

Badis pancharatnaensis, a new percoid fish species from Brahmaputra River drainage, Assam, India (Teleostei: Badidae)

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Abstract

Badis pancharatnaensis, a new percomorph, is described from the Brahmaputra River drainage of Assam, India. It is distinguished from its congeners by having the following combination of characters: a conspicuous black blotch on the superficial part of cleithrum; pointed soft dorsal, anal, and pelvic fins, the 2nd soft ray of pelvic-fin reaching slightly beyond the vent; 13–14 pectoral-fin rays; circumpeduncular scales 14–17; body depth 28.2–33.8% of SL; interorbital distance 7.1–9.4% of SL; and 28 number of vertebrae.

Key words

Badidae, *Badis*, taxonomy, new species, River Brahmaputra, Assam.

Introduction

BLEEKER (1853) erected the genus *Badis* for *Labrus badis* HAMILTON, 1822 by absolute tautonymy under the family Nandidae. After a comparative study on the osteology, behavior and ontogeny of the two genera, *Badis* and *Nandus*, BARLOW *et al.* (1968) erected the family Badidae for *Badis*. However, a thorough revision by KULLANDER & BRITZ (2002) led to the description of a new genus *Dario*, and as such, the family Badidae comprises of two valid genera till date. *Badis* has currently 21 species and *Dario*, six species (ESCHEMEYER, 2015; VALDESALICI & VAN DER VOORT, 2015a & 2015b).

The diversity of badids lies in the southern and north-eastern India, Nepal, Bangladesh, China, Myanmar, Thailand and Laos (KULLANDER & BRITZ, 2002; SCHINDLER & LINKE, 2010; BRITZ & KULLANDER, 2013; DAHANUKAR *et*

al., 2015; ESCHEMEYER & FRICKE, 2015). Of the 21 species of *Badis*, the Brahmaputra basin alone harbours seven species, viz., *Badis assamensis* AHL, 1937; *B. badis* (HAMILTON, 1882); *B. blosyrus* KULLANDER & BRITZ, 2002; *B. dibruensis* GEETAKUMARI & VISHWANATH, 2010; *B. kanabos* KULLANDER & BRITZ, 2002; *B. singenensis* GEETAKUMARI & KADU, 2011 and *B. tuivaiei* VISHWANATH & SHANTA, 2004.

During field surveys to a floodplain wetland – Hasi-la Beel, at the vicinity of the River Brahmaputra in the Goalpara District of Assam, India, the second author was able to collect specimens of an unknown species of *Badis* which differs from its congeners in respect to morphology and osteology. The species is herein described as *Badis pancharatnaensis*, new species.

Material and Methods

Counts and measurements follow KULLANDER & BRITZ (2002). Morphometric measurements were made point to point on the left side of the specimens (as far as possible) with an electronic digital caliper to the nearest 0.1 mm. Meristic counts were made under a PC-based binocular stereo zoom microscope (Leica S8APO) with transmitted light. Body proportions are expressed as percentages with respect to standard length (SL). Snout length and orbital diameter are further expressed as percentages of head length (HL).

Nomenclature of laterosensory pores follow KULLANDER & BRITZ (2002). Osteological protocols follow HOLLISTER (1934). For identification and nomenclature of bones as well as vertebrae counts, the method of GREENWOOD (1976) was followed. The analysis of water parameters was done by using digital water analyzing kit (Systronics 371). Photographs were taken with a Canon EOS 550D camera.

The specimens were fixed in 10% formaldehyde for morphometric study, and then transferred to 70% ethanol. The holotype and nine paratypes were deposited to Gauhati University Museum of Fishes (GUMF), Assam, India. Two paratypes were deposited to the Zoological Survey of India (ZSI), Kolkata, India.

Results

Badis pancharatnaensis, sp. nov.

Fig. 1–3

Material examined. Holotype: GUMF 0095: 36.7mm SL; India, Assam, Goalpara District, Brahmaputra drainage, Hasila Beel, 26°10'20.8" N, 90°36'17.2" E, 40 m above sea level, 28 May 2015, H. Choudhury & party.

Paratypes: GUMF 0096–0104: 9 specimens, 27.3–46.1mm SL; same data as holotype. ZSI FF 5432, 2 specimens, 30.8–33.3 mm SL; same data as holotype. GUMF 102–104, 29.9–46.1 mm SL were dissected, cleared & stained for osteology.

Comparative Material

Badis assamensis: GUMF 0075–0080, 5 exs., 49.6–53.2 mm SL; India: Assam: Kokrajhar district: Sankosh River (Brahmaputra basin).

B. badis: GUMF 0086–0089, 4 exs., 25.6–27.1 mm SL; India: Assam: Goalpara district: Hasila Beel (Brahmaputra drainage).

B. blosyrus: GUMF 0090, 1 ex., 41.6 mm SL; India: Assam: Kamrup district: Small pond at Palasbari (Brahmaputra drainage).

B. dibruensis: GUMF 0081–0084, 4 exs., 33.2–39.7 mm SL; India: Assam: Tinsukia district: Guijan Ghat of Dibru River (Brahmaputra drainage).

B. kanabos: GUMF 0093, 1 ex., 35.6 mm SL; India: Assam: Kamrup district: Small pond at Palasbari (Brahmaputra drainage).

B. singenensis: GUMF 0071–0073, 3 exs., 26.0–34.3 mm SL; India: Assam: BARPETA district: Manas River (Brahmaputra basin).

B. tuivaiei: ZSI FF 4159, 1 ex., 57.0 mm SL; India: Manipur: Tamenglong district: Irang River, a tributary of Barak River (Meghna basin).

B. chittagongis: Data from KULLANDER & BRITZ (2002).

B. andrewraoi, *B. autumnum*, *B. kyanos*, *B. laspiophilus* & *B. so-
raya*: Data from VALDESALICI & VAN DER VOORT (2015a, b).

Diagnosis

Badis pancharatnaensis sp. nov. is distinct from all its congeners in having a combination of characters: presence of dark brownish black bars on sides; a series of dark blotches along middle of dorsal-fin; a prominent black blotch on the superficial part of cleithrum; elongate median caudal blotch with a posterior bar surrounding the caudal-fin base; pointed pelvic-fin reaching beyond vent in both the sexes; pointed soft dorsal and anal-fin; 28.2–33.8% SL body depth; 7.1–9.4% SL interorbital distance; 14–17 circumpeduncular scales; 31–33 lateral scale rows; 6–8 number of gill rakers; and 28 (15+13) number of vertebrae.

Description

Biometric data and frequency distribution of meristic counts are provided in Table 1 and 2 respectively. Body elongate, moderately compressed laterally. Pre-dorsal contour strongly sloping till nape, running at some angle till dorsal-fin origin, giving a convex profile; along with presence of a slight depression just above orbit in larger specimens. Pre-pelvic profile less sloping, running almost horizontal from opercle to pelvic-fin base. Snout obtusely pointed with terminal oblique mouth; lower jaw slightly projecting. Both jaws bear tiny caniniform rows of teeth; with 2 rows laterally, expanding to 4 rows anteriorly. Gape of mouth reaching about 1/3 of eye diameter. Orbit situated in anterior half of the head and at about mid axis of body. Opercular spine slender ending with a sharp tip.

Laterosensory pores on head (Fig. 3): 3 dentary, 2 anguloarticular, 5 preopercular, 2 nasal, 4 frontal, 1 coronalis, 3 lachrymal, 3 infraorbital, 3 pterotic, 2 posttemporal, 5 extrascapular (internally).

Scales on lateral aspect of body strongly ctenoid whereas cycloid on head. Scales on cheek 3, mostly ctenoid; with a few anterior scales cycloid. Opercular scales ctenoid. Pre-dorsal scales 4–5 anterior to coronalis pore; 7–9 posteriorly. Vertebrae constant irrespective of size: 28 (15 abdominal + 13 caudal).

Pectoral-fin rounded, reaching about 1/2 to 2/3 of distance to anal-fin origin. Dorsal-fin starting a little ahead of pectoral-fin. Soft dorsal-fin pointed; its 23rd fin ray reaching about half of caudal-fin. Pelvic-fin bluntly pointed with the second soft ray reaching just beyond the



Fig. 1. *Badis pancharatnaensis* sp. nov., GUMF 0095: 36.7mm SL, holotype.



Fig. 2. Colouration in life of *Badis pancharatnaensis* sp. nov.

vent in both male and female. Caudal-fin rounded. Anal-fin pointed reaching about $\frac{1}{3}$ of caudal-fin length.

Colouration in preservative (Fig. 1): dark cocoa brown colour body to almost black on sides within indistinct bars. Bars on sides form black blotches on scaly part of dorsal-fin base. Black blotch on cleithrum above pectoral-fin base prominent. Overall fin colouration blackish brown; pectoral-fin hyaline; caudal, soft dorsal and anal-fin dusky gray with darker interradiation membranes. Bases of fins with dark gray to brown interradiation membranes. A continuous series of black blotches starting behind the 3rd spine along dorsal-fin base. Dorsal lappets white distally, bordered by submarginal black stripes. Presence of

prominent elongate black blotch with posterior bar surrounding the caudal-fin base (in some specimens, black bar surrounding the entire caudal-fin base without any visible blotch).

Colouration in life (Fig. 2): body dark brown with five distinct black bars on sides (colour variation – Bars often distinct to almost absent according to the mood of the fish). Dorsolateral half of head grayish-brown with a distinct blackish preorbital stripe continuing across chin, a black postorbital stripe formed by two successive blotches, indistinct supraorbital stripe and a black suborbital stripe faintly continuing across posterior part of lower jaw. A series of prominent blackish blotches on interra-

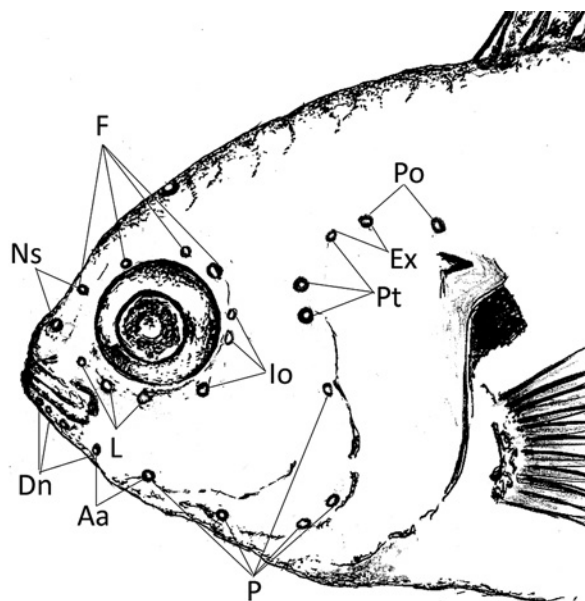
Table 1. Biometric data of holotype (GUMF 0095) and nine paratypes (GUMF 0096–0104; ZSI FF 5432) of *Badis pancharatnaensis* sp. nov. ‘*’ indicates data of holotype included in range.

Morphometric character	Holotype	Range (*)	Mean $\pm$ SD
Standard length (mm)	36.7	27.3–46.1	
<i>In percent of standard length (SL)</i>			
Head length	29.7	27.4–33.7	30.1 $\pm$ 2
Snout length	6.8	6.2–7.8	6.9 $\pm$ 0.4
Orbital diameter	8.2	7.1–9.2	8.7 $\pm$ 0.8
Interorbital width	9.4	7.1–9.4	8.1 $\pm$ 0.7
Upper jaw length	7.3	6.3–9.1	7.9 $\pm$ 1.1
Lower jaw length	7.9	6.8–9.8	8.4 $\pm$ 1.1
Body depth	31.5	28.2–33.8	31.3 $\pm$ 1.4
Pelvic-fin length	30.5	26.6–30.5	28.2 $\pm$ 1.4
Pelvic to anal distance	27.9	23.9–28.1	25.9 $\pm$ 1.5
<i>In percent of head length (HL)</i>			
Snout length	23.0	20.5–25.1	22.8 $\pm$ 1.3
Orbital diameter	27.5	25.2–30.7	29.0 $\pm$ 1.7
Meristics			
Dorsal-fin	XVI/9	XV–XVII/8–9	
Pectoral-fin	13	13–14	
Anal-fin	III/8	III/7–8	
Lateral scale rows	29	26–29	
Lateral line scale count	22/4	21–23/4	
Lateral transverse scales	10 ½	9 ½–10 ½	
Circumpeduncular scales	17	14–17	
Gill rakers		6–8	
Vertebrae		28	

Table 2. Frequency distribution of meristic counts of *Badis pancharatnaensis* sp. nov.

a. Dorsal-fin (spines/soft rays)				
Counts	XV/8	XVI/8	XVI/9	XVII/9
Specimens	1	1	4	4
b. Anal-fin (spines/soft rays)				
Counts	III/7	III/8		
Specimens	3	7		
c. Pectoral-fin				
Counts	13	14		
Specimens	6	4		
d. Lateral Scale rows				
Counts	31	32	33	
Specimens	3	1	1	
e. Lateral line pored scales (upper/ lower)				
Counts	21/4	21/6	22/4	23/4
Specimens	2	1	4	3
f. Gill rakers				
Counts	6	7	8	
Specimens	2	2	2	
g. Vertebrae				
Counts	28			
Specimens	3			

dial membranes along middle of spinous dorsal with blue iridescence anterodorsally. Spinous dorsal-fin dusky gray having white dorsal lappets with blackish submarginal

**Fig. 3.** Left side of the head of *Badis pancharatnaensis* sp. nov. (A composite of Holotype and Paratypes) showing arrangement of laterosensory pores. Ns=nasal, Dn=dentary, Io=intraorbital, F=frontal, L=lachrymal, P=preopercular, Pt=pteroic, Po=post-temporal, Aa=anguloarticular, Ex=extrascapular.

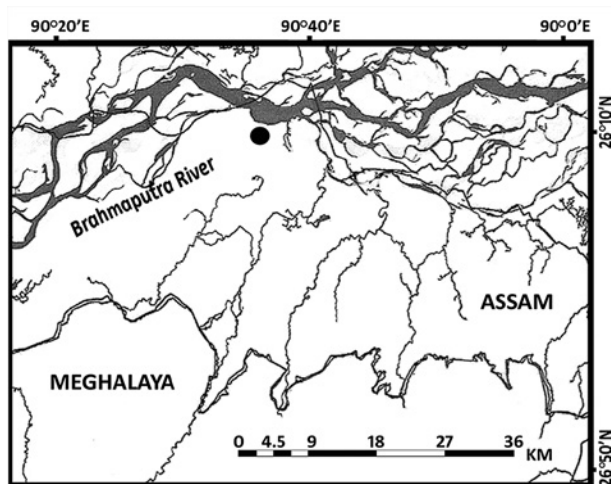
stripes. Soft dorsal and anal-fin dusky to hyaline with iridescent interradiat membranes at the bases and reddish-brown tinge distally. Distinct blotch on cleithrum shows bluish-green iridescence. The base of scales below the lateral line shows creamywhite colouration, gradually fading towards the caudal peduncle region. An elongate median black blotch with posterior bar covering entirely the base of caudal-fin.

Sexual dimorphism. No visible differences could be seen in external morphology among male and female as dissection of freshly killed specimens for gonadal identity showed no relation of external colouration pattern or morphometric data with sexual differences.

Distribution and habitat. Presently the species is known from Hasila Beel – a riverine wetland of Brahmaputra drainage at Goalpara district, Assam, India (Fig. 4). The type locality is a low lying wetland having dense macrophytic vegetation well connected with the River Brahmaputra and often flooded by the river water; that shows high degree of rise and fall of water level depending on seasonal climatic variations (Fig. 5). The associated fish fauna caught along with the species were *Amblypharyngodon mola*, *Anabas testudineus*, *Channa gachua*, *Lepidocephalichthys guntea*, *Mastacembelus armatus*, *Macrognathus pancalus*, *Puntius sophore* and *Trichogaster fasciata* which commonly occur in the region. Water quality analysis carried out during the month of May 2015 estimated as temperature – 24.8°C, pH – 8.2, Do – 7.8 mg l⁻¹, conductivity – 194 mg l⁻¹ and hardness – 81 mg l⁻¹.

Table 3. Comparative measurements in percentage of standard length and meristic counts of *Badis pancharatnaensis* sp. nov. with related species

Proportions	<i>B. pancharatnaensis</i> sp. nov.	<i>B. badis</i>	<i>B. chittagongis</i>	<i>B. dibruensis</i>	<i>B. kanabos</i>	<i>B. tuivaiei</i>	<i>B. soraya</i>
Body depth	28.2–33.8	30.7–38.9	29–34	25.4–30.0	29–35	25.9–29.2	31.9–35.5
Interorbital width	7.1–9.4	6.5–8.3	5.5–6.7	10.7–12.2	7.3–8.6	5.6–6.6	6.3–8.8
Counts							
Dorsal fin rays	XV–XVII/8–9	XV–XVIII/9	XVII–XVIII/9	XV–XVII/8	XV–XVII/9	XVI–XVIII/9	XIV–XVI/9–11
Pectoral fin rays	13–14	11–14	12–14	13–14	11–13	13–14	12–13
Anal fin branched rays	7–8	6–8	6–9	5–8	6–8	6–10	7–8
Lateral scale rows	26–29	25–28	27–29	25–29	25–26	26–32	25–27
Lateral line scales (upper/lower)	21–23/4	17–24/1–4	20–24/3–6	19–22/4–5	20–22/3–4	20–25/2–4	20–22/5–6
Circumpeduncular scales	14–17	19–20	20	21–22	16–17	16–20	18–22
Gill rakers	6–8	5–9	8–11	7	6–7	6–8	—
Vertebrae	28	26–28	28–29	27	26–28	30–31	27

**Fig. 4.** Map showing type locality of *Badis pancharatnaensis* sp. nov.**Fig. 5.** Hasila Beel, type locality of *Badis pancharatnaensis* sp. nov. showing habitat.

Etymology. The species is named after the historical place called ‘Pancharatna’ in Goalpara district of Assam, India.

Remarks

Comparative data of *Badis pancharatnaensis* sp. nov. with related species is provided in Table 3. Badid species are considered allopatric and *Badis badis* is believed to be an unresolved complex of distinct populations (KULLANDER & BRITZ, 2002). Based on diagnostics, they have been classified under seven groups (KULLANDER & BRITZ, 2002; VALDESALICI & VAN DER VOORT, 2015a, b), of which, the hitherto species described belongs to the *Badis badis* group, all sharing a cleithral blotch. *Badis pancharatnaensis* has the basic bar pattern similar to its congeners but the bars become almost indistinct to absent with respect to behavioral response of the fish towards

prevailing stimulus. The new species can immediately be distinguished from *B. assamensis* and *B. blosyrus* in the absence of a blotch on opercle (vs. presence). It is also distinct from the recently described species viz., *B. andrewraoi*, *B. autumnum* and *B. kyanos* by the presence (vs. absence) of a cleithral blotch. The new species is distinct from *B. singenensis* and *B. laspiophilus* in the absence (vs. presence) of blotches on the dorsal-fin and anal-fin and in the presence (vs. absence) of a cleithral blotch.

Badis pancharatnaensis is distinguished from *B. badis* in having lesser body depth (28.2–33.8 % SL vs. 30.7–38.9 % SL), more interorbital distance (7.1–9.4 % SL vs. 6.5–8.3 % SL) and lesser number of circumpeduncular scales (14–17 vs. 19–20).

The new species differs from *Badis kanabos* in having a shallower body (28.2–33.8 % SL vs. 29–35 % SL), more number of anal-fin branched rays (7–8 vs. 6–8) and more lateral scale rows (26–29 vs. 25–26); from *B. chittagongis* in having more interorbital distance (7.1–9.4 % SL vs. 5.5–6.7 % SL), lesser number of ci-

cumpeduncular scales (14–17 vs. 20) and lesser gill rakers (6–8 vs. 8–11).

Badis pancharatnaensis is distinguished from *B. dibruensis* in having a deeper body (28.2–33.8 % SL vs. 25.4–30.0 % SL), shorter interorbital distance (7.1–9.4 % SL vs. 10.7–12.2 % SL), more lateral line scales (21–23/4 vs. 19–22/4–5), lesser number of circumpeduncular scales (14–17 vs. 21–22) and more number of vertebrae (28 vs. 27).

Further, *Badis pancharatnaensis* is compared with *B. tuivaiei* of the Meghna basin. It is different in having a deeper body (28.2–33.8 % SL vs. 25.9–29.2 % SL), more interorbital distance (7.1–9.4 % SL vs. 5.6–6.6 % SL), lesser dorsal-fin spines (XV–XVII vs. XVI–XVII), lesser lateral line scales (21–23/4 vs. 20–25/2–4), less number of circumpeduncular scales (14–17 vs. 16–20), and less number of vertebrae (28 vs. 30–31).

The new species is similar to *Badis soraya*, belonging to the *B. badis* species group, in absence of blotches on the operculum and dorsolateral aspect of the caudal peduncle and in the presence of a cleithral blotch. However, it differs in having more interorbital width (7.1–9.4 % SL vs. 6.3–8.8 % SL), dorsal-fin spines (XV–XVII vs. XIV–XVI), scales in lateral rows (26–29 vs. 25–27), more lateral scale rows (26–29 vs. 25–27), number of vertebrae (28 vs. 27) and less number of circumpeduncular scales (14–17 vs. 18–22).

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