



Badis dibruensis, a new species (Teleostei: Badidae) from northeastern India

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Author Details: KH. GEETAKUMARI is a research scholar in the Department of Life Sciences, Manipur University. She is pursuing research in Phylogenetic studies of fishes belonging to the order Perciformes found in northeastern India under the supervision of W. Vishwanath. W. VISHWANATH is a professor in the Department of Life Sciences, Manipur University. His field of specialization is Fish and Fisheries. He is at present engaged in taxonomy and systematics of freshwater fishes of northeastern India

Author Contribution: The study: Kh.G Undergoing research in the Perciformes fishes of northeastern India. WV Supervision of taxonomy and phylogeny of freshwater fishes of northeastern India. Current paper: As a part of the research work, all the badid fishes of the region have been studied and the species is found to be new. Supervised the work and helped in identifying the species.

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Abstract: A new species of the genus *Badis* Hamilton is described from Dibru River, Dibrugarh, Brahmaputra basin in Assam, India. The species has the following combination of characters: a conspicuous black blotch covering the superficial part of the cleithrum above pectoral fin base, a small oval-shaped black blotch on the middle of caudal fin, two predorsal bones, interorbital width 9.9-15.0, upper jaw length 6.1-6.9, lower jaw length 7.1-8.3 and orbital diameter 7.6-9.4 % SL. The species differs from its nearest congeners, *B. badis*, *B. kanabos* and *B. tuivaiei* by the absence of dark black or brown vertical bars on sides. A key to species of *Badis* of India is provided.

Keywords: Assam, Brahmaputra basin, new fish, Perciformes.

INTRODUCTION

Hamilton (1822) described *Labrus badis* and *L. dario* from Gangetic provinces. Bleeker (1854) established genus *Badis* for *L. badis* under family Nandidae. Barlow et al. (1963) erected a new family, Badidae, in which *Badis* has been incorporated based on osteological characters. The genus is separated from the nandid genus *Nandus* in having a smooth (versus serrated) preopercular margin and edentulous (versus toothed) tongue. As per Kullander & Britz (2002) the genus is characterized by a combination of the following features: opercle with a single sharp spine at its posterodorsal corner; spinous and soft dorsal fins contiguous, the base of the soft part longer than that of the spinous part; anal fin with three spines; lateral line pores tubed and interrupted; jaws, vomer and palatines with villiform teeth; scales both ctenoid and cycloid; 2-4 dentary foramina; hypobranchial 3-toothed; males with short pelvic fin, not reaching the first dorsal spine; short dorsal fin lappets; rounded caudal fin.

Ahl (1937) described *Badis badis assamensis* from Assam, while Talwar & Jhingran (1991) did not recognize any subspecies of *B. badis*. Kullander & Britz (2002) treated *B. assamensis* as a valid species and designated a neotype. They also described *B. blosyrus* and *B. kanabos* from Brahmaputra basin, Assam and *B. ferrarisi* from Myanmar. Vishwanath & Shanta (2004) described *B. tuivaiei* from Tuivai River in Brahmaputra basin. Vishwanath et al. (2007) also recorded *B. ferrarisi* from Chindwin basin in Manipur. Thus, six species of *Badis* are currently recognized from northeast India.

During field surveys in northeast India in 2006 and 2007, specimens of an undescribed *Badis* were collected from Dibru River, Dibrugarh, Brahmaputra basin, Assam. The species is herein described as *Badis dibruensis* sp. nov.

MATERIALS AND METHODS

Measurements were made point to point with dial calipers to the nearest 0.1mm and expressed as percentages of standard length (SL). Counts and measurements were made on the left side of specimens under a PC-based binocular stereo zoom microscope (Olympus SZ40) with transmitted light. Counts and measurements followed Kullander & Britz (2002). The method of clearing and staining of specimens for osteology follows Hollister (1934). Identification and nomenclature of bones and vertebral counts follows Greenwood (1976). For branchial toothplate count, the first gill arch on the left side of the specimens was taken, and plates starting from hypobranchial to epibranchial of the outer side were counted. Type specimens are deposited in the Manipur University Museum of fishes (MUMF).



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***Badis dibruensis* sp. nov.**

(Images 1 & 2)

Type material

Holotype: 37.3mm SL, 16.iii.2006, 27°32'09.98"N & 94°58'02.31"E, Dibru, Brahmaputra drainage, Dibru River, Dibrugarh, Assam, India; coll. Santosh, MUMF-Per 95.

Paratypes: MUMF-Per 96-110, 15, 23.0-40.8mm SL, data as for holotype; MUMF Per-108-110, 3, dissected, cleared and stained for osteology.

Diagnosis

Badis dibruensis sp. nov. is distinguished from its nearest congener, *B. badis* in having two (vs. three) predorsal bones; small oval (vs. large rectangular) black blotch in the mid-base of caudal fin; more interorbital width (9.9-15.0 vs. 6.5-8.3% SL); shorter upper jaw (6.1-6.9 vs. 8.2-10.2% SL) and lower jaw (7.1-8.3 vs. 11.3-14.5% SL). It is distinguished from *B. kanabos* in having smaller eye diameter (7.6-9.4 vs. 9.5-12.7% SL). It is also distinguished from *B. tuivaiei* in having vertebrae 27 (vs. 31); more interorbital width (9.9-15.0 vs. 5.6-7.2% SL); shorter upper jaw (6.1-6.9 vs. 8.5-10.4% SL). *B. dibruensis* differs from all three mentioned species by the absence (vs. presence) of dark black or brown vertical bars on sides.

Description

Morphometric data and counts are in Tables 1 & 2, respectively. Frequency distributions of meristic characters are provided in Table 3 and comparison with related species in Table 4. Body elongate, moderately compressed laterally. Predorsal profile in small specimens straight, sloping at some angle as of prepelvic profile in larger specimens and more strongly as the size increases. Orbit situated in anterior half of head, at about mid-lateral axis of body. Jaws almost equal anteriorly, lower jaw slightly projecting, maxilla reaching to 1/3 of orbit. Opercular spine slender, with a sharp tip. Palatine, vomer and parasphenoid toothed.

Pores: dental 3, anguloarticular 2, preopercular 6, nasal 6, supraorbital 3, extrascapular 5, supracleithral 2, posttemporal 2, coronalis 1, lachrymal 3, infraorbital pores 3-4. A row of free neuromasts extending across gap between lachrymal and anteriormost infraorbital.

Scales strongly ctenoid on sides, cycloid on top of head. Predorsal scales anterior to coronalis pore 4-5, posteriorly 8-9. Scales on cheek 3, mostly ctenoid, a few scales anterior to cheek cycloid. Circumpeduncular scale rows 10 above, 10 below lateral line, totaling 22. Scales in vertical row 1½ above, 7 below lateral lines. Vertebra 27 (15/12).



Image 1. Side view of *Badis dibruensis* sp. nov., holotype, adult male, MUMF-Per 95, 39.3mm SL



Image 2. Side view of *Badis dibruensis* sp. nov., paratype, adult female, MUMF-Per 96, 37.3mm SL

Soft dorsal and anal fins with rounded tips reaching to almost about 1/3 or 1/4 of caudal fin. Caudal fin rounded. Pectoral fin rounded, extending about 2/3 distance to anal-fin origin. Pelvic fin pointed, inner branch of second soft ray longest, not reaching up to vent. Orbital diameter, interorbital width and upper jaw length respectively (7.69.4), (9.9-15.0) and (7.1-8.3) % SL.

Colouration

In 10% formaline, overall dark brownish to yellowish. Preorbital stripe dark grey, continued across chin; postorbital stripe blackish, formed by a single blotch close to orbit; dark pigment also on one scale posterior to that blotch. No supraorbital stripe. A conspicuous black blotch covering the superficial part of the cleithrum above pectoral-fin base. Dorsal fin dusky. Dorsal lappets white along distal margin, bordered by blackish submarginal stripe in male. Caudal fin with a small oval black blotch at middle of base, also covering last lateral scale on body. Anal fin dusky basally, soft part hyaline throughout in large specimens. Pelvic fin dusky in small specimens, dark brown in large specimens. Vertical dark black or brown bars are completely absent across the side and caudal peduncle.

Table 1. Proportional measurements of *Badis dibruensis* sp. nov. in percentage of standard length except standard length.

Proportional Measurements	Holotype	Paratypes N=4				Paratypes N=10			
	Mean	Min.	Max.	S.D.	Mean	Min.	Max.	S.D.	
Standard length (mm)	39.3								
Head length	29.3	31.7	26.5	36.5	5.0	30.1	26.5	36.5	3.3
Snout length	6.6	7.5	6.8	8.3	0.7	6.8	5.4	8.3	0.9
Orbital diameter	7.6	9.0	8.7	9.7	0.6	8.6	7.6	9.4	0.7
Interorbital width	15.0	11.3	10.7	12.2	0.8	11.4	9.9	15.0	1.7
Upper jaw length	6.6	6.4	6.1	6.9	0.5	6.4	6.1	6.9	0.3
Lower jaw length	7.9	8.1	7.8	8.3	0.3	7.8	7.1	8.3	0.4
Body depth	29.5	28.3	25.4	30.0	2.5	29.6	25.4	30.1	1.9
Pelvic fin length	27.5	24.8	22.6	27.4	2.4	25.9	22.6	27.5	1.8
Pelvic to anal fin distance	30.5	31.5	26.1	35.8	4.9	31.8	26.1	35.8	3.6

Table 2. Counts of *Badis dibruensis* sp. nov. In case of paratypes, maximum and minimum numbers are given.

Counts	Holotype	Min.	Max.
D	16/8	15/8	17/8
P	14	13	14
A	iii,6	5	8
Lateral scale rows	27	25	29
Lateral scale count	20/4	19/4	22/5
Lateral transverse scales	1½/1/6	1½/1/6	1½/1/6
Circumpeduncular scales	22	21	22
Toothplate count		7	7
vertebrae		27	27

Sexual dimorphism

Males have uniform dark brown fins with white dorsal fin lappets along distal margin, bordered by blackish submarginal stripe. Extension of the posteriormost tip of the dorsal fin extends upto 1/2 of the caudal fin.

In females, body pale yellow with dark grey spots, fins with uniform light brown coloration. Extension of the posteriormost tip of dorsal fin extends upto 1/3 of the caudal fin.

Etymology

Named after the Dibru River, the type locality.

Distribution

Presently known from Dibru River at Dibrugarh, Assam, Brahmaputra drainage (Fig. 1)

DISCUSSION

Badis dibruensis is similar to *B. badis*, *B. kanabos* and *B. tuivaiei* in having a conspicuous dark blotch covering the superficial part of cleithrum above pectoral-fin base. However, the species differs from them in morphometric characters as in diagnosis above. *B. dibruensis* is distinct from *B. assamensis* and *B. blosyrus*, other two congeners of Brahmaputra basin in absence (vs. presence) of blotch on opercle.

Five species of *Badis*, viz., *B. corycaeus*, *B. ferrarisi*, *B.*

Table 3. Frequency distribution of meristic characters

a. Dorsal fin counts (spines/soft rays)					
Counts	15/8	16/8	16/9	17/8	
Specimens	1	8	3	3	
b. Anal fin counts					
Counts	5	6	7	8	
Specimens	2	7	3	3	
c. Pectoral fin counts					
Counts	13	14			
Specimens	4	11			
d. Lateral scale rows					
Counts	25	26	27	28	29
Specimens	1	3	9	-	2
e. Lateral line scale counts (upper/lower scales)					
Counts	19/4	20/4	21/4	21/5	22/5
Specimens	1	10	1	1	2
f. Tooth plate					
Counts	6	7			
Specimens	1	2			
g. Vertebrae number					
Counts	15/12	15/13			
Specimens	2	1			

kyar, *B. pyema* and *B. ruber* are known from Irrawaddy drainage (Kullander & Britz 2002). The new species differs from *B. kyar*, *B. corycaeus* *B. pyema* in the presence (vs. absence) of cleithral blotch; from *B. ruber* in absence (vs. presence) of a dark black blotch on dorsolateral aspect of caudal peduncle. It also differs from *B. ferrarisi* in absence (vs. presence) of the vertical bars across side and caudal peduncle.

Badis dibruensis also differs from *B. siamensis* and *B. khwae* respectively of Takaupa River basin and Mae Nam Khwae Noi drainage, Thailand in absence (vs. presence) of a dark blotch on dorso-lateral aspect of caudal peduncle; from

Table 4. Comparison of proportional measurements in percentage of standard length and counts of *Badis dibruensis* sp. nov. with related species in mean and (range in parentheses).

Proportions	<i>B. dibruensis</i> sp. nov.	<i>B. badis</i>	<i>B. kanabos</i>	<i>B. tuivaiei</i>
Interorbital width	11.4 (9.9-15.0)	7.4(6.5-8.3)	5.7(5.1-6.2)	6.4(5.6-7.2)
Orbital diameter	8.6(7.6-9.4)	11.6(10.8-12.3)	11.1(9.5-12.7)	7.5(6.1-9.4)
Upper jaw length	6.4(6.1-6.9)	9.2(8.2-10.2)	8.7(7.6-9.8)	8.9(8.5-10.4)
Lower jaw length	7.8(7.1-8.3)	12.9(11.3-14.5)	10.2(9.8-10.5)	13.9(10.9-16.4)
Vertebrae	27	27(26-28)	27(26-28)	31(30-31)

Key to species of genus *Badis* of India

1. Body without dark brown or vertical black bars on sides *B. dibruensis* sp. nov.
Body with dark brown or vertical black bars on side 2
2. Conspicuous blotch behind opercle dorsally 3
No blotch behind opercle dorsally 4
3. Body with 10-11 distinct bars *B. ferrarisi*
Body with indistinct bars 5
4. Toothplates 7-9, scales in lateral row 29 *B. assamensis*
Toothplates more than 9, scales in lateral row 27 *B. blosyrus*
5. No spot between 3-5 dorsal fin spines *B. badis*
A dark spot between 3-5 dorsal fin spines 6
6. Bars narrow, circumpeduncular scales 16..... *B. kanabos*
Bars broad, circumpeduncular scales 20 *B. tuivaiei*

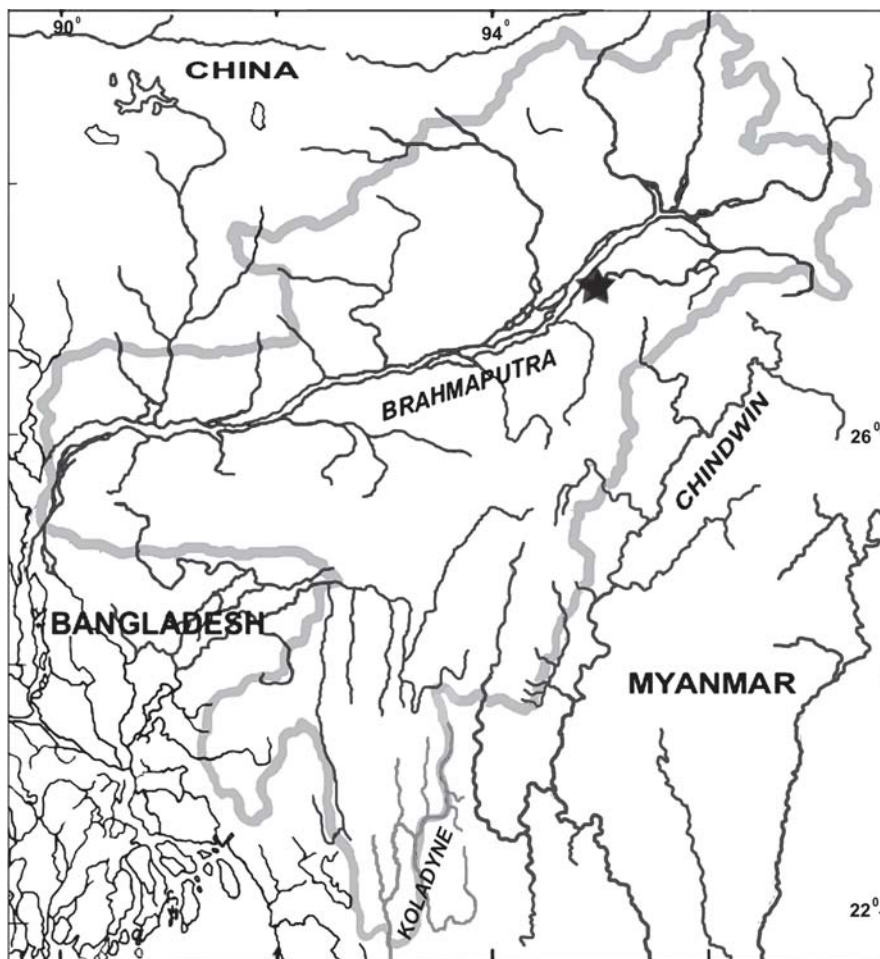


Figure 1. Map showing type locality of *Badis dibruensis* sp. nov.

B. chittagongis of Matamohuri River drainage, Bangladesh, in absence (vs. presence) of the vertical bars across side and caudal peduncle.

Kullander & Britz (2002) classified the species of *Badis* into five groups viz., *B. ruber* group, *B. assamensis* group, *B. corycaeus* group, *B. kyar* group and *B. badis* group. The species of *B. badis* group share a cleithral blotch. They expected more number of species in *B. badis* group from the view i.e. the limited material from India, variable characters and scattered locality record of the species. The present species under diagnosis belongs to *B. badis* group.

Out of the known 13 valid species of *Badis*, six is reported from northeast India. In addition to this the present species under study is also from the Brahmaputra basin. General inventory and phylogenetic study of the diverse species of *Badis* in northeast India and adjoining areas would be of great interest.

Comparative materials

Badis assamensis: MUMF Per-51-54, 4, 41.6-55.8 mm SL, Dibru River, Dibrugarh, Assam, India; *B. badis*: MUMF Per-55-65, 11, 23.5-28.7 mm SL, Barak River, Manipur, India; *B. blosyrus*: MUMF Per-66-68, 3, 36.8-38.9 mm SL, Teju River, Teju District, Arunachal Pradesh, India; *B. ferraris*: MUMF Per-69-75, 7, 32.0-44.0 mm SL, Lokchao River, Manipur, India; *B. kanabos*: MUMF Per-76-81, 6, 48.7-54.9 mm SL, Barak River; Manipur, India; *B. tuivaiei*: MUMF 5125-5132, 8, 53.5-59.4 mm SL, Tuivai and Irang River, Manipur, India.

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