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New record and redescription of *Osteobrama cunma* (Day, 1888) (Cypriniformes: Cyprinidae) from the Meghna-Barak drainage system, Tripura, India

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Abstract

Osteobrama cunma (Day) has hitherto been considered to be restricted to the eastern parts of Manipur in India (Chindwin drainage system) besides its type locality, Moulmein, in Myanmar. While confirming the identity of fish species collected from the Gumti, a tributary of the Barak-Meghna river system in Tripura, India, several specimens of *Osteobrama* tentatively identified as *O. cotio* (Hamilton) and housed in the Museum of the Central Agricultural University, Tripura, India, were observed to belong *to O. cunma*. This forms the first record of *O. cunma* from the Barak-Meghan drainage, which is geographically isolated from the type locality of this species.

Keywords: *Osteobram cotio*, Taxonomy, Morphometric, Meristic, Distribution, Gumti River.
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Introduction

The Northeastern region of India, located at the confluence of the Indo-Malayan and Palaearctic biogeographical realms, is known for its high levels of diversity and endemism of freshwater fish. Rivers in the states of Manipur, Mizoram and Nagaland originating from the Naga hills and Northwestern hills of Manipur are distinctly of two types: some flowing south east and joining the Chindwin-Irrawaddy Basin, while others such as the Barak and its tributaries flow southwest forming the Barak-Meghna river system. Gumti, the longest river in Tripura, along with its tributaries, originates from the Longtharai and Atharmura hill ranges and flows south-west to join the Barak-Meghan system. The fish faunas of these two drainages are distinct in view of various geographical barriers such as the Naga hills, Manipur hills and Longtharai (Allen et al. 2010).

Osteobrama Heckel, 1843, a genus of freshwater cyprinid fish distributed in South and South-East Asia, comprising of eight valid species characterised by having compressed, fairly deep and short body, abdominal edge trenchant entirely or up to anal-fin from pelvic-fin origin, the last simple ray of the dorsal fin osseous and serrated posteriorly (Heckel and Russeger 1843; Tilak and Hussain 1989). Four species have been recorded previously from North East India, *O. belangeri* (Valenciennes, 1844), *O. cotio* (Hamilton, 1822), *O. cunma* (Day, 1888) and *O. feae* Vinciguerra, 1890. Except *O. cotio*, all other species have been recorded only from the Chindwin drainage system, whereas *O. cotio* has been recorded from the Barak-Brahmaputra drainage and the Gangetic basin (Talwar and Jhingran 1991). *Osteobrama cunma* was previously recorded from Manipur by Vishwanath and Shantakumar (2007), who considered it to be endemic to the eastern part of Manipur, India and Myanmar (Chindwin drainage).

While identifying a collection of fishes from Gumti, a tributary of the Barak-Meghna river system in Tripura, India, several specimens of *Osteobrama* tentatively identified as *O. cotio* housed in the Museum of the Central Agricultural University, Lembucherra, Tripura, some of the specimens were observed to belong to *O. cunma*. This contribution serves to document the first record of the species from the Barak-Meghna river system and the redescription of *O. cunma* and *O. cotio*, resolve their identity and distributional status.

Material and Methods

Extensive surveys were undertaken to collect and catalogue fish faunal resources of different river systems in North East India and their tributaries with an aim to establish a referral museum of endemic fishes of the region

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Table 1. Morphometric data of *Osteobrama cotio* and *O. cunma* specimens examined.

Morphometric traits	*O. cotio* (n=12)			*O. cunma* (n=38)		
	mean	range	SD	mean	range	SD
Total length (mm)	83.8	73.6–93.2	6.3	75.7	63.0–104.4	9.4
Standard length (mm)	71.6	60.3–81.5	6.2	57.5	48.1–79.2	8.7
In percent of TL						
Head length	19.4	16.8–21.3	1.10	19.4	17.5–21.3	0.9
Head depth	14.0	10.6–17.4	1.93	14.7	11.2–16.6	1.2
Body depth	**32.8**	29.1–37.9	2.5	**27.0**	23.3–29.6	1.5
Pre-Dorsal length	**44.9**	40.6–49.4	2.5	**40.1**	37.1–42.1	1.27
Post- dorsal length	**36.0**	32.4–48.9	4.5	**29.9**	26.8–36.4	2.0
Pre-ventral length	32.83	29.14–34.59	1.48	32.96	29.84–37.93	1.6
In percent of SL						
Head length	**22.6**	19.8–25.6	1.6	**25.6**	22.7–28.1	1.2
Head depth	16.2	12.4–19.0	1.9	19.3	14.0–21. 7	1.6
Body depth	**38.0**	35.5–41.4	1.9	**35.5**	31.9–39.5	1.9
Pre-Dorsal length	52.2	47.7–55.5	2.8	52. 9	49.9–55.3	1.4
Post dorsal length	41.7	38.8–57.0	5.1	39.4	34.8–48.3	2.3
Pre- pectoral length	23.0	21.2–26.4	1.5	24.1	21.2–27. 7	1.2
Pre-ventral length	**38.2**	34.0–42.0	2.4	**43.4**	37.4–48.6	2.2
Pre-anal length	**52.3**	47.8–54.7	2.1	**58.7**	49.6–65.4	3.1
In percent of FL						
Pre-Dorsal length	48.1	41.9–50. 9	2.6	46.4	41.4–50.0	1.7
Post dorsal length	**38.5**	35.5–50.5	3.9	**34.6**	30.9–41.9	2.2
Pre-pectoral length	21.2	18.6.24.4	1.4	21.2	19.1–24.6	1.0
Pre-ventral length	**35.2**	32.3–37.7	1.7	**38.1**	34.4–43.7	1.8
Pre-anal length	**48.2**	45.8–50.1	1.5	**51.5**	45.7–56.7	2.5
In percent of HL						
Head depth	**72.2**	57.3–84.8	9.1	**75.6**	60.2–82.2	5.1
Head width	**34.8**	26.8–53.1	5.1	**48.9**	27.5–54.8	6.4
Eye diameter	**36.6**	31.3–42.0	2.6	**30.3**	25.7–40.6	3.3
Pre–orbital length	27.0	21.1–35.8	4.0	29.1	20.1–48.0	4.9
Post–orbital length	**37.0**	30.9–44.3	4.2	**44.7**	35.4–50.5	3.6
Inter orbital width	31.7	23.7–36.6	3.7	34.3	22.5–42.2	4.5
Inter nostril distance	**14.3**	12.3–18.9	1.5	**22.9**	15.9–28.0	2.6
Upper jaw length	**14.7**	13.1–18.6	1.8	**22.9**	13.8–26.3	2.9
Lower jaw length	**13.3**	10.0–16.8	2.3	**19.0**	11.3–24.0	2.6

at the College of Fisheries, Central Agricultural University, Lembucherra, Agartala, Tripura. An examination of tentatively identified material of *Osteobrama* from the Gumti River at Indiranagar revealed that some of the specimens were erroneously identified as *O. cotio*.

Morphometric measurements were made point to point using a dial caliper to the nearest 0.1 mm and meristic counts with the help of scale reader and binocular microscope (Jayaram 2013). Of the 33 morphometric characters, 20 proportions of different attributes for each specimen were subjected to statistical analysis (Table 1), and this data was compared with those retrieved from a series of 30 specimens of *O. cunma*, collected from the Chindwin-Irrawaddy basin in Manipur.

Abbreviations used: TL, total length; SL, standard length; FL, fork length; HL, lateral head length; COF-CAU, College of Fisheries, Central Agricultural University.

Table 2. Range of variation and mean of meristic data of *Osteobrama cotio* and *O. cunma* specimens examined.

Characters	*O. cotio* (n=12)		*O. cunma* (n=38)	
	range	mean	range	mean
Dorsal-fin rays	iii7–iii8	iii 8	iii7–iii8	iii8
Pectoral-fin rays	i13–i14	i 13	i13– i 14	i13
Pelvic-fin rays	i9–i10	i10	i8–i9	i9
Anal-fin rays	iii31–iii35	**iii33**	iii 25–iii29	**iii 27**
Caudal-fin rays	19–20	**20**	19–20	**19**
Lateral-line scales	55–65	**60**	45–49	**48**
Pre-dorsal scale	24–27	**26**	18–20	**19**
Pre-pelvic fin scales	19–23	**21**	15–19	**18**
Pre-anal fin Scales	21–25	**23**	25–29	**28**
Dorsal fin base to lateral line scales	12½–14½	**13½**	8½–9½	**9½**
Lateral line to ventral fin base scales	13½–19½	**14½**	8½–9½	**8½**
Lateral line to anal fin base scales	16½–19½	**17½**	11½–12½	**11½**
Circum-peduncular scales	21–28	**26**	18–20	**19**

Results

Morphometric and meristic data of 38 *O. cunma* specimens and 12 *O. cotio* specimens of different size and age groups revealed that these two species could be distinguished on the basis of 16 morphometric and 10 meristic characters (Tables 1, 2). However, eight specimens collected from the Gumti River and previously identified as *O. cotio* differ from the original description of *O. cotio* in the number of anal-fin rays (ii 25-ii 29 vs. ii 31-ii 35) and lateral line scales (45-49 vs. 55-65), which were considered as major diagnostic characters to differentiate these two species by earlier workers (Talwar and Jhingran 1991; Vishwanath and Shantakumar 2007; Jayaram 2013), besides various morphometric characters. Comparison of two series of *O. cunma* (eight specimens from Tripura and 30 specimens from Manipur) with 12 specimens of *O. cotio,* collected from the Gumti River, Tripura exhibited some overlapping morphometric characters, but the most distinguishing characters to differentiate *O. cunma* from *O. cotio,* include, head length, head width, body depth, pre-anal length, pre-ventral length, as % standard length and head depth, head width, post-orbital length, inter-nostril width, upper jaw length, lower jaw length, caudal peduncle width, eye diameter and caudal peduncle length %HL, as quantified in bold (Table 1). Besides morphometric characters, the two species (*O. cunma* and *O. cotio*) can easily be distinguished based on meristics counts, including the number of anal-fin rays (iii 27 vs. iii 33), lateral-line scales (48 vs. 60), pre-dorsal scales (19 vs. 26), pre-anal scales (28 vs. 23), scale rows from dorsal-fin base to lateral line (9½ vs. 13½), scale rows from lateral line to ventral-fin base (8½ vs. 14½), scale rows from lateral line to anal fin (11½ vs. 17½) and circumpeduncular scales (19 vs. 26) as depicted in bold (Table 2). Field notes of the collector reveal that the two species co-exist in the Barak-Meghna river system, but information on habitat and ecological niche was not documented.

Osteobrama cunma (Day, 1888)

(Fig. 1)

Rohtee cunma Day, 1888. *Fishes of India Suppl.*: 807 (type-locality: Moulmein, Burma).

Rohtee cotio var*. cunma*: Hora and Misra (*partim*), 1940, *Rec. Indian Mus.*, 42(1): 168. pl. 4, fig. 1 (Manipur Valley and Myanmar).

Osteobram cotio cunma: Talwar and Jhingran (*partim*), 1991, *Inland Fishes of India and Adjacent Countries*. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 1: 239

Osteobrama cunma: Vishwanath and Shantakumar (*partim*), 2007, *Zoos' Print Journal*, **22** (11): 2881–2884 (from Chindwin drainage, Manipur).

Figure 1. *Osteobrama cunma* (COF-CAU-0172, 72.90 mm SL).

Diagnosis: Body moderately deep with 48 (45-49) lateral-line scales; pre-dorsal scales 19 (18-20), pre-anal scale 28 (25–29); scale rows between dorsal-fin base to lateral line and lateral line to pelvic-fin base 9½ and 8½, respectively, lateral line to anal-fin base 11½; circumpeduncular scales 19 (18-20); anal-fin rays iii 27 (iii 25-iii 29).

Description: Body laterally compressed and moderately deep, dorsal and ventral profile more or less equally concave, gently tapering from origin of dorsal fin to caudal peduncle, its maximum depth 27.0 (23.3–29. 6) %TL, 35.5 (31.9–39.5) %SL, abdominal edge slightly keeled between pelvic-fin base and anal-fin base, pre-ventral and pre-anal length 38.1 (34.4–43.7) and 51.5 (45.7–56.7) %FL, respectively. Head broader, maximum depth 75.6 (60.2–82.2) and width 48. 9 (27.5–54.8) %HL; eyes moderate, eye diameter 30.3(25.7–40.6) %HL; inter-orbital width 34.3 (22.5-42.2) %HL; inter-nostril width 22.9 (15.9–28.0) %HL; mouth small, terminal, upper jaw longer than lower, 22.9 (13.8–26.3) vs. 19.0 (11.3–24.0) %HL, respectively. Third dorsal-fin ray serrated, extent of serration depending on age; more pronounced in the adults. Scales moderate, 48 (45–49) along lateral line, 9½ (8½–9½) between dorsal-fin base and lateral line, 8½ (8½–9½) from lateral line to ventral-fin base, 11½ (11½–12½) from lateral line to anal-fin base; pre-dorsal scales 19 (18–20), pre-anal scales 28 (25–29); circumpeduncular scales 19 (18–20). Fin formula are: D iii 7–8; P i 13–14; V i 8–9; A iii 25–29; C 19–20.

Distribution: India: Manipur (Chindwin drainage), Tripura (Gumti river, Barak drainage); Myanmar.

Osteobrama cotio (Hamilton, 1822)

(Fig. 2)

Cyprinus cotio Hamilton, 1822, *Fishes of Ganges*: 339, 393, pl. 39, fig. 93 (Type locality: Ponds and ditches of Bengal)

Rohtee cotio: Day (Partim), 1878. *Fishes of India*: 587, pl. 151, fig. 1.

Osteobrama cotio: Vishwanath and Shantakumar (partim), 2007, *Zoos' Print Journal*, 22(11): 2881–2884 (from Brahmaputra and Barak rivers).

Diagnosis: Body very deep, with 60 (55–65) lateral-line scales; pre-dorsal scales 26 (24–27), pre-anal scales 23 (21–25); scale rows between dorsal-fin base and lateral line and lateral line and pelvic-fin base 13½ (12½–14½) and 14½ (13½–19½), respectively, lateral line to anal-fin base 17½ (16½–19½); circum-peduncular scales 26 (21–28); anal fin rays iii 33 (iii 31–iii 35).

Description: Body laterally compressed and very deep, ventral profile more concave than dorsal, abruptly tapering from origin of dorsal-fin towards caudal peduncle, its maximum depth 37.99 (35.45–41.42 %SL), abdominal edge slightly keeled between pelvic-fin base and anal-fin base, pre-ventral and pre-anal length 35.2 (32.3-37.7), and 48.2 (45.8-50.1) %FL, respectively. Head at its maximum depth 16.2 (12.4–19.0) %SL, width 34.8 (26.8–53.1) %HL; eyes large, eye diameter 36.6 (31.3-42.0) %HL; inter-orbital width 31.7 (23.7–36.6)

Figure 2. *Osteobrama cotio* (COF-CAU-0005, 73.30 mm SL).

%HL; inter-nostril width 14.3 (12.3–18.9) %HL; mouth small, terminal, upper jaw and lower jaw almost equal. Third dorsal-fin ray serrated, however extent of serration varies with the age, more pronounced in the adults. Scales small, 60 (55–65) along lateral line, 13½ (12½–14½) between dorsal-fin base and lateral line, 14½ (13½–19½) from lateral line to ventral-fin base, 17½ (16½–19½) from lateral line to anal-fin base; pre-dorsal scales 26 (24–27), pre-anal scales 23 (21–25); circumpeduncular scales 26 (21–28). D iii, 7–8; P i, 13–14; V i, 9–10; A iii, 31–35; C 19–20.

Distribution: India: Widely distributed throughout the Ganges and Bramhaputra river systems; Pakistan: Indus river system; Bangladesh: Barak-Meghana river system.

Discussion

Day (1888) described *Rohtee cunma* from Moulmein, Myanmar (erstwhile Burma), which was subsequently relegated as a sub-species *Osteobrama cotio cunma* (Hora 1921, 1937; Hora and Misra 1940; Menon 1954; Tilak and Hussain 1989; Talwar and Jhingran 1991). Based on detailed taxonomic studies and published information on its distribution, Vishwanath and Shantakumar (2007) considered *O. cunma* as a valid species restricted to the eastern part of Manipur in the Chindwin-Irrawaddy basin. Despite several studies on the fishes of the Barak-Meghna basin (Barman 1994; Kar and Sen 2007), not a single record of *O. cunma* exists. Although Kar and Sen (2007) suggested taxonomical differences in the specimens of *Osteobrama* collected from the Barak basin, but they could not ascertain its specific identity. Although we have not examined these specimens because of their non-availability, it is likely that those specimens might belong to *O. cunma*.

Based on our study, it is clear that *O. cunma* and *O. cotio* can easily be distinguished by the range of 16 morphometric characters and 10 meristic counts (Tables 1, 2), which substantiate the findings of Vishwanath and Shantakumar (2007). However, while discussing the occurrence and distribution of these two species in two different drainage systems, Vishwanath and Shantakumar (2007) inadvertently quoted, "*comparison of O. cunma from Barak drainage in Manipur and Brahmaputra basin in Assam and O. cotio from Chindwin basin in Manipur in the present study reveal several differences between the two*", whereas it should have been *vice versa*, as indicated in the material examined.

Konthoujam and Goswami (2011) studied the nucleotide sequence variation of *Osteobrama* species of North-east India based on mitochondrial COI gene but did not mention any diagnostic feature to separate the two species. Singh et al. (2017) studied the molecular phylogenetic relationship of *Ostebrama* species of Northeastern India and concluded that six species within this genus exhibits very high inter-specific genetic distance ranging from 3.04 to 22.86%. Based on this study, they also proposed a new species, *O. serrata* by comparing its morphological attributes with that of *O. cotio.* However, they did not compare the morphometric and meristic data with *O.cunma.*

The diagnostic characters of the new species they proposed, such as serrated dorsal-fin ray, anal and ventral-fin ray counts and scale counts are well within the range of *O. cunma*. Particularly, the serration of 3rd ray of dorsal fin is invariably present in *O. cunma* as well as in other species of this genus; however, the extent of serration depends on the age and size of the specimens. Therefore, the status of new species *O. serrata* seems to be doubtful until various populations of both the species are examined. Moreover, the only criteria of genetic distance i.e. 3.04%, between *O. cunma* and *O. serrata* may not be very convincing to establish a new taxon, as threshold criteria of genetic distance of 5% has been proposed (Collins and Cruickshank 2012; Panijpan et al. 2014). Although, we have not examined four voucher specimens of the new designate species, it is likely that these fish samples may be the habitat dependent morphological variant of *O. cunma*, collected from Jiribam, Manipur which is a part of the Barak-Meghna basin. This clearly indicates that the two species co-exist in Gumti-Meghna drainage system but were misidentified in previous studies as a result of the overlapping diagnostic characters mentioned in the published literature. *Osteobrama cunma* is reported here for the first time from Gumti-Meghna drainage system and it is likely that the distribution may extend up to the rivers of Bangladesh in view of the contiguity of this drainage system.

Material examined (all from India): *Osteobrama cunma* (Day, 1888): COF-CAU-0172, 6, 60.3–72.9 mm SL, Gumti River, Indiranagar, Tripura, 13.05.2014, Akhtar Husain. — COF-CAU-0173, 2, 49.0–51.2 mm SL, Gumti River, Ghrantali, Tripura, 23.09.2013, Sukanto and Panchali. — COF-CAU-0174, 11, 54.9–66.1 mm SL, Iril River, Saikul, Manipur 15.04.13, Lakshmi Chanu. — COF-CAU- 0174, 7, 49.5-63.3 mm SL, Iril River, Tiger camp, Manipur 18.03.13, Lakshmi Chanu. — COF-CAU-0174, 11, 48.1–79.2 mm SL, Iril River, Top kongpal, Manipur 20.04.13, Lakshmi Chanu. — COF-CAU-0175, 1, 65.6 mm SL, Imphal River, Laiphrakpam, Manipur, 25.04.13, Lakshmi Chanu.
— *Osteobrama cotio* (Hamilton): COF-CAU-0005, 7, 57.3–73.3 mm SL, Gumti River, Indiranagar, Tripura, 13.05.2014, Akhtar Husain. — COF-CAU-0176, 5, 68.3–81.4 mm SL, Gumti River, Battali, Tripura, 13.05.2014, Akhtar Husain.

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