

Ichthyofaunal Diversity of the Genus *Garra* in the Jaldhaka River Basin with New Records of *G. birostris* and *G. quadratiostris* from West Bengal, India

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Abstract – Fishes of the genus *Garra* from the Jaldhaka River basin in West Bengal, India, were studied, based on the present survey and available literature. A total of 7 species were recorded, viz., *Garra annandalei*, *G. binduensis*, *G. birostris*, *G. jaldhakaensis*, *G. kempfi*, *G. lamta* and *G. quadratiostris*. Notably, *G. birostris* and *G. quadratiostris* are reported for the first time in West Bengal. Furthermore, *G. binduensis* and *G. jaldhakaensis* are recognised as endemic to the Jaldhaka River in West Bengal, India. These findings not only enhance understanding of the *Garra* species in the region but also highlight the urgent need to conserve them and their habitats. Systematic accounts and a key to the species of *Garra* of the Jaldhaka River in West Bengal are provided.

Keywords – Cyprinidae, *Garra*, new record, West Bengal.

I. INTRODUCTION

The cyprinid fish genus *Garra* includes bottom dwelling fishes usually found in fast flowing streams where they cling to rocks using the highly modified mouth which acts as a sucker (Kullander & Fang, 2024). They are found in Africa, and southwest, south, southeast and east Asia. Species of *Garra* in south, southeast and east Asia are found in habitats with strong current, such as rapids, torrents and waterfalls, usually solitary under rocks or among stones and boulders. Most have a dull brown to black body with more or less distinct darker stripes between scale rows on the posterior half of the body (Kottelat, 2020). So far, 9 species of *Garra* are reported from West Bengal, viz. *G. annandalei* Hora, 1921; *G. arupi* Nebeshwar et al., 2009; *G. gotyla* (Gray, 1830), *G. jaldhakaensis* Kosygin et al., 2021; *G. kempfi* Hora, 1921,

G. lamta (Hamilton, 1822), *G. lissorhynchus* (McClelland, 1842); *G. mullya* (Sykes 1839); and *G. nasuta*, (McClelland, 1838) (Mogalekar et al., 2017; Sen & Sreeraj, 2023).

During an Ichthyofaunal survey in the Jaldhaka River in West Bengal, India, seven species of *Garra* were recorded. The Jaldhaka River is a transboundary river earlier known as the Dichu River and is one of the six major rivers of the Darjeeling Himalayas. It makes a natural boundary between India and Bhutan. It originates from the Kupup or Bitang Lake in southeastern Sikkim in the Eastern Himalayas and flows through Bhutan and West Bengal, India. The river has a total length of 233 kilometres. After mainly flowing through the Kalimpong, Jalpaiguri and Cooch Behar districts of West Bengal, India, it

enters Bangladesh through the Lalonirhat district, where it is known as the Dharla River. Later it joins with the Brahmaputra River in the Kurigram district of Bangladesh (Murshed, 2012). Out of 7 species of *Garra* reported from the Jaldhaka River, *G. birostris* and *G. quadratiostris* are reported here for the first time from West Bengal in India.

II. METHODOLOGY

Fishes of the genus *Garra* from the Jaldhaka River in West Bengal, India, were collected from 2017 to 2021, based on the present survey and available literature.

2.1. Collection and preservation

Fish specimens were collected using different types of nets and traditional fishing methods used by the local fisherman from the Jaldhaka River. Geographical locations and altitudes were recorded using GPS for all the collection sites. The Colour of the fish and habitat information were recorded in the field. All the collected fish specimens were fixed and preserved in 10% formalin and later transferred to 70% alcohol in the laboratory.

2.2. Identification

Fish were identified following Jayaram (2010), Talwar and Jhingran (1991) and by consulting the relevant literature. Species were confirmed after comparing with the type and other specimens in the National Zoological Collections (NZC) of Zoological Survey of India, Kolkata and Manipur University Museum of Fishes, Imphal.

2.3. Cataloguing

All the specimens identified are kept in museum jars with a label containing information like registration No., locality, date of collection, collected by, number of examples etc. All the specimens collected and identified are registered and deposited in the National Zoological Collection (NZC) of the Zoological Survey of India, Kolkata.

III. RESULTS AND DISCUSSION

A total of seven species of the genus *Garra* have been recorded from the Jaldhaka River in West Bengal, India: *Garra annandalei*, *G. binduensis*, *G. birostris*, *G. jaldhakaensis*, *G. kempfi*, *G. lamta*, and *G. quadratiostris*. Among these, *G. birostris* and *G. quadratiostris* were originally described from Arunachal Pradesh and

Sikkim, respectively. *Garra birostris* has also been reported from Bhutan, while *G. quadratiostris* is currently known only from Arunachal Pradesh in India. In this study, both species are reported for the first time in West Bengal, India and their distribution is extended to West Bengal. Sarkar and Pal (2018) identified *Garra mccllellandi* in the Jaldhaka River. Since *G. mccllellandi* is considered endemic to the Cauvery River drainage in southern peninsular India (Fricke *et al.*, 2026), its presence in West Bengal remains uncertain. During the current survey, no specimens of *G. mccllellandi* were collected. Therefore, further studies are necessary to confirm the distribution of species in the Jaldhaka River. Additionally, *G. binduensis* and *G. jaldhakaensis* are considered endemic to the Jaldhaka River in West Bengal, India. These findings enhance our understanding of the genus *Garra* and highlight the urgent need to conserve these species and their habitats.

Systematic accounts of species of the genus *Garra* of the Jaldhaka River are furnished below:

Genus: *Garra* Hamilton, 1822

Garra Hamilton, 1822: 343, 393 (subgenus of *Cyprinus* Linnaeus, 1758: 320; type species: *Cyprinus lamta* Hamilton, by subsequent designation).

Body cylindrical, head slightly depressed. Mouth inferior, semicircular. Lips thick, fleshy. Lower lip forms a suctorial disc on chin consisting of a semi cartilaginous pad. The rostral fold hypertrophied, its free margin invaginated to fimbriate, expanded over the upper jaw and premaxilla, connected to lower lip at corner of mouth. Upper lip absent or vestigially present; lower lip expanded posteriorly to form an ovoid or circular adhesive disc with a callous pad in the middle.

The genus *Garra* is represented by seven species in the Jaldhaka River and its tributaries.

Garra annandalei (Hora, 1921)

Garra annandalei Hora, 1921. *Rec. Indian Mus.*, 22 (5):657. (Type locality: Mahananda river, below Darjeeling, India).

Common Name: Annandale Garra.

IUCN Status: Least Concern (LC).

Material examined: ZSI FF 5655, 3 ex., 82.5-113.1 mm SL, India, West Bengal, Jaldhaka River, Bindu,

Darjeeling, 2-3-2016, Coll. Ujjal Das; ZSI FF 7241, 1 ex., 107 mm SL, India, West Bengal, Jhalong River, Darjeeling, North Bengal 17-9 2011, Coll. Ujjal Das; ZSI FF 7810, 2 ex., 85.8-87 mm SL, India, West Bengal, Jhalong, Jaldhaka River, Kalimpong, North Bengal, 9-4-2018, Coll. Ujjal Das; ZSI FF 7879, 2 ex., 73.8-76.1 mm SL, India, West Bengal, Murti River, Chalsa, Jalpaiguri, North Bengal, 8-4-2018, Coll. Ujjal Das; ZSI FF 7925, 1 ex., 52 mm SL, India, West Bengal, Diana River, Chengmari, Jalpaiguri, North Bengal, 6-4-2018, Coll. Ujjal Das; ZSI FF 7991, 1 ex., 54.8 mm SL, India, West Bengal, Murti River, Chalsa, Jalpaiguri, 28-10-2017, Coll. Ujjal Das; ZSI FF 8208, 1 ex., 54.8 mm SL, India, West Bengal, Jaldhaka River, Nagrakata, Jalpaiguri, 27-3-2019, Coll. Ujjal Das; ZSI FF 8736, 1 ex., 39.2 mm SL, India, West Bengal, Mujnai River, a tributary of Jaldhaka River Madhya chhekari, Alipurduar District, West Bengal, 15-2-2021, Coll. L.K. Singh.

Distribution: West Bengal, Bihar, Assam. Elsewhere: Bangladesh and Nepal.

Remarks: *Garra annandalei* is abundant and widely distributed in the Jaldhaka River in West Bengal.

***Garra binduensis* Das, Kosygin & Panigrahi, 2016**

Garra binduensis Das, Kosygin & Panigrahi, 2016. *Bioglobia*, 3(1):52-58.(Jaldhaka River at Bindu near Jaldhaka Hydrel complex, Brahmaputra River basin, North Bengal, Darjeeling district, West Bengal).

Common Name: Jaldhaka Garra.

IUCN Status: Not Evaluated.

Material examined: ZSI FF 5623, 1 ex., 54.8 mm SL, India, West Bengal, Jaldhaka River, Bindu, Darjeeling, 28-8-2015, Coll. Ujjal Das; ZSI FF 5624, 9 ex., 54.8 mm SL, India, West Bengal, Jaldhaka River, Bindu, Darjeeling, 28-8-2015, Coll. Ujjal Das; ZSI FF 5772, 4 ex., 64.2-107.2 mm SL, India, West Bengal, Jaldhaka River, Bindu, Darjeeling, 2-3-2016, Coll. Ujjal Das; ZSI FF 7242, 2 ex., 48-80 mm SL, India, West Bengal, Jhalong River, Darjeeling, 17-9-2011, Coll. Ujjal Das; ZSI FF 8306, 5 ex., 54.8 mm SL, India, West Bengal, Jaldhaka River, Bindu, Darjeeling, North Bengal, 31-10-2017, Coll. Ujjal Das.

Distribution: West Bengal. Elsewhere: Nil.

Remarks: *Garra binduensis* was described by Das et al. (2016) from the Jaldhaka River at Bindu, West Bengal. The development of the proboscis on the

snout is an interesting adaptation to rapid running waters. The characteristics of the proboscis, distribution pattern of the tubercles and the transverse lobe on the snout are of taxonomic significance in distinguishing species of the genus (Nebeshwar & Vishwanath 2013, 2017). Based on the snout and oromandibular morphology, *Garra binduensis* belongs to the snout with a proboscis and transverse lobe species group. It is endemic to the Jaldhaka River in West Bengal, India.

***Garra birostris* Nebeshwar & Vishwanath, 2013**

(Fig. 1)

Garra birostris Nebeshwar & Vishwanath, 2013. *Ichthyol. Explor. Freshwater*: 24; 104, fig.5. (Type locality: Papum Pare district, Dikrong River at Doimukh, Brahmaputra basin, Arunachal Pradesh, India).



Fig. 1. *Garra birostris* Nebeshwar & Vishwanath, 2013.

Common Name: Not available.

IUCN Status: Not Evaluated.

Material examined: ZSI FF 7172, 1 ex., 102 mm SL, India, West Bengal, Jaldhaka River, Bindu, Darjeeling, 2-3-2016, Coll. Ujjal Das.

Distribution: West Bengal, Arunachal Pradesh and Manipur. 39 Elsewhere: NA.

Remarks: *Garra birostris* is characterised by a bilobed proboscis on its snout. It is a new record for West Bengal. In the Jaldhaka River, it has been observed upstream.

***Garra jaldhakaensis* Kosygin, Shangningam, Singh & Das, 2021**

Garra jaldhakaensis Kosygin, Shangningam, Singh & Das, 2021. *Rec. zool. Surv. India*, 121 (3): 325-331 (type locality: Jaldhaka River, Kalimpong District, West Bengal).

Common Name: Not available.

IUCN Status: Not Evaluated.

Material examined: ZSI FF 8126, holotype, 97.2 mm SL, India, West Bengal, Kalimpong district, Jaldhaka River near Jhalong, Brahmaputra River Drainage, 27°02'39' N 88°52'71'E, elevation 1,220 ft. 09.iv.2018, coll. Ujjal Das; ZSI FF 8127, paratypes: 3 exs., 84.3-95.3 mm SL, same locality and label data as holotype.

Distribution: West Bengal. Elsewhere: Nil.

Remarks: *Garra jaldhakaensis* was described by Kosygin et al. (2021) from the Jaldhaka River. Its distribution is confined to the upstream region (>300 m asl) of the Jaldhaka River, and it is endemic to this river in West Bengal, India.

***Garra kemp* Hora, 1921**

Garra kemp Hora, 1921. *Rec. Indian Mus.*: 665, pl. 26; fig.3, 3a. (Type locality: Siyom River, below Damda, among the abor Hills, Assam).

Common Name: Kemp Garra.

IUCN Status: Least Concern.

Material examined: Nil.

Distribution: West Bengal, Assam, Arunachal Pradesh and Manipur. Elsewhere: NA.

Remarks: *Garra kemp* is a widely distributed fish in northeastern India. No specimens were collected during the present survey from the Jaldhaka River. Dey et al. (2015) reported it from the river and its tributaries.

***Garra lamta* (Hamilton, 1822)**

Cyprinus lamta Hamilton, 1822. *Fishes of Ganges*: 343, 393. (Type locality: Rapti river, Gorakhpur, India).

Common Name: Lamta Garra.

IUCN Status: Least Concern.

Material examined: Nil.

Distribution: West Bengal, Uttar Pradesh, Assam, Manipur and Sikkim. Elsewhere: Nepal.

Remarks: The species has a deep transverse groove marking off the tip of the snout, and a dark lateral band on the body is bordered above and below by light pale stripes in the posterior region. No specimens were collected during the present survey. It was reported by Dey et al. (2015) from the Jaldhaka River in West Bengal.

***Garra quadratiostris* Nebeshwar & Vishwanath 2013**

(Fig. 2)

Garra quadratiostris Nebeshwar & Vishwanath, 2013. *Ichthyol. Explor. Freshwater*: 107, fig.6. (Type locality: Sikkim, Tista River at Rangpo, Ganga basin).



Fig. 2. *Garra quadratiostris* Nebeshwar & Vishwanath 2013.

Common Name: Not available.

IUCN Status: Not Evaluated.

Material examined: ZSI FF 7938, 4 ex., 68.8- 80 mm SL, India, West Bengal, Jaldhaka River, Bindu, Darjeeling, North Bengal, 4-3-2016, Coll. Ujjal Das.

Distribution: West Bengal, Arunachal Pradesh.

Elsewhere: NA.

Remarks: *Garra quadratiostris* has a prominent quadrate proboscis on the snout. The anterior margin of the proboscis is separated from the depressed rostral surface by a distinct groove. This species was collected from upstream (over 300 meters above sea level) of the Jaldhaka River and reported here as a new record for West Bengal.

Key to species of *Garra* from the Jaldhaka River in West Bengal:

1. Snout with proboscis and transverse lobe or only transverse lobe..... 2
Snout without proboscis and transverse lobe *G. annandalei*
2. Snout with proboscis and transverse lobe..... 3
Snout with only a transverse lobe 6
3. Proboscis bilobed *G. birostris*
Proboscis quadrate, not lobed 4
4. Anterior margin of proboscis not delineated from the depressed rostral surface by a

groove.....G.
binduensis

Anterior margin of proboscis delineated from the depressed rostral surface by a groove 5

5. Lateral line scales 37; circumpeduncular scales 12 G. *quadratiostris* Lateral line scales 33; circumpeduncular scales 16 G. *jaldhakaensis*
6. Predorsal scales 12-14; lateral line scales 38-40..... G. *kempi*
Predorsal scales 8-10; lateral line scales 31-34..... G. *lamta*

IV. CONCLUSION

The investigation of the *Garra* species in the Jaldhaka River basin has provided crucial insights into the biodiversity of freshwater ecosystems in West Bengal, India. The report of seven species, including two previously unreported species, *Garra birostris* and *G. quadratiostris* underscores the ecological significance of this region and the necessity for ongoing surveys to document and preserve freshwater biodiversity. Furthermore, *G. binduensis* and *G. jaldhakaensis* are considered endemic to the Jaldhaka River in West Bengal. The findings not only advance our understanding of the genus *Garra* but also underscore the urgent need to conserve these species and their habitats. The systematic accounts and identification key developed in this study will serve as essential tools for future research and conservation initiatives, ultimately aiding in the preservation of aquatic biodiversity in the region.

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