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Somnath Bhakat

Department of Zoology,
Rampurhat College, Rampurhat,
Birbhum, West Bengal, India

Arup Kumar Sinha

Department of Zoology,
Rampurhat College, Rampurhat,
Birbhum, West Bengal, India

A new sisorid catfish of the genus *Gagata*, Bleeker, 1858 from West Bengal, India

Somnath Bhakat and Arup Kumar Sinha

Abstract

A new species of *Gagata* (Family: Sisoridae), *Gagata rhodobarbus* nov. Has been collected from Mayurakshi river, belonging to Gangetic river system. The species is diagnosed by the presence of red barbels along with five saddles from head to tail, black blotches on caudal peduncle and lobes of caudal fin. Maxillary barbels shorter than head and serrated pectoral spine bearing filamentous extension are the other two distinguishing characters.

The species differs from its banded congeners viz. *G. itchkea*, *G. cenia*, *G. youssoufi* and *G. sexualis* by several characters like least height of caudal peduncle in its length, eye diameter in % of inter orbital distance, head length in % of standard length, inter-dorsal in adipose dorsal base, head width in % of head length and specially having rosy red coloured barbels.

Keywords: Red barbel, Mayurakshi river, five bands, filamentous pectoral spine, minute nasal barbel

1. Introduction

Genus *Gagata* ^[1], a catfish of the family Sisoridae superficially resembles members of the genus *Nangra* ^[2], in morphology but differs from it by having branchiostegal membrane broadly fused to the isthmus, compressed head, extension of maxillary barbel, length of mandibular barbel etc.

So far nine species of *Gagata* have been found in different drainages like Indus, Ganges, Brahmaputra, Narmada, Cauvery, Meghna, Irrawaddy, Salween, Rangoon Sittang of Pakistan, India, Bangladesh, Nepal, Myanmar and China ^[3]. Among them seven species are reported from India including three species from West Bengal (North Bengal) viz. *G. itchkea* ^[4], *G. gagata* ^[5] (West Bengal), *G. cenia* ^[5] (West Bengal), *G. viridescens* ^[5] (West Bengal), *G. youssoufi* ^[6], *G. sexualis* ^[7], *G. nangra* ^[5].

Rivers of South Bengal belong to the Gangetic River System are least studied ichthyologically. So it is not surprising to find new species of different freshwater fish families restricted to these rivers of South Bengal. While carrying out ichthyological survey in different rivers of Birbhum (a district of West Bengal) the first author recovered a specimen of *Gagata* species accidentally from a heap of small fishes collected from Mayurakshi river at Tilpara Barrage, Suri (23.9041°N, 87.5247°E) on July 23, 2017. Later the authors identified it a new species analyzing all its characteristics in the laboratory. Again thirteen specimens were recovered in later months of the year by the first author from the same spot. The description of this material as *Gagata rhodobarbus*, a new species form the basis of this study.

2. Materials and Methods

Measurements were made with a dial caliper to the nearest 0.1 mm. Counts and measurements were made on the left side of specimens wherever possible using binocular stereo-zoom microscope.

Gagata rhodobarbus nov. (Plate. 1 and 2)

Type material

Holotype: 23. VII. 2017. Mayurakshi River, Tilpara Barrage (Fig. 1), Suri, District Birbhum, West Bengal, India. 51mm. Standard Length (SL). Freshwater Fish Museum, Department of Zoology, Rampurhat College, Rampurhat-731224, Birbhum, West Bengal, India.

Correspondence

Somnath Bhakat

Department of Zoology,
Rampurhat College, Rampurhat,
Birbhum, West Bengal, India

Paratype: Same locality, 44.20 – 61.00mm. SL (n=13).
Freshwater Fish Museum, Dept. of Zoology, Rampurhat

College, Rampurhat-731224, Birbhum, West Bengal, India.

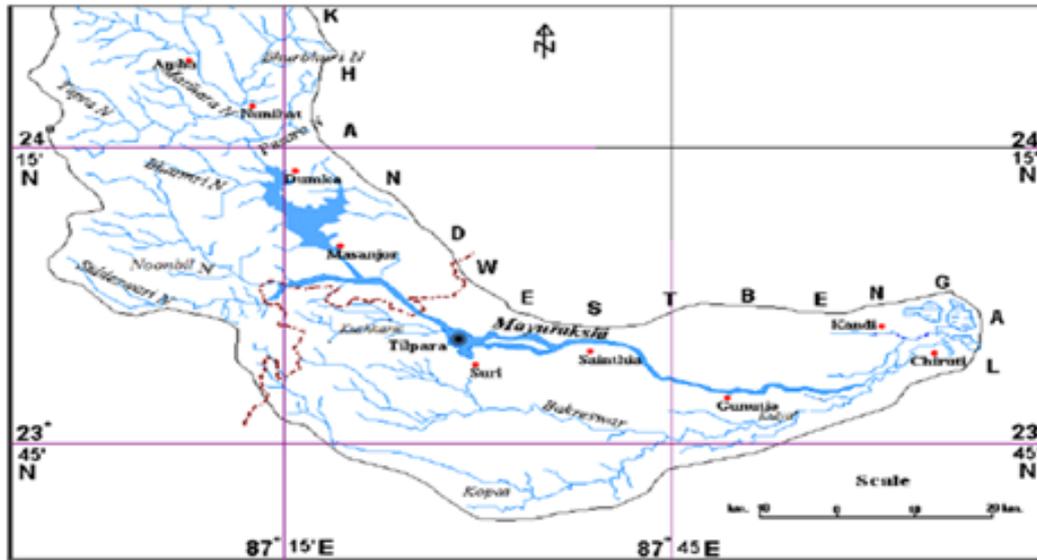


Fig 1: Collection site (•) at Tilpara Barrage on Mayurakshi River.

3. Result

3.1 Diagnosis

Dorsum with five dark saddles from head to tail and black blotches on caudal peduncle, anterior of dorsal fin and lobes of caudal fin; median longitudinal groove on head reaching posterior border of orbit, followed by a median oval fontanel, extending to base of occipital process separated from base of dorsal fin; eyes large and dorso-lateral in position; mouth transverse and inferior; branchiostegal membrane fused with isthmus.

Maxillary barbels shorter than head, reaching to the base of pectoral fin; nasal barbels minute; mandibular barbels and posterior half of the maxillary barbel inserted in shallow grooves; a longitudinal groove in the middle of two inner mandibular barbels; all the barbels are of flat type and have a rosy red line in the middle.

Rayed dorsal fin inserted above midline of pectoral fin; forked caudal fin, upper lobe slightly longer; pectoral spine with filamentous extension, outer edge smooth but inner with distinct teeth.

Least height of caudal peduncle 1.02 in its length; occipital process more than three times as long as its base; inter-dorsal 1.69 in adipose dorsal fin base.

3.2 Description

Morphometric data of *G. rhodobarbus* is presented in Table I. Body moderately elongated and compressed; dorsal profile rises slowly up to dorsal fin base, thereafter slopes gently. Ventral profile is almost horizontal up to anal fin origin. Body depth is 13.93-17.82 in SL. Head is half oval, straight below and slightly arched above. Upper part is curved by a bony plate. Median longitudinal groove on head is distinct, reaching posterior border of eyes followed by a small median oval fontanel and extends to base of occipital process. Occipital process is more than 3 (three) times (mean 3.25) as long as its base and not reaching the basal bone of dorsal fin, separated by inter-space (Plate 9). Snout pointed though the tip is almost rounded, overhanging mouth, 2.8 in head. Head length is 27.45-29.41 in SL and 2.31 in total length (TL). Head width (HW) and head depth are almost equal. Eyes are subcutaneous, dorso-lateral, slightly in the upper half of head,

and also in the middle of the posterior half of the head. Above and below each eye, there is a ridge, upper terminating at the nostril while lower at the upper jaw. The longer diameter of eyes is horizontal. (Plate 7 and 8).

Mouth is transverse, inferior, small, narrow and below the extremity of the nostril. Lips are fleshy and thick, upper lip slightly arched but the lower one is straight, creating a half oval opening (gape 2.6 in HW). Median portion of upper lip is swollen. The tongue and palate are smooth, without tooth.

Both aperture of each nostril is circular, close together, separated from one another by a flap bearing minute nasal barbel, just like a triangular notch (often lost during handling). (Plate 8).

Branchiostegal membranes are confluent with skin of isthmus; operculum triangular, tip near the ventral region.

Four pairs of barbels; all shorter than head; maxillary with stiff base and a membranous flap along the inner side reaching near the origin of pectoral fin base; minute nasal separating the nostrils in the form of a flap; outer and inner mandibular barbels with swollen base, in a transverse row behind lower lip, inner pair placed slightly in advance of the outer pair, outer being slightly longer. Mandibular barbels are placed in shallow grooves of almost equal length. In mid ventral line of two inner mandibular barbels, a long groove ($2/3^{\text{rd}}$ in length of inner mandibular barbel) is present. Distinct mid red line along the length of each barbel is present (the most striking and demarcating character, noticeable by the authors), except the tip portion of maxillary, inner and outer mandibular barbels (Plate 1) and also the whole minute nasal barbels.

Dorsal fin origin ahead of ventral fin origin and in the mid line of pectoral fin; Rayed dorsal fin pointed, shorter than head, (1.12 in HL) with a spine, shorter than next soft ray, finely serrated anteriorly along its distal half of its length, inner edge smooth (Plate 5). First three rays followed by spine are blackish. Base of dorsal fin is bony with two bony lateral projections of deep brown in colour (Plate 5 and 7)

Adipose dorsal fin origin, opposite to anal fin origin and nearer to caudal peduncle, but widely separated from both the rayed dorsal fin and caudal peduncle; inter-dorsal 1.69 (ranges 1.54 – 1.89) in adipose dorsal base; adipose dorsal

base equal to rayed dorsal base; lower half of adipose dorsal is thick and yellowish (Plate 3).

Pectoral fin pointed, placed above the level of the ventral surface, 1.26 times head (ranges 1.16 – 1.35) not reaching to ventral fin, with a strong spine shorter than head. Spine bears a soft branched filament at its distal, followed by five distinct teeth internally, but smooth externally. Base of the pectoral fin ended in a structure like whale bone. (Plates 6 and 8).

Ventrals 1.93 in head (ranges 1.73-2.08), extending beyond anal opening or vent, not reaching anal fin origin. First fin ray of ventral fin is unbranched.

Anal fin slopes much backward, 1.57 in head (ranges 1.42-

1.78), its origin opposite to adipose dorsal fin, nearer to ventral fin origin than to caudal base. First fin ray is very short.

Caudal deeply forked, upper lobe slightly longer than the lower, 4.20 (ranges 3.82-4.48) in TL, both lobes with pointed tip; least height of caudal peduncle 1.02 (ranges 0.92-1.10) in its length. (Plate 4).

Skin smooth; lateral line complete (Plate 4) it attains 81mm (ranges 60.50-81.00mm.) in length; Air bladder in two rounded portions, enclosed in bone. Gill rakers 5-7; vertebra 34; branchiostegal 5.

D. I.6; P. I.9; V. i.5; A. iv.9; C 17.



Plate 1: Ventral view of the specimen showing rosy red barbels.

Plate 2: Dorsal view of the whole specimen showing saddles.



Plate 3: Posterior portion showing adipose fin and caudal fin with blotch.

Plate 4: Showing distinct lateral line and extension of saddles and longer upper lobe



Plate 5: Showing serrated dorsal spine.

Plate 6: Showing arrangement of pectoral and ventral fins.



Plate 7: Lateral view showing position of eye and nostril.



Plate 8: Showing position of nasal barbel and pectoral fin base with whale bone structure.



Plate 9: Showing fontanel and occipital process.

Table 1: Morphometric data of *Gagata rhodobarbus* (n = 14).

Parameter	Allotype	Paratype	
		Range	Mean
Total length (TL) mm	69.00	60.50 – 81.00	66.07
Standard length(SL) mm	51.00	44.20 – 61.00	49.30
Fork length(FL) mm	58.50	52.00 – 71.50	57.29
% SL			
Pre dorsal length	37.25	35.29 – 40.22	37.79
Pre pectoral length	23.53	23.47 – 29.29	26.08
Pre pelvic length	53.92	53.19 – 57.61	55.50
Pre anal length	78.43	73.53 – 78.43	76.32
Dorsal fin length	23.53	22.83 – 29.17	25.79
Pectoral fin length	21.96	21.20 – 23.76	22.78
Pelvic fin length	14.90	13.00 – 16.30	14.88
Anal fin length	19.61	16.00 – 20.13	18.28
Dorsal fin base length	13.72	12.46 – 16.12	14.75
Pectoral fin base length	5.10	5.10 – 6.35	5.81
Pelvic fin base length	3.92	3.37 – 4.59	3.99
Anal fin base length	15.69	14.06 – 18.01	15.47
Body depth at anus	15.49	13.93 – 17.82	15.71
Body depth at DF origin	16.47	16.39 – 19.80	18.30
Head length (HL)	29.41	27.45 – 29.41	28.66
Head width	14.70	14.70 – 17.37	15.92
Head depth	16.08	15.68 – 18.22	16.66
Caudal peduncle length	8.82	7.07 – 9.04	8.46
Caudal peduncle depth	8.80	7.07 – 9.13	8.32
Dorsal spine	21.96	18.63 – 22.92	20.85
Pectoral spine	19.80	17.60 – 21.87	19.99
Adipose dorsal fin base	13.92	12.98 – 14.86	14.10
Adipose DF length	11.96	10.10 – 16.95	12.79
DF to adipose fin	24.81	21.21 – 25.10	23.85
Adipose to caudal fin	10.20	9.78 – 12.29	10.66
% HL			
Snout	34.67	32.31 – 39.68	35.63
Eye diameter	30.00	25.71 – 32.14	29.00
Inter orbital distance	20.00	18.23 – 23.29	21.46

Inter narial distance	14.00	12.16 – 17.12	14.57
Maxillary barbel	73.33	68.92 – 87.41	76.76
Outer mand. barbel	38.66	36.88 – 44.61	39.87
Inner mand. barbel	32.67	29.08 – 38.09	33.14

3.3 Colouration

Skin smooth, body colour is dirty white with copper coloured bands on dorsum; first band on the posterior end of head, around fontanel with projected rod like dark brown occipital process, second at the origin of dorsal fin with two lateral dark brown projections, third in between rayed and adipose dorsal fin, fourth covering the base of adipose dorsal fin and fifth on caudal peduncle. The last band is comparatively lighter. All the body saddles or bands descend half-way down the sides above lateral line (Plate 2 and 4).

Caudal with transverse dark bar across peduncle; a black blotch on the middle of each lobe of caudal fin (Plate 3); Spine and upper half of anterior three rays of dorsal fin blackish. The lower ridge of orbit is with black spots, looks like eye brow. (Plate 7 and 8). All the barbels except nasal have a rosy red mid line along length except at the tip. (Plate 1).

3.4 Etymology

Species rhodobarbus is derived from two latin words. The first word rhodo means rosy red and last one, barbus means barbel.

3.5 Distribution and habitat

Gagata rhodobarbus is known for the type locality in the Mayurakshi River in West Bengal. Mayurakshi River is the western tributaries of Bhagirathi of the Ganga basin. The species was collected from the Tilpara Barrage of Mayurakshi River, where river is swift flowing with a mixed rocky and sandy bottom. At this locality other fish species collected, are *Barilius barna*, *B. tileo*, *B. bendelesis* (Cyprinidae); *Arius arius*, *A. gagora* (Ariidae); *Mystus vittatus*, *M. tengara*, *M. cavasius*, *M. bleekeri* (Bagridae); *Wallago attu*, *Ompok pabda*, *O. pabo* (Siluridae); *Xenentodon cancila* (Belonidae); *Bagarius bagarius*, *Glyptothorax botius*, *G. telchitta*, *G. cavia* (Sisoridae) and *Amblyceps mangois* (Amblycipitidae).

4. Discussion

In India, seven species of *Gagata* has so far been reported including three species of West Bengal. A comparative account is presented in Table II. Here ten important characters like size, number of dorsal band on body and other morphological features are considered to compare with the present species. Size of four Indian species ranges from 50-58 mm. while size varies from 85-162 mm. in other three Indian species [8, 9]. But the maximum size in the present species is 81 mm (including a gravid female of 67 mm). Four species of *Gagata* viz. *G. itchkea*, *G. cenia*, *G. sexualis* and *G. youssoufi* possesses dorsal band or saddles. These four species along

with others differ from the present species on several characters as presented in Table II.

G. rhodobarbus differs from the above mentioned four Indian species by following characters also:

In *G. itchkea*, maxillary barbel reaches half length of pectoral fin (vs. reaches to pectoral fin base), mandibular barbels not in a transverse row (vs. in transverse row) and two to three inner serrations in pectoral fin spine (vs. five serrations).

In *G. sexualis*, pectoral fin reaches the base of ventral fin (vs. not reaches), maxillary barbel longer than head (vs. shorter than head), dorsal fin spine smooth on both edges (vs. only inner edge is smooth), and pectoral fin spine with eight to ten serrations (vs. five serrations).

In *G. cenia*, dorsal fin spine serrated on both edges (vs. only outer edge serrated), pectoral fin without filamentous prolongation (vs. with filamentous prolongation) and three bands on head (vs. one band on head).

In *G. youssoufi*, nine to ten recurved teeth in the inner edge of pectoral spine (vs. five teeth), vertebrae 37 – 38 (vs. 34) and pectoral fin rays 12 (vs. 9).

Distribution of different species of *Gagata* is restricted to particular geographic area as these small catfishes are less dispersed. *G. cenia*, *G. gagata*, *G. viridescens* are reported from the rivers of northern parts of West Bengal [8, 10, 11]. But only a few report of *Gagata* species is available from southern parts of West Bengal [12 – 15]. Our observation is presently restricted in Mayurakshi river of South Bengal, where we found the present species.

A key is formulated on the basis of different characters of seven Indian species of *Gagata*.

Key to seven Indian species of *Gagata*:

1. Body with saddles or bands2
Body without saddles or bands3
2. Barbels with red colour streak*G. rhodobarbus*
Barbels without colouration4
3. Mandibular barbel in a transverse row*G. gagata*
Mandibular barbel not in a transverse row*G. itchkea*
4. Maxillary barbel longer than head and with long nasal barbel5
Maxillary barbel shorter than head6
5. Eye dia. % HL less than 20*G. nangra*
More than 20*G. sexualis*
6. Pectoral spine both edge serrated*G. cenia*
Only inner edge serrated7
7. Two dark bands on smooth head*G. youssoufi*
One dark spot on head that is covered with minute spine like structure*G. viridescens*.

Table 2: Comparative analysis among eight species of *Gagata* sp.

Character	<i>G. rhodobarbus</i>	<i>G. itchkea</i>	<i>G. gagata</i>	<i>G. cenia</i>	<i>G. youssoufi</i>	<i>G. nangra</i>	<i>G. viridescens</i>	<i>G. sexualis</i>
Eye dia. %HL	25.71 – 32.14	37.03 – 45.45	27.03 – 38.46	30.30 – 34.44	30.30 – 35.71	16.67 – 18.87	24.39 – 28.57	30.30 – 34.48
HL %SL	27.45 – 29.41	25.00 – 28.57	23.81 – 33.33	23.81 – 25.64	22.22 – 23.81	-	-	23.81 – 25.64
Least height of CP in its length	0.92 – 1.10	1.1 – 1.8	1.8 – 2.0	1.2 – 2.1	-	2.2 – 2.7	1.6 – 1.7	-
OP as long as broad at its base	3 times	3 times	4-5 times	3 times	-	3 times	4 times	6.3 – 10.5 times

Inter-dorsal in adipose dorsal base	1.69	1.3	1.1	2.0	-	1.2	1.0 – 1.3	-
HD %HL	53.19 – 63.49	-	-	55.55 – 83.33	66.67 – 71.43	50	58.82 – 62.50	66.67 – 83.33
HW %HL	50.00 – 60.74	66.67 – 90.91	66.67 – 83.33	50.00 – 71.43	58.82 – 62.50	66.67 - 100	76.92 – 83.33	66.67 – 90.91
Eye dia. %IOD	62.00 – 85.00	125.00 – 166.67	83.33 – 166.67	125 - 200	111.11 – 142.86	76.92 – 83.33	100	125.00 – 166.67
Snout %HL	32.31 – 39.68	26.31 – 35.71	38.46 – 40.00	33.33 – 41.67	-	33.33 – 35.71	33.33 – 35.71	24.39 – 35.71
Band	Present	Present	Absent	Present	Present	Absent	Absent	Present

HL- Head length, SL- Standard length, CP- Caudal peduncle, OP- Occipital process, HD- Head depth, HW- Head width, IOD- Inter orbital distance.

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