-3m. Stream basin is characterized by denudational hills and valley hills. High level regions of the stream are blanketed by moderate to dense riparian vegetation. *Adenantha pavonina*, *Albizia chinensis*, *Aegle marmelos*, *Areca catechu*, *Artocarpus heterophyllus*, *Artocarpus incisus*, *Averrhoa bilimbi*, *Borassus flabellifer*, *Corypha umbraculifera*, *Cocos nucifera*, *Dabergia latifolia*, *Erythrina stricta*, *Ficus auriculata*, *Hevea brasiliensis*, *Mangifera indica*, *Ochreinauclea missionis*, *Psidium guajava*, *Syzygium lanceolatum*, *Theobroma cacao*, *Terminalia bellirica*, *Syzygium jambos*, *Strychnos nux-vomica*, *Tamarindus indica*, etc. are some of the major plant components of the area. *Anguilla bengalensis*, *A. bicolor*, *Barilius bakeri*,

caudal base with same color pattern vs. 9 small, single, vertical stripes) and in possessing 13-14 (vs. 8) branched anal fin rays. It differs from *B. bendelisis* Hamilton (1807)

Devario malabaricus, *Garra mullya*, *Haludaria fasciatus*, *Rasbora dandia*, *Mystus montanus*, *Ompok bimaculatus*, *Mesonoemacheilus pulchellus*, etc. are some co-occurring fishes.

In conclusion, *B. cyanochlorus* can distinctly be differentiated from its congeners in mid-lateral color spots. Color spots in *Barilius* species may be small (round or oval) or elongated (stripes or bands). Most of the *Barilius* species of south Indian water bodies are having oval or round black or blue spots on mid laterals of the body. *Barilius bakeri*, *B. malabaricus*, *B. canarensis*, and *B. ardens* belong to this category. The new fish *Barilius cyanochlorus* is unique in having elongated mid-lateral color bands on the body, each of the bands is formed of lower blue and upper green parts. *Barilius gatensis* Valenciennes (1844) and *B. bendelisis* Hamilton (1807) from Western Ghats are like the new species in having elongated color spots on the body. But *B. cyanochlorus* is greatly dissimilar in having more branched dorsal fin rays and deeper body. Consequently, the above Valenciennes' and Hamilton's 'Hill Trout's are not close congeners of the new species. Moreover, owing to the possession of its slender body with 7-8 dorsal rays, *gatensis* and *bendelisis* must be included in *Opsarius* M'Clelland (1839, which is treated as a valid species as per the latest findings (Tang et al. 2010; Kottelat, 2013). It is expected that many new species of this genus will be discovered in the coming days.

Comparative materials examined

Barilius bakeri: GCC/DOZ 118, 3, 91-110 mm SL, Manimala River, 07.02.2012, coll. Mathews Plamoottil; *Barilius malabaricus*: GCC/DOZ 113, 2, 81-90 mm SL, Malom, Kasargod, coll. Mathews Plamoottil & Vineeth, 21/06/2019; *Barilius ardens*: GCC/DOZ 115, Kammaadam, Kerala, coll. Mathews Plamoottil & Vineeth K, 05/01/2020; *Barilius canarensis*: GCC/DOZ 114, 1, 67 mm SL, Uppinangadi, Karnataka, coll. Mathews Plamoottil & Vineeth, 30/01/2020; GCC/DOZ 119, 1, 103 mm SL, Kolichal, coll. Mathews Plamoottil & Vineeth, 03/01/2020; ZSI/WGRC/6866, 2, 94-100 mm SL, Coorg, coll. P.M Sureshan; *Barilius gatensis*, 3, 80-84 mm SL, Palakkad hill ranges, coll. Mathews Plamoottil, 15/09/2019; ZSI/WGRC/4818, 75-79 mm SL, Noolpuzha, Rampur, Wayanad, coll. K.N Nair; GCC/DOZ 120, 1, 97 mm, Hunsur, Karnataka, coll. Mathews Plamoottil & Vineeth K 24/01/2020; *Barilius bendelisis*, GCC/DOZ 121, 2, 38.5-56 mm SL, Thirthahalli, Karnataka, coll. Mathews Plamoottil & Vineeth K 29/02/2020.

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