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Cover: A female Javan Leopard *Panthera pardus melas* in rehabilitation phase at Cikananga Wildlife Center. © Yayasan Cikananga Konservasi Terpadu.

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SHORT COMMUNICATION

First record of *Garra birostris* Nebeshwar & Vishwanath, 2013 (Cypriniformes: Cyprinidae) from Doyang and Dikhu rivers of Brahmaputra drainage, Nagaland, India

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Abstract: *Garra birostris* is recorded for the first time from the Doyang and Dikhu tributaries of the Brahmaputra drainage, Nagaland, northeastern India. The detailed morphometric and meristic data of the specimens that forms the basis of this new record are presented.

Keywords: Freshwater fish, meristic data, northeastern India, stone suckers, taxonomy.

Members of the labeonine genus *Garra* Hamilton, 1822 are widely distributed from Sub-Saharan Africa to Borneo through the Arabian Peninsula, southern, and southeastern Asia, and southern China (Zhang & Chen 2002). The genus *Garra* is diagnosed in possessing a specialized adhesive pad or modified lower lip forming a gular disc, that displays extraordinary variations in the snout (Kottelat 2020a). They can also be distinguished by their pharyngeal teeth arranged in three rows, the origin of dorsal fin which starts slightly anterior to pelvic fins, and an anal fin originating well behind the pelvic fins (Stiassny & Getahun 2007).

Northeastern India, part of the Himalaya Biodiversity Hotspot is represented by 56 nominal species of the genus *Garra* which are distributed in the Brahmaputra, Barak, Kaladan, Karnaphuli, and Chindwin drainages, respectively (Vishwanath 2017; Roni & Vishwanath 2018; Fricke et al. 2022). Rivers in the state of Nagaland harbour 13 species of the genus *Garra—G. annandalei* Hora, 1921, *G. gravelyi* Annandale, 1919, *G. gotyla* Gray, 1830, *G. kempi* Hora, 1921, *G. lamta* Hamilton, 1822, *G. lissorhynchus* McClelland, 1842, *G. mcclellandi* Jerdon, 1849, *G. notata* Blyth, 1861, *G. naganensis* Hora, 1921, *G. nasuta* McClelland, 1838, *G. rupicola* McClelland, 1839, *G. chathensis* Ezung, Shangningam & Pankaj, 2020 and *G. langlungensis* Ezung, Shangningam & Pankaj, 2021 (Ezung et al. 2020a,b,c). So far, *Garra birostris*is known to occur in Arunachal Pradesh (Nebeshwar & Vishwanath 2013) and Assam (Basumatary et al. 2017)

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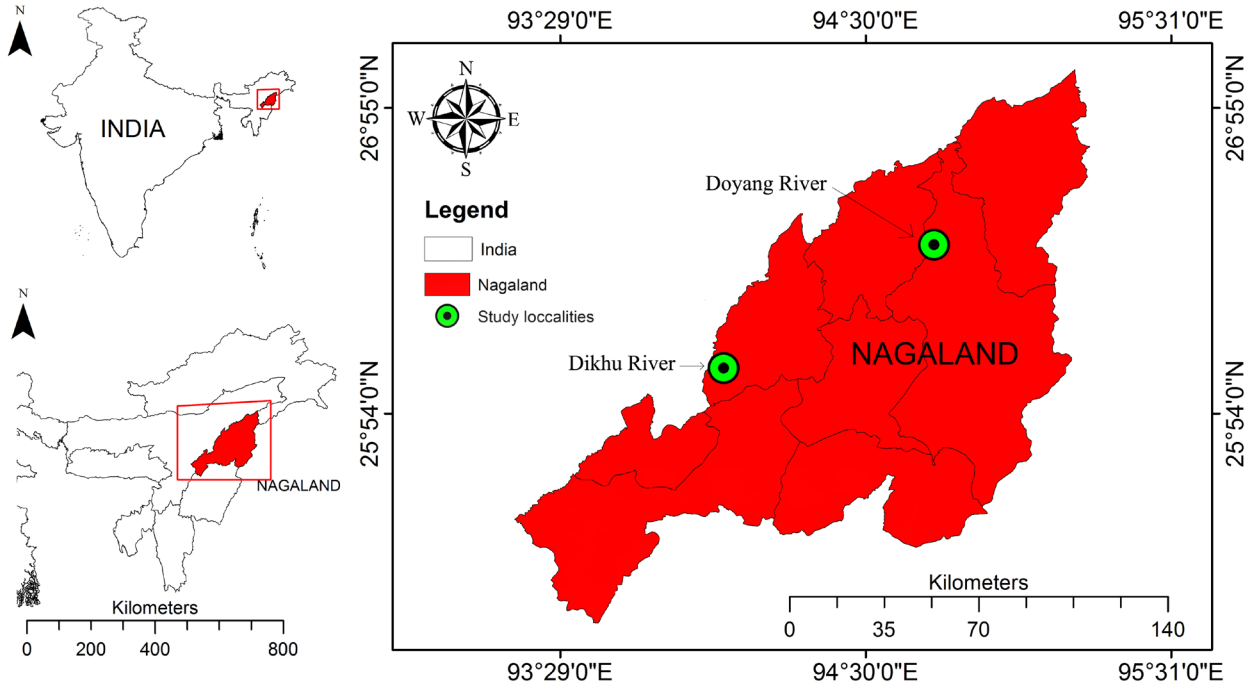

Figure 1. Collection locations of *Garra birostris* in the Doyang River and Dikhu River, Nagaland, India.

as well as in neighbouring Bhutan (Thoni et al. 2016). The present study records for the first time the occurrence of *Garra birostris* from two major river systems of Nagaland state—Dikhu and Doyang—are tributaries of the Brahmaputra.

Materials and Methods

Specimens were collected from the Doyang (26.0605^{0}N, 94.0005^{0}E) and Dikhu rivers (26.4506^{0}N, 94.7033^{0}E) of the Brahmaputra drainage, in Nagaland, India (Figure 1). Specimens were fixed in 10% formalin on site, and subsequently transferred to 70% ethanol for permanent storage. All measurements were recorded to the nearest 0.1 mm using digital calipers including the first non-zero digit from the left, through the last digit. Meristic and morphometric data followed Kottelat (2000b) and Nebeshwar & Vishwanath (2013). Gular disc terminology followed Kottelat (2020a). Meristic data were taken under a Leica M205A stereo-zoom microscope. ArcGIS tool was used to map the spatial distribution of specimens (ESRI 2017). Specimens are deposited at the Zoological Survey of India (ZSI), Kolkata and Nagaland University Fish Museum (NUFM), Nagaland.

Results

Specimens were identified as *Garra birostris* primarily based on the presence of a prominent, bilobed proboscis, bearing large, tri- to tetra-cuspid acanthoid tubercles on each lobe, a transverse lobe with small to large acanthoid tubercles, deep transverse groove, a black spot at the upper angle of gill opening and six lateral black stripes on the caudal peduncle (Image 1,2). Meristic and morphometric data are presented in Table 1. Dorsal fins with two simple and, 8½ branched rays. Pectoral fin with one simple and, 12–15 branched rays. Pelvic fin with one simple and 8 branched rays. Anal fin with two simple and 5½ branched rays. Predorsal scales 10–11. Lateral line complete with 33–34 scales. Circumpeduncular scales rows 16. Transverse scale rows above lateral line scale 4½, and, between lateral line and pelvic-fin origin 3½.

Distribution and Habitat

Previously known only from the rivers in Arunachal Pradesh (Nebeshwar & Vishwanath 2013), Assam (Basumatary et al. 2017), and Bhutan (Thoni et al. 2016), this study extends the distribution of the species into the Doyang and Dikhu rivers of Nagaland. *Garra birostris* tends to inhabit swiftly-flowing sections of headwaters and tributaries of large river systems, but also occurs in some wider, lowland river channels, as well as reservoirs. Ideal habitats comprise clear and slightly basic (pH: 7.5–8.08), oxygen-saturated water (10.02–11.38 mg/l) with a total hardness (82.39–72.52) and total dissolved solids under the desirable limits of 500 mg/l.

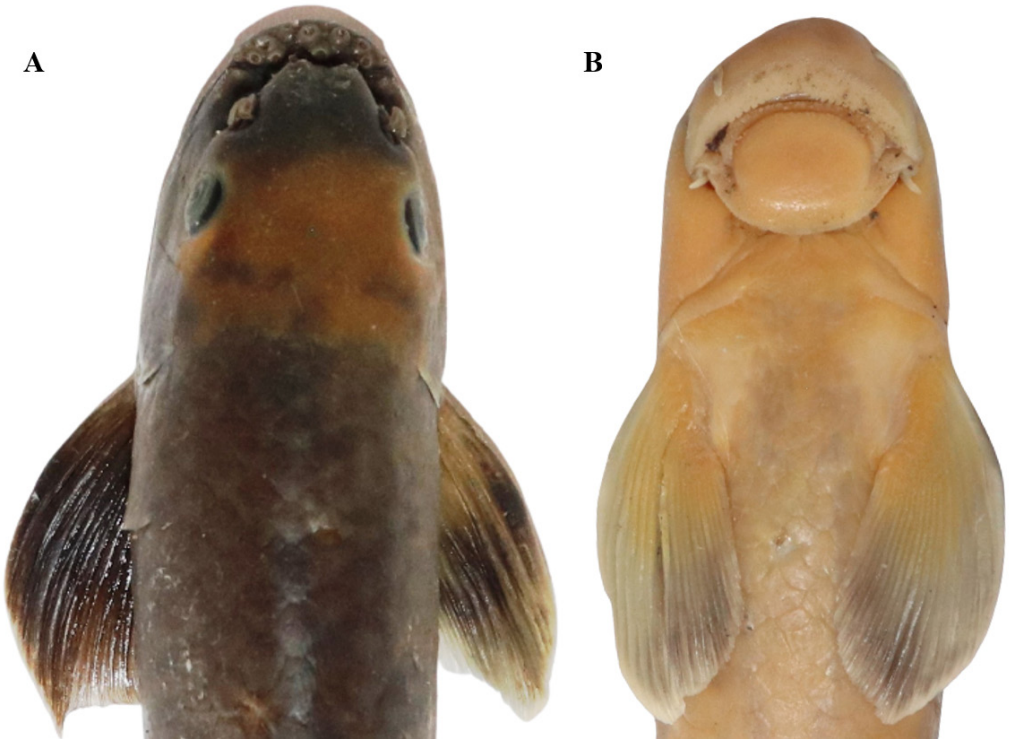

Image 1. *Garra birostris*, NUFM 1302, 113.1 mm SL, Dikhu River in Nagaland: A—dorsal view | B—ventral view. © Metevinu Kechu.

Image 2. *Garra birostris*, ZSI FF 7151, 67.12 mm SL, Doyang River in Nagaland: A—lateral view | B—dorsal view. © Metevinu Kechu.

Discussion

Members of the genus *Garra* shows varied snout morphology (Nebeshwar & Vishwanath 2017). *Garra birostris* specimens collected as part of the present study belonged to group possessing a snout with proboscis (bi-lobed) and a prominent transverse lobe as described by Nebeshwar & Vishwanath (2017). *Garra birostris* is rheophilic cyprinid with a flat belly and the lower lip expanded at its posterior rim to form an oval sucking pad and a greatly diminished vomero-palatine organ.

Table 1. Biometric data of *Garra birostris*. N—number of specimens | SD—standard deviation.

River	Doyang river (n = 04)			Dikhu river (n = 05)		
Locality	**Liphiyan**			**Longleng, Yong**		
Altitudes	**371 m**			**371 m**		
	Range	Mean	SD	Range	Mean	SD
Standard length (mm)	52.7–80.5			113.1–138.7		
In percent of standard length						
Head length	24.1–27.7	25.7	1.5	23.3–25.3	24.4	0.7
Body depth at dorsal fin origin	21.1–23.4	22.2	1.0	20.1–24.9	22.7	1.7
Predorsal length	45.6–47.7	46.4	0.9	44.5–47.4	46.1	1.1
Preanus length	66.3–70.9	68.7	1.9	67.4–72.8	69.4	2.0
Preanal length	59.8–78.3	72.1	8.3	75.1–78.2	76.1	1.2
Prepectoral length	21.9–46.1	28.8	11.6	19.9–23.1	21.7	1.5
Prepelvic length	48.3–53.6	50.7	2.2	49.1–52.3	50.5	1.2
Dorsal-fin base length	15.5–18.7	17.8	1.5	17.1–20.1	18.8	1.1
Dorsal-fin length	23.2–26.4	24.9	1.3	24.1–27.7	25.3	1.4
Pectoral-fin length	22.2–26.4	23.4	2.0	19.3–23.7	21.9	1.6
Pelvic-fin length	18.8–21.1	20.1	1.0	20.1–23.1	21.7	1.2
Anal-fin base length	6.4–9.4	7.5	1.4	7.1–10.0	8.3	1.1
Anal-fin length	18.6–20.7	19.6	1.0	20.3–22.0	21.1	0.8
Vent to anal distance	6.2–7.1	6.5	0.4	5.4–7.1	6.4	0.6
Caudal peduncle length	14.3–20.8	18.7	3.0	15.2–17.2	15.9	0.7
Caudal peduncle depth	12.5–13.8	13.1	0.6	12.3–14.1	13.1	0.6
Caudal fin length (upper lobe)	20.4–26.4	24.3	2.7	24.4–28.1	26.6	1.5
Disc length	9.5–10.8	10.1	0.6	6.3–10.5	8.4	1.6
Disc width	11.4–13.5	12.2	0.9	9.8–13.8	12.2	1.4
Pulvinus length	6.4–6.6	6.5	0.1	3. 1–6.3	5.5	1.3
Pulvinuswidth	8.3–8.6	8.4	0.1	5. 7–9.1	8.1	1.3
In percent of head length						
Head depth at occiput	59.7–75.1	68.8	6.8	67.4–72.1	69.9	1.8
Snout length	47.0–58.6	53.7	5.4	51.2–58.3	53.8	3.2
Interorbital width	33.7–44.8	41.7	5.3	37.9–43.5	41.1	2.1
Eye diameter	22.1–29.2	26.3	3.2	16.1–19.5	17.8	1.5
Disc length	37.4–41.2	39.2	1.6	26.4–43.3	34.5	6.6
Disc width	44.9–50.6	47.6	2.5	41.1–56.9	50.1	6.1
Pulvinus length	23.5–27.0	25.3	1.4	13.2–26.2	22.7	5.3
Pulvinus width	30.0–34.3	32.7	1.8	23.6–36.3	33.2	5.3
Meristic counts	N = 04			N = 05		
Dorsal-fin rays	ii8½			ii8½		
Pectoral-fin rays	i12–14			i14–15		
Pelvic-fin rays	i8			i8		
Anal-fin rays	ii5½			ii5½		
Pre-dorsal scales	10–11			10–11		
Lateral line scales	33–34			33–34		
Transverse scales	4½|1|3½			4½|1|3½		
Circumpeduncular scale rows	16			16		

Garra biloborostris (Roni & Vishwanath, 2017) and *Garra chathensis* (Ezung et al., 2020b) are the closest congeners of *Garra birostris* as they belong to the 'proboscis species-group' with a prominent bilobed proboscis (Nebeshwar & Vishwanath 2017). The presence of large tri- or tetra-cuspid acanthoid tubercles on each lobe in *G. birostris*, three acanthoid tubercles on each lobe in *G. biloborostris*, and large bicuspid acanthoid tubercles on each lobe in *G. chathensis* are the most important characters distinguishing the three species.

In the present study, *G. birostris* was identified based on the large, tri- to tetra-cuspid acanthoid tubercles on each lobe, having 4½|1|3½ transverse scale rows and a black spot at the upper angle of the gill opening. Our specimens of *G. birostris* differed to a certain extent in the characters mentioned in the original description in having fewer dorsal fin ii8½ (vs iii8½) and anal fin rays ii5½ (vs iii5½) which may be to the result of differences in habitat physio-chemistry and climatic conditions.

The first record of *G. birostris* from Nagaland, adds yet another species to Nagaland's ichthyofauna. This species is locally known as Aaghungu in Sumi Naga dialect, Angad in Ao Naga dialect and Engoro in Lotha Naga dialect. The prevailing threats to the fish species and their habitat occur mostly due to over exploitation including using destructive fishing methods, various anthropogenic activities hazards, such as irrigation water for human needs and plastic waste discharge, and sand & boulder mining. Public awareness campaigns among the general public could be the most effective step toward preserving and conserving native fisheries resources. Anthropogenic activities must be regulated, especially those negatively impacting aquatic ecosystems and their resources. It is also necessary to conduct continued research to investigate and document the ichthyofauna in this region, especially from poorly-explored tributaries, as to develop sustainable exploitation and for conservation plans for the fish fauna.

Materials examined

Garra biloborostris: ZSI FF 7928, 2 paratypes, 69.1–75.6 mm; India, Assam, Chirang District, Kanamakra River, Brahmaputra basin, Sewali and Paraty.

Garra chathensis: ZSI FF 8037, holotype, 65.6 mm SL; India: Nagaland: Chathe River, Brahmaputra basin, Ezung et al. (2020)

Garra birostris: Data from Nebeshwar & Vishwanath (2013)

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