

New range extension of *Badis singenensis* (Geetakumari and Kadu, 2011) (Teleostei: Cyprinidae) from Eastern Ghats, Andhra Pradesh, India

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ABSTRACT

Badis singenensis (Geetakumari and Kadu, 2011) is first time recorded from the Darakonda hill stream water bodies of Sabari tributary of River Godavari, Eastern Ghats, Andhra Pradesh, India based on the whole completion of detailed morphometric and meristic data of the collected specimens that form the basis of this new record are presented. *Badis singenensis* is identified by a unique combination of characteristics such as three distinct black blotches at the base of the dorsal fin: the first is behind the third spine, the second is behind the sixth dorsal spine, and the third is behind the fifth and sixth soft dorsal rays. There is a prominent spherical black blotch positioned postero-dorsally situated on the opercle at the base of the opercle spine, covering many scales. Its close congeners, *B. assamensis* and *B. blosyrus*, are distinguished from this species by the black patch at the base behind the fifth soft anal fin ray. lateral line with 29–31 scales.

Key words: Fish taxonomy, New report, Hill streams, Eastern Ghats, Sabari tributary.

Introduction

For *Labrus badis* Hamilton, 1822, Bleeker (1853) created the genus *Badis* by absolute tautonymy under the family Nandidae. Barlow *et al.* (1968) erected the family Badidae for *Badis* following a comparison of the osteology, behavior, and ontogeny of the two genera, *Badis* and *Nandus*. But after extensive revision, Kullander and Britz (2002) described a new genus, *Dario*. Southern and north-eastern India, Nepal, Bangladesh, China, Myanmar, Thailand, and Laos are home to a diverse range of badids (Dahanukar *et al.*, 2015; Kullander *et al.*, 2019).

Samples of an unidentified species of *Badis* that is distinct from its congeners of widely distributed *Badis badis* in the Alluri Sitaramaraju District of Andhra Pradesh, India, were gathered during field surveys to the hill streams of the Eastern Ghats, nearby Darakonda village. Most of the Eastern Ghats hill streams and rivers of the Andhra Pradesh and Odisha region empty into the Godavari River only, Sabari one of the major tributary river of Godavari which has numerous hill streams and these rivers and rivulets are renowned for their abundant fish species which is not explored yet.

After keen observations of five un identified *Badis*

species morphological and meristic characteristics, we discovered the range extension of *Badis singenensis* in Eastern Ghats streams. As a result, our study is the first to report the species *Badis singenensis* from the Eastern Ghats of Andhra Pradesh state.

Materials and Methods

Meristic counts were taken using a stereo zoom microscope with transmitted light, and morphometric measurements were made to the nearest 0.1 mm on the left side of the specimens. Body proportions are expressed as percentages with respect to standard length (SL), and snout length and orbital diameter are further expressed as percentages of head length (HL). The specimens were fixed in 10% formaldehyde for morphometric study, collected specimens were deposited in the Andhra University Zoology Museum (AUZM), Visakhapatnam. Data for literature and comparison of *Badis singenensis* is taken from Geetakumari and Kadu, 2011.

Results

Badis singenensis Geetakumari and Kadu, 2011 (Figs. 1).

Material examined. AUZM 48, 5exs., 20.3–32.1 mm SL, Darakonda stream at Sabari Rivera tributary of River Godavari, Alluri Sitaramaraju District, Andhra Pradesh; Collected by Jagan, 23. Aug. 2020.

Diagnosis: Based on the diagnosis, *Badis singenensis*



Fig. 1. Dorsal, Lateral and ventral views of *Badis singenensis*

is identified by a unique combination of characteristics such as three distinct black blotches at the base of the dorsal fin: the first is behind the third spine, the second is behind the sixth dorsal spine, and the third is behind the fifth and sixth soft dorsal rays. There is a prominent spherical black blotch positioned postero-dorsally situated on the opercle at the base of the opercle spine, covering many scales. Its close congeners, *B. assamensis* and *B. blosyrus*, are distinguished from this species by the black patch at the base behind the fifth soft anal fin ray. lateral line with 29–31 scales.

Description: In Tables 1 morphometric and meristic data are displayed. Body elongate, moderately compressed laterally. Predorsal profile straight in small specimens and slope at an angle similar to the prepelvic profiles in bigger specimens, with their rigidity increasing with size, head angled to the side. Orbit situated in anterior half of head at about mid-lateral axis of body and moderately large, diameter about one-third of head length. Mouth is oblique and somewhat large, protruding, with the maxilla extending to the middle of the orbit. thin opercular spine with a pointy end. Vomer, parasphenoid, and palatine teeth.

The following are the number of pores: coronalis one, lachrymal three, infraorbital pores three,

Table 1. Morphometric measurement of *Badis singenensis*.

Morphometric character	Holotype	Range
Standard length (mm)	25.7	20.3 – 32.1
<i>In percent of standard length (SL)</i>		
Head length	30.2	28.4 – 32.6
Snout length	6.7	6.1 – 8.7
Orbital diameter	10.4	7.8 – 10.7
Interorbital width	8.2	7.7 – 11.5
Upper jaw length	8.1	7.9 – 8.4
Lower jaw length	8.2	8.2 – 9.5
Body depth	28.4	26.2 – 32.7
Pelvic-fin length	25.5	24.6 – 29.7
Pelvic to anal distance	25.9	23.9 – 27.2
<i>In percent of head length (HL)</i>		
Snout length	20.4	20.1 – 24.5
Orbital diameter	24.2	23.5 – 28.7
Meristics		
Dorsal-fin	XVI/7	XV – XVII/8
Pectoral-fin	14	13 – 14
Anal-fin	III/6	III/6-7
Lateral scale rows	29	28– 30
Lateral line scale count	21/5	21 – 22/4
Lateral transverse scales	1 ½1/8	1 ½1/8 – 9
Circumpeduncular scales	19	18– 20

extrascapular two, supracleithral two, posttemporal two, nasal three, anguloarticular two, preopercular six, and dental three. a row of free neuromasts that spans the distance between the anteriormost infraorbital and lachrymal regions. Strongly ctenoid scales on the sides, cycloid on the crown of the head. The scale sizes on the ventral side decrease toward the posterior side. Scales predorsal to coronalis pore 4-5 in front, 8-9 in behind. Four to five rows of scales on the cheek, opercular and cheek scales (ctenoid). There are several scales in front of the cheek cycloid, three rows of scales on the opercle, and one row each on the preopercle, subopercle, and interopercle. Two parts make up the lateral line; the anterior segment is positioned more dorsally than the posterior segment. The upper lateral line starts at the operculum's dorsal origin. The lower lateral line centers vertically along the caudal peduncle's length and starts at the posterior end of the anal fin origin. Nine rows above and nine rows below the lateral line make up the 19 circumpeduncular scale rows. Anal fin scales are three scales wide, whereas dorsal fin scales can cover up to four scales. Scales in a vertical row: eight below lateral lines and a quarter above.

Dorsal fin long base, anterior insertion through the base of the last anal-fin ray, posterior insertion through the base of the pectoral fin. Round-tipped, soft dorsal and anal fins that extend to nearly $\frac{1}{2}$ or $S\frac{1}{2}$ of the caudal fin. Round caudal fin. Rounded pectoral fin that extended $T^2/4$ of the way to the origin of the anal fin. Pelvic fin is long and pointed, with the inner branch of the second soft ray being the longest. In two specimens, this branch ends close to the vent. Head length (28.4–32.6), orbital diameter (7.8–10.7), interorbital width (7.7–11.5), upper jaw length (7.9–8.4), and lower jaw length (8.2–9.5) % SL.

Coloration in 10% formalin: prominent rounded black opercular spot, prominent supraorbital stripe. 5-six wide black bars on the body completely faded out. Between the bases of the dorsal and anal fins dorsal fin 3rd ray blotch only slightly visible, there is a black bar on the caudal peduncle that is clearly separated from the bar before it also faded out due to preservation. Except blotches on head and opercular region all other black blotches completely faded.

Distribution: Earlier reported from Singen River at Saku-Kadu Village, East Siang District Brahmaputra River drainage of Arunachal Pradesh with present

studies its extended range extension in River Godavari of Southern India, Easter Ghats (Figs. 2).



Fig. 2. Collecting sites of *Badis singenensis*

Discussion

The badidae fish, *Badis singenensis* is was described by Geetakumari and Kadu, (2011) from the Singen River at Saku-Kadu Village, East Siang District, Arunachal Pradesh, Brahmaputra drainage, north-eastern India. The main characteristics that easily distinguished the reported species from congeners are the existence of prominent spherical black blotch positioned postero-dorsally situated on the opercle at the base of the opercle spine, covering many scales. Its close congeners, *B. assamensis* and *B. blosyrus*, are distinguished from this species by the black patch at the base behind the fifth soft anal fin ray. lateral line with 29–31 scales.

Badis singenensis reported herein is in agreement with size, body proportions and meristic counts with the original description. In having scales in lateral row (28–30 vs. 28–29); wider interorbital region (7.7–11.5 vs. 9.2–13.3% SL); shorter upper jaw (7.9–8.4 vs. 7.6–8.8 % SL) and lower jaw (8.2–9.5 vs. 9.4–10.2 % SL). It is also similar in having shorter head length (28.4–32.6 vs. 30.2–34.6 % SL). The main distinguish character of *Badis singenensis* species of the Brahmaputra drainage in the presence of opercle blotch and in the presence of black blotch on the soft dorsal fin also have been noticed in this species while examining the species morphological meristic characteristics and believed that more numbers of unidentified species of the group exist in the region.

Conclusion

According to the results of the current investigation, *Badis singenensis* is found in the Eastern Ghats of In-

dia and the state of Andhra Pradesh. This is the first record of the occurrence in the region and indicates the possibilities of hidden diversity in the Eastern Ghats for need more attention for conservation measures to protect the valuable fish gene pool.

Future Scope

These investigation result will show a high impact on future fish taxonomic explorations in the Eastern Ghats of India to conserve valuable endemic fish gene pools.

Authors' contributions

This work was carried out in collaboration among all authors. Author DRT designed the study, analyzed data, and curated the manuscript. Authors VK, NA, and RD did the literature survey and analysis. All authors read and approved the final manuscript

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Conflict of Interests

Authors declare that no conflict of interests exists.

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