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*—*Garra annandalei* Hora, 1921, *Garra gravelyi* Annandale, 1919, *Garra gotyla* Gray, 1830, *Garra kempi* Hora, 1921, *Garra lamta* Hamilton, 1822, *Garra lissorhynchus* McClelland, 1842, *Garra mceillandi* Jerdon, 1849, *Garra notata* Blyth, 1861, *Garra naganensis* Hora, 1921, *Garra nasuta* McClelland, 1838, *Garra rupicola* McClelland, 1839, *Garra chathensis* Ezung, Shangningam & Pankaj, 2020 and *Garra 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).
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°N, 94.0005°E) and Dikhu rivers (26.4506°N, 94.7033°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.

![Figure 1. Collection locations of Garra birostris in the Doyang River and Dikhu River, Nagaland, India.](image-url)
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          |
| Head length     | 24.1–27.7             | 23.3–25.3            | 24.4      | 0.7      |
| Body depth at dorsal fin origin | 21.1–23.4             | 20.1–24.9            | 22.7      | 1.7      |
| Predorsal length | 45.6–47.7             | 44.5–47.4            | 46.1      | 1.1      |
| Preanal length  | 66.3–70.9             | 67.4–72.8            | 69.4      | 2.0      |
| Preanal length  | 59.8–78.3             | 75.1–78.2            | 76.1      | 1.2      |
| Prepectoral length | 21.9–46.1             | 19.9–23.1            | 21.7      | 1.5      |
| Prepelvic length | 48.3–53.6             | 49.1–52.3            | 50.5      | 1.2      |
| Dorsal-fin base length | 15.5–18.7             | 17.1–20.1            | 18.8      | 1.1      |
| Dorsal-fin length | 23.2–26.4             | 24.1–27.7            | 25.3      | 1.4      |
| Pectoral-fin length | 22.2–26.4             | 19.3–23.7            | 21.9      | 1.6      |
| Pelvic-fin length | 18.8–21.1             | 20.1–23.1            | 21.7      | 1.2      |
| Anal-fin base length | 6.4–9.4               | 7.1–10.0             | 8.3       | 1.1      |
| Anal-fin length  | 18.6–20.7             | 20.3–22.0            | 21.1      | 0.8      |
| Vent to anal distance | 6.2–7.1               | 5.4–7.1              | 6.4       | 0.6      |
| Caudal peduncle length | 14.3–20.8             | 15.2–17.2            | 15.9      | 0.7      |
| Caudal peduncle depth | 12.5–13.8             | 12.3–14.1            | 13.1      | 0.6      |
| Caudal fin length (upper lobe) | 20.4–26.4             | 24.4–28.1            | 26.6      | 1.5      |
| Disc length     | 9.5–10.8              | 6.3–10.5             | 8.4       | 1.6      |
| Disc width      | 11.4–13.5             | 9.8–13.8             | 12.2      | 1.4      |
| Pulvinus length | 6.4–6.6               | 3.1–6.3              | 5.5       | 1.3      |
| Pulvinus width | 8.3–8.6               | 5.7–9.1              | 8.1       | 1.3      |
| **In percent of head length** |                   |                     |           |          |
| Head depth at occiput | 59.7–75.1             | 67.4–72.1            | 69.9      | 1.8      |
| Snout length    | 47.0–58.6             | 51.2–58.3            | 53.8      | 3.2      |
| Interorbital width | 33.7–44.8             | 37.9–43.5            | 41.1      | 2.1      |
| Eye diameter    | 22.1–29.2             | 16.1–19.5            | 17.8      | 1.5      |
| Disc length     | 37.4–41.2             | 26.4–43.3            | 34.5      | 6.6      |
| Disc width      | 44.9–50.6             | 41.1–56.9            | 50.1      | 6.1      |
| Pulvinus length | 23.5–27.0             | 13.2–26.2            | 22.7      | 5.3      |
| Pulvinus width | 30.0–34.3             | 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-cuspoid 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-cuspoid acanthoid tubercles on each lobe, having 4½–13½ 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 i8½ (vs iiii8½) and anal fin rays iii5½ (vs iiii5½) 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, Kanamakura River, Brahmaputra basin, Sewalli 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)

References

Basumatary, S., F. Jabeen, A. Dey, H. Choudhury, B. Talukdar, H.K. Kalita & D. Sarma (2017). Length-weight relationships of Garra birostris Nebeshwar & Vishwanath, 2013, Garra annandalei (Hora, 1921), Johnius coltor (Hamilton, 1822) and Raiamas bola (Hamilton, 1822) from the Brahmaputra River basin, Northeast India. Journal of Applied Ichthyology 33(6): 1242–1243.

ESRI (2017). ArcGIS desktop and spatial analyst extension: release 10.5. Environmental Systems Research Institute; Redlands, CA.

Ezung, S., B. Shangningam & P.P. Pankaj (2021). A new fish species of genus Garra (Cyprinidae) from Nagaland, India. Journal of Threatened Taxa 13(6): 18618–18623. https://doi.org/10.11609/jtt.40.5.13.6.18618-18623

Ezung, S., S. Bungdon & P.P. Pankaj (2020). A new fish species of the genus Garra (Teleostei: Cyprinidae) from the Brahmaputra basin, Nagaland, India. Journal of Experimental Zoology, India 23(2): 1333–1339.

Fricke, R., W.N. Eschmeyer & R. van der Laan (2018). Eschmeyer’s Catalog of Fishes: genera, species, references, online version. California Academy of Sciences, San Francisco. Available from: http://researcharchive.calacademy.org/research/ichthyology/catalog/fishticmain.asp (accessed 31 December 2020).

Kottelat, M. (2020a). Ceratogarra, a genus name for Garra camboediensis and G. fasciacauda and comments on the oral and gular soft anatomy in labeonine fishes (Teleostei: Cyprinidae). Raffles Bulletin of Zoology Supplement No. 35: 156–178.

Kottelat, M. (2000b). Diagnoses of a new genus and 64 new species of fishes form Laos (Teleostei: Cyprinidae, Balitoridae, Bagridae, Syngnathidae, Chauhuiridae and Tetradontidae). Journal of South Asian Natural History 5: 37–82.

Nebeshwar, K. & W. Vishwanath (2013). Three new species of Garra (Pisces: Cyprinidae) from north-eastern India and redescriptions of G. gotyla. Ichthyological Exploration of Freshwaters 24(2): 97–120.

Nebeshwar, K. & W. Vishwanath (2017). On the nout and oromandibular morphology of genus Garra, description of two new species from the Koladnye River basin in Mizoram, India, and redescription of G. manipuresis (Teleostei: Cyprinidae). Ichthyological Exploration of Freshwaters 28(1): 17–53.

Roni, N. & W. Vishwanath (2018). A new species of the genus Garra (Teleostei: Cyprinidae) from the Barak River drainage, Manipur, India. Zootaxa 4374(2): 263–272.

Roni, N. & W. Vishwanath (2017). Garra biloborostris, a new labeonine species from north-eastern India (Teleostei: Cyprinidae). Vertebrate Zoology 67(2): 133–137.

Sflassny, M. L. & A. Getahun (2007). An overview of labeonine relationships and the phylogenetic placement of the Afro-Asian genus Garra Hamilton, 1922 (Teleostei: Cyprinidae), with the description of five new species of Garra from Ethiopia, and a key to all African species. Zoological Journal of the Linnean Society 150(1): 41–83.

Thoni, R.I., D.B. Gurung & R.L. Mayden (2016). A review of the genus Garra Hamilton 1822 of Bhutan, including the descriptions of two new species and three additional records (Cypriniformes: Cyprinidae). Zootaxa 4169(1): 115–132.

Vishwanath, W. (2017). Diversity and conservation status of freshwater fishes of the major rivers of northeast India. Aquatic Ecosystem Health & Management 20(1–2): 86–101. https://doi.org/10.1080/14634988.2017.1294947

Zhang, E. & Y.Y. Chen (2002). Garra tengchongensis, a new cyprinid species from the upper Irrawaddy River basin in Yunnan, China (Pisces: Teleostei). Raffles Bulletin of Zoology 50(2): 459–464.
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