

Garra chindwinensis, a new species of cyprinid fish (Teleostei: Cypriniformes) from Manipur, Northeastern India

Nongthombam Premananda¹, Laishram Kosygin^{2*} and Bano Saidullah³

¹Zoology Department, Presidency College, Motbung – 795107, Manipur, India; nong.prem@yahoo.in

²Freshwater Fish Section, Zoological Survey of India, 27 J.L. Nehru Road, Kolkata – 700016, India; lkzsi5@yahoo.com

³Department of Life Sciences, Indira Gandhi National Open University, New Delhi – 110068, India;
banosaidullah@hotmail.com

Abstract

A new species *Garra chindwinensis* i.e., of cyprinid fish is described from the Chindwin basin in Manipur, northeast India. The details on their diagnosis, description, colour, morphometric data and distribution are also provided.

Keywords: Chindwin basin, Manipur, New cyprinid

Introduction

The labeonine cyprinid genus *Garra* are elongate, small to medium-sized, bottom-dwelling fishes usually found in hill streams and fast flowing rivers, where they adhere to the rocky bottom surface with the help of highly modified lower lip, acting as sucker (Zi-ming *et al.*, 2009). It is widely distributed from the northern and central Africa to Southeast Asia through the Middle East, Southern China and South Asia. So far, nineteen species of the genus *Garra* are reported from the headwaters of the Chindwin-Irrawaddy in India and Myanmar of which 8 species viz., *G. bispinosa*, *G. cornigera*, *G. elongata*, *G. gravelyi*, *G. litanensis*, *G. rotundinatus*, *G. qiaojiensis* and *G. trilobata* bear proboscis on the snout (Shangningam and Vishwanath, 2015). A collection of fishes from the Laniye River, a tributary of the Chindwin River in Senapati District of Manipur, included an undescribed species of *Garra* with a proboscis, which are herein described as *G. chindwinensis*.

Material and Methods

Fish samplings were carried out using an electrofishing device, in shallow rapid running water. The specimens were fixed in 10% formalin at the site and then transferred to 70% ethanol. Measurements were made point to point with a slide caliper and data recorded to tenths of a millimeter. Counts, measurements, and terminology follow Nebeshwar and Vishwanath (2013). Fin rays were counted under a stereo-zoom binocular microscope. The number in parenthesis following a count indicates the frequency of that count. Specimens are deposited in the Zoological Survey of India, Kolkata (ZSI) and Presidency College Zoological Museum, Motbung (PCZM).

Garra chindwinensis sp. nov.

(Figure 1)

Materials examined: Holotype: 120 mm SL, India, Manipur, Senapati District, Laniye River near Laii, (Chindwin basin), 25°31'20"N 93°26'13"E, 05-xi-2015, coll. N. Premananda

* Author for correspondence

(ZSI FF 5906). *Paratype*: 1 ex., 104 mm SL, data same as holotype (PCZM F 1050).

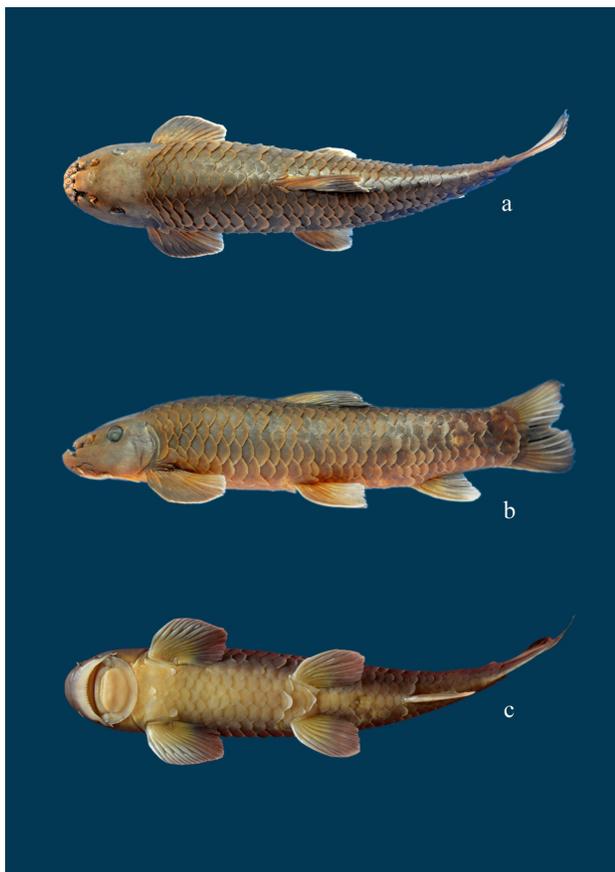


Figure 1. *Garra chindwinensis* sp. nov. (Holotype, ZSI FF 5906, 120 mm SL). (a). dorsal view, (b). lateral view, (c). ventral view.

Diagnosis: *Garra chindwinensis* is distinguished from its congeners in possessing a callous pad with a narrow, papillated transverse lobe at the anterior portion, which is demarcated posteriorly by a transverse groove. It is further, distinguished from its congeners by the following combination of characters: a bilobed proboscis, protruding beyond vertically to transverse groove; presence of only unicuspid acanthoid tubercles on snout; 10 predorsal scales; 34 lateral line scales; 2½ transverse scale rows between lateral line and pelvic fin origin; 12 circumpeduncular scale rows; head length (25.4–26.2% SL); pectoral fin length (19.2–19.4% SL); disc length (39–41% HL); presence of anterolateral lobe and five faint longitudinal stripes on the body.

Description: Morphometric data in Table 1. Body elongated, more or less cylindrical, compressed laterally in caudal

peduncle region. Dorsal profile rising gently overhead, sharply convex up to dorsal-fin origin, then straight up to caudal fin base. Ventral profile flat up to anal fin origin. Head moderately large and depressed, with slightly convex interorbital space; height less than length; width greater than height. Snout moderately pointed with transverse lobe covered with 10–11 small to moderate unicuspid tubercles, demarcated posteriorly by deep transverse groove. Proboscis prominent, quadrate, anteriorly bilobed, forwardly protruding beyond vertically to transverse groove, each lobe with a large forwardly projecting unicuspid acanthoid tubercle on the distal end, one small tubercle present between lobes directing downwards, sharply delineated from depressed rostral surface by deep transverse groove; width smaller than internarial space; and lateral margin with or without tubercle (Figure 2). Depressed rostral surface slightly bulgy. Eye placed dorsolaterally in posterior half of head. Sublachrymal groove shallow not connected to rostral cap groove.



Figure 2. Head of *Garra chindwinensis* showing proboscis (Holotype, ZSI FF 5906, 120 mm SL). (a). dorsal view; (b). lateral view.

Table 1. Morphometric data of *Garra chindwinensis*

	Holotype (ZSI FF 5906)	Paratype (PCZM F 1150)
Standard length (in mm)	120	104
In percentage of standard length		
Head length	25.4	26.2
Body depth at dorsal fin origin	20.8	22.1
Predorsal length	49.6	50.0
Preanus length	69.2	68.8
Preanal length	79.2	76.9
Prepectoral length	21.8	21.0
Prepelvic length	53.3	52.9
Dorsal fin base length	14.3	15.9
Dorsal fin length	20	22.6
Pectoral fin length	19.2	19.4
Pelvic fin length	17.5	19.4
Anal fin base length	7.7	7.5
Anal fin length	17.3	16.7
Vent to anal distance	9.6	10.1
Caudal peduncle length	15.4	13.5
Caudal peduncle depth	13.8	13.5
Caudal fin length (upper lobe)	24.6	26.9
Mental adhesive disc length	10.3	10.1
Mental adhesive disc width	15.8	14.9
Callous pad length	6.8	6.7
Callous pad width	10.4	9.1
% Head length		
Head depth at occiput	55	58
Snout length	53	52
Interorbital width	46	46
Eye diameter	14	15
Mental adhesive disc length	41	39
Mental adhesive disc width	61	57
% Caudal peduncle length		
Caudal peduncle depth	89.2	100

Barbels in two pairs; rostral barbel anterolaterally located, equal to eye diameter; maxillary barbel at corner of mouth, shorter than rostral. Rostral cap well-developed, highly fimbriate, papillate ventral surface moderately wide. Upper lip present as a thin band of weakly developed papillae in one row, incompletely covered by rostral cap. Disc elliptical, shorter than width and slightly narrower than head, width through roots of maxillary barbels; papillae on posteromedian region of anteromedian fold larger; papillae on inner half of whole length of lateroposterior flap larger and coarsely arranged; anterolateral lobe of lower lip present. Central callous pad with a narrow, papillated transverse lobe at anterior

portion, demarcated posteriorly by a shallow transverse groove, anteriorly separated from the anteromedian fold by a deep transverse groove (Figure 3).

Dorsal fin with 3(2) simple and 8½(2) branched rays; last simple ray much shorter than head length; distal margin concave; origin midway between snout tip and caudal fin base, inserted anterior to vertical from pelvic fin origin; first branched ray longest, last branched ray not extending vertically to anal fin origin. Pectoral fin with 1(2) simple and 13(1) or 14(1) branched rays, reaching midway to pelvic fin origin when adpressed; length shorter than head length; sixth branched ray longest. Pelvic fin with 1(2) simple and 7(1) or 8(1) branched rays, reaching



Figure 3. Mental adhesive disc of *Garra chindwinensis*, (Paratype, PCZM F 1050, 104 mm SL).

beyond midway to anal fin origin, surpassing anus when adpressed; second branched ray longest; inserted below base of second branched dorsal fin ray; distal margin almost truncate. Anal fin short with 2(2) simple rays and 5(2) branched rays, first branched ray longest, not reaching caudal fin base; distal posterior margin slightly concave; origin closer to caudal fin base than to pelvic fin origin. Anus closer to anal fin origin than to pelvic fin origin. Caudal fin forked; lobe tips pointed; lower lobe slightly longer; tenth principal ray shortest.

Lateral line complete, with 34(2) scales. Transverse scale rows above lateral line $3\frac{1}{2}$ (1) or $4\frac{1}{2}$ (1); between lateral line and pelvic fin origin $2\frac{1}{2}$ (2); between lateral line and anal fin origin $3\frac{1}{2}$ (2). Circumpeduncular scale rows 12. Predorsal scales 10(2); scales regularly arranged almost same size as flank scales. Chest and belly scaled. One long axillary scale at base of pelvic fin dorsolaterally, its tip not reaching posterior end of pelvic fin base; another axillary scale present ventrally at posterior end of pelvic fin base. Preanal scales 4. Dorsal fin base scales 6, of which 4 are touching the dorsal fin; anal fin base scales 3, all touching the anal fin.

Colour: In live, head, dorsum and lateral sides yellowish brown, ventral greyish brown, distal margins of caudal fin lobes blackish. In alcohol, head, dorsum, and lateral sides dark brown. Mouth, chest and abdomen brownish to yellowish white. Ventral surface from rostral cap to anal fin origin brownish grey. Five faint longitudinal stripes present along the lateral side of the body, extending from operculum to caudal fin base, which becomes more distinct posteriorly. Posterior margins of pelvic and anal fins hyaline. Caudal fin with black markings on median rays and tips of the lobes.

Distribution: Known only from Laniye River at Laii village in Senapati District of Manipur (Chindwin River basin) (Figure 4).

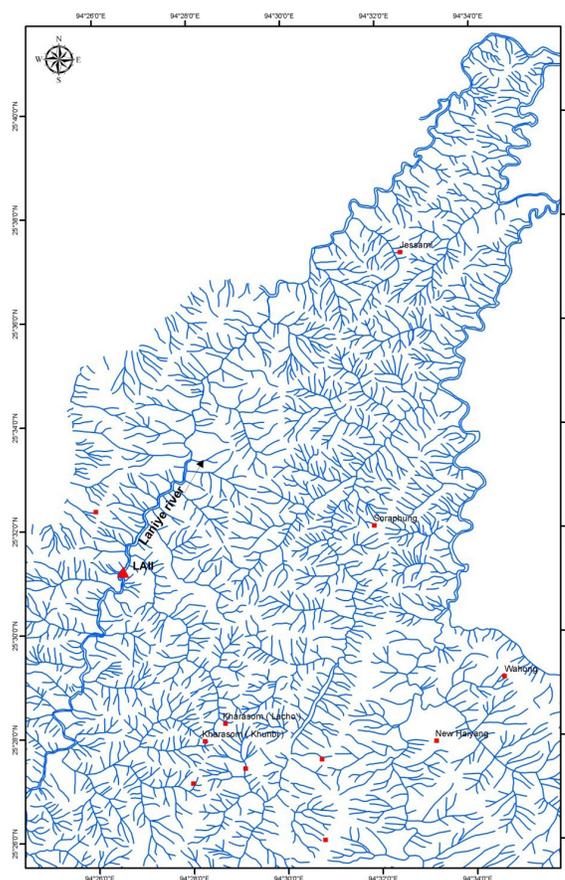


Figure 4. Map showing type locality of *Garra chindwinensis* (▲).

Etymology: The specific name is derived after the name of the basin, *Chindwin*.

Discussion

In the genus *Garra*, the general shape differences of the proboscis, and the distribution and shapes of tubercles are significant characters utilized for distinguishing species (Zhang, 2005; Nebeshwar and Vishwanath, 2013). Since fishes of the genus *Garra* species are typically specialized rheophilic and restricted to one or adjacent river basin, our comparisons of *G. chindwinensis* is, therefore, restricted to congeners with proboscis on snout from the Chindwin-Irrawaddy River basin. We have also compared *G. chindwinensis* with other similar congeners with proboscis from the neighboring Brahmaputra basin and species currently recognized from China and Southeast Asia.

Garra chindwinensis is distinguished from its congeners by the presence (vs. absence) of a narrow, papillated transverse lobe at the anterior portion of the central callous pad, which is demarcated posteriorly by a transverse groove. Further, it is distinguished from its congeners of the Chindwin-Irrawaddy basin, except *G. bispinosa* and *G. cornigera*, in having a bilobed proboscis (vs. unilobed in *G. litanensis*, *G. rotundinasus*, and *G. qiaojiensis*; vs. trilobed in *G. trilobata*; vs. incipient in *G. elongata* and *G. gravely*). It differs from *G. bispinosa* in having a longer head (25.4–26.2% SL vs. 22.6–24.6), smaller eye diameter (14–15 % HL vs. 17.9–21.7), rostral barbel equal (vs. shorter) to eye diameter; longer predorsal length (49.6–50.0% SL vs. 44.0–48.0), fewer unbranched dorsal fin rays (3 vs. 4), shorter anal fin length (16.7–17.2 % SL vs. 17.3–19.6), fewer circumpeduncular scale rows (12 vs. 16) and more longitudinal stripes on the lateral side of the body (5 vs. 3 or 4); from *G. cornigera* in having more lateral line scales (34 vs. 33), fewer transverse scale rows between lateral line and pelvic fin origin (2½ vs. 3½), fewer circumpeduncular scale rows (12 vs. 14), proboscis extending (vs. not extending) beyond vertically to transverse groove, presence (vs. absence) of anterolateral lobe; absence (vs. presence) of transverse ridges on rostral depressed surface, and sublachrymal groove not confluent (vs. confluent) to lateral groove of rostral cap. *Garra chindwinensis* is further distinguished from *G. elongata* in having fewer lateral line scales (34 vs. 39–40), fewer predorsal scales (10 vs. 13) and scaled (vs. naked) chest; from *G. gravely* in having fewer unbranched dorsal fin rays (3 vs. 4), fewer lateral line scales (34 vs. 36–37); from *G. litanensis* in the presence (vs. absence)

of scales on the chest and fewer scales between dorsal fin origin and lateral line scales (3½ or 4½ vs. 5½) and absence (vs. presence) of black spot along the base of the dorsal fin; from *G. rotundinasus* in having longer head (25.4–26.2% SL vs. 19.9–21.7), fewer lateral line scales (34 vs. 36–37) and a smaller disc (length 39–41% HL vs. 46–60; width 57–61% HL vs. 68–82); from *G. qiaojiensis* in having a longer head (25.4–26.2% SL vs. 21.8–23.9), fewer unbranched dorsal fin rays (3 vs. 4) and a smaller mental disc (length 39–41% HL vs. 48–55; width 57–61% HL vs. 62–70); and from *G. trilobata* in having only unicuspid (vs. uni- to tetracuspid) acanthoid tubercles on snout, longer disc length (39–41% HL vs. 20–34), sublachrymal groove not confluent (vs. confluent) to lateral groove of rostral cap, and presence (absence) of anterolateral lobe.

Garra chindwinensis is distinguished from its congeners with proboscis on the snout, occurring in the Brahmaputra basin, except *G. birostris* and *G. gotyla*, in having a bilobed proboscis (vs. unilobed in *G. arunachalensis*, *G. lamta*, *G. parastenorhynchus* and *G. quadratirostrus*; vs. trilobed in *G. nasuta* and *G. tamangi*; vs. incipient or weakly developed in *G. alticaputus*, *G. bimaculacauda*, *G. kalpangi*, *G. kimini* and *G. nigricauda*) with two large unicuspid acanthoid tubercles. *Garra chindwinensis* can be easily distinguished from *G. birostris* in having feebly (vs. prominently) bilobed proboscis, each lobe short and blunt with a large unicuspid (vs. tri- or tetracuspid) acanthoid tubercle on the distal end, shorter pectoral fin (length 19.2–19.4% SL vs. 21.0–23.9), shorter dorsal fin base length (14.3–15.9% SL vs. 17.5–19.7), shorter anal fin (length 16.7–17.3% SL vs. 18.0–21.5), last dorsal fin simple ray shorter than HL (vs. equal), and dorsal body profile to dorsal fin origin sharply convex (vs. straight), and from *G. gotyla* in having a proboscis extending (vs. not extending) beyond vertically to transverse groove, rostral barbel equal to (vs. shorter than) eye diameter, upper jaw incompletely (vs. entirely) covered by rostral cap, fewer transverse scale rows between lateral line and anal fin origin (3½ vs. 4½), fewer circumpeduncular scale rows (12 vs. 16), and absence (vs. presence) of a black spot at the upper angle of the gill opening. The new species further differs from *G. alticaputus* in having more lateral line scales (34 vs. 33), fewer scales rows between lateral line and pelvic fin origin (2½ vs. 3½) and fewer circumpeduncular scale rows (12 vs. 16); from *G. arunachalensis* in having shallower body (body depth at dorsal fin origin 20.8–22.1% SL vs.

22.3–25.4), deeper caudal peduncle (14.0–16.5 % SL vs. 11.7–12.9), shorter dorsal fin base (14.3–15.9% SL vs. 16.4–17.6), shorter pectoral fin (19.2–19.4% SL vs. 22.3–26.5), and shorter anal fin (16.7–17.3% SL vs. 19.3–22.7); from *G. bimaculacauda* in having deeper body (20.8–22.1 vs. 19.2–20.3), and by absence (vs. presence) of two distinct black spots on the caudal fin; from *G. kalpangi* in having fewer circumpeduncular scale rows (12 vs. 16), presence (vs. absence) of transverse groove at tip of snout, and more lateral line scales (34 vs. 32–33); from *G. kimini* by presence (vs. absence) of scales on chest, fewer scales rows between lateral line and pelvic fin origin (2½ vs. 3½) and fewer circumpeduncular scale rows (12 vs. 16); from *G. nigricauda* in having deeper caudal peduncle (13.5–13.8% SL vs. 11.5–12.4), longer predorsal length (49.6–50.0% SL vs. 45.0–48.7), and by the absence (vs. presence) of a distinct subterminal stripe in each caudal lobe; from *G. lamta* in having fewer transverse scale rows between lateral line and pelvic fin origin (2½ vs. 3½ or 4), and absence (vs. presence) of a black spot at the base of the caudal fin; from *G. parastenorhynchus* in having more lateral line scales (34 vs. 31–32), fewer circumpeduncular scale rows (12 vs. 16), and shorter head (25.4–26.2% SL vs. 28.5–30.7); from *G. quadratirostris* in having fewer lateral line scales (34 vs. 37), fewer preanal scales (4 vs. 6–7), fewer tubercles on transverse lobe (10–11 vs. 13–20), shorter dorsal fin base length (14.3–15.9% SL vs. 17.1–18.4), shorter dorsal fin (20.0–22.6% SL vs. 24.1–27.1), shorter pectoral fin (19.2–19.4% SL vs. 21.0–24.6), and shorter anal fin (16.7–17.3% SL vs. 20.5–24.9); and from *G. nasuta* by absence (vs. presence) of a distinct pit between the nares, longer head length (25.4–26.2% SL vs. 23.4–24.6), greater vent to anal-fin origin distance (9.6–10.1 % SL vs. 8.3–9.4), fewer transverse scale rows between lateral line and pelvic fin origin (2½ vs. 3½).

Gurumayum and Kosygin (2015) described *Garra tamangi* from Arunachal Pradesh. *Garra chindwinensis* can be distinguished from *G. tamangi* in having transverse lobe of proboscis with 10–11 (vs. 15–25) unicuspid (vs. uni- to tetracuspid) acanthoid tubercles; 2–3 (vs. 5–17) small tubercles on the lateral margin of the proboscis; shorter dorsal fin (20.0–22.6% SL vs. 24.5–29.1), shorter pectoral fin (19.2–19.4% SL vs. 22.1–25.1), shorter anal fin (16.7–17.3% SL vs. 19.0–20.6), longer vent to anal distance (9.6–10.1% SL vs. 5.0–6.7); shorter snout (52% HL vs. 56.0–58.0); sublachrymal groove not confluent (vs. confluent) to rostral cap groove.

Garra chindwinensis is also closely associated with *G. bourreti*, *G. cyrano*, *G. orientalis*, *G. salweenica* and *G. fuliginosa* which are currently recognized from China and Southeast Asia in having a conspicuous and tuberculated proboscis on the snout (Shangningam and Vishwanath, 2015). The new species can be easily distinguished from *G. bourreti*, *G. orientalis*, *G. salweenica* and *G. fuliginosa* in having a bilobed (vs. trilobed) proboscis. Further, *G. chindwinensis* differs from *G. bourreti* in having fewer branched dorsal fin rays (3 vs. 4) and a shorter dorsal fin (length 20.0–22.6% SL vs. 41.1–52.5); from *G. cyrano* in having fewer transverse scale row below lateral line (2½ vs. 5½) and presence of 5 (vs. 6) faint longitudinal stripes on posterior portion of the body; from *G. orientalis* in having fewer circumpeduncular scales (12 vs. 14–15); from *G. salweenica* in having fewer circumpeduncular scales (12 vs. 16), and absence (vs. presence) of a black mark at tip of the upper caudal fin lobe; from *G. fuliginosa* by absence (vs. presence) of a dark blotch on the caudal peduncle.

Fishes of the genus *Garra* are well adapted to the fast flowing rivers and streams by clinging to the rocky substratum, mainly by means of the suctorial mental disc modified from the lower lip (Menon, 1964; Shangningam and Vishwanath, 2015). *Garra chindwinensis* seems to be more specialized rheophilic species among the species of the genus, as it has developed an additional papillated adhesive transverse lobe at the anterior region of the callous pad, which is demarcated posteriorly from the remaining portion by a transverse groove.

Comparative materials: *Garra arunachalensis*: Paratype, 1 ex., 116.3 mm SL, India, Arunachal Pradesh, Lower Divang valley district, Deopani River at Roing (Brahmaputra basin) (ZSI FF 5499). *Garra birostris*: Paratype, 1 ex., 95.74 SL, India, Arunachal Pradesh, Papum Pare district, Dikrong River at Doimukh (Brahmaputra basin) (ZSI FF 5501). *G. cornigera*: Paratype, 2 ex., 49.0–73.5 SL, India, Manipur, Ukhrul District, Sanalok River (Chindwin basin) (MUMF12062–63). *Garra elongata*: Holotype, 94.9 mm SL, India, Manipur hill stream near Tolloi, (Chindwin basin), (MUMF 2311). *Garra gotyla*: neotype, 104.3 mm. SL, India, Sikkim, Tista River at Rangpo (MUMF 4300). *Garra lamta*: 1 ex, 95.0 mm SL, India, Uttar Pradesh, A small Stream flowing near Matwatal, (ZSI F 9971/1). *Garra litanensis*: Holotype, 92.5 mm SL, India, Manipur, Litan stream at Litan, (MUMF-68/1). *Garra quadratirostris*:

Paratype, 1 ex., 71.3 mm SL, India, Sikkim, Tista River at Rangpo, (ZSI FF 5500). *Garra salweenica*: ZSI F 11602/1, Holotype, 98.0 mm. SL; Myanmar: S. Shan States: Salween River at Takaw Keng. *Garra tamangi*: Holotype 153.9 mm SL, Dikrong River at Hoj a tributary of Brahmaputra River basin, Papum Pare district, Arunachal Pradesh, India (ZSI/APRC/P-1175); Paratypes, 2 ex., 82.0-104.6 mm SL, same data as holotype (ZSI FF 5423). *G. trilobata*: Paratypes, 2 ex., 97.2-120.0 mm SL, Sanalok River, Ukhrul District, Manipur (Chindwin basin), India (MUMF 12053-54).

Published information used for comparison: M'Clelland (1838) for *G. nasuta*; Hora and Mukerji (1934) for *G. salweenica*; Menon (1964) for *Garra lamta*; Vishwanath (1993) for *G. litanensis*; Vishwanath and Kosygin (2000) for *G. elongata*; Zhang (2005) for *bispinosa*, *G. fuliginosa*, *G. orientalis*, *G. qiaojiensis* and *G. cyrano*; Zhang (2006) for *G. rotundinasus*; Nebeshwar *et al.*, (2012) for *G. kalpangi*;

Nebeshwar and Vishwanath (2013) for *G. arunachalensis*, *G. birostris*, *G. gotyla*, and *G. quadritrostris*; Shangningam and Vishwanath (2015) for *G. bourreti*, *G. cornigera* and *G. trilobata*; Thoni *et al.*, (2016) for *G. bimaculacauda* and *G. parastenorhynchus*.

Acknowledgements

We are grateful to Dr. Kailash Chandra (Director, Zoological Survey of India) and Prof. Waikhom Vishwanath (Manipur University) for permission to access materials and for providing laboratory facilities; and to Shri K. C. Gopi (ZSI) for encouragements and support. The first author is grateful to University Grants Commission- North Eastern Regional Office (UGC-NERO) for providing financial assistance for undergoing a research project (vide approval letter No. F.5-486/2014-15/MRP/NERO/2295 dt.18th February, 2015) under which the research work has been taken up.

References

- Gurumayum, S.D. and Kosygin, L. 2016. *Garra tamangi*, a new species of cyprinid fish (Teleostei: Cypriniformes) from Arunachal Pradesh, northeastern India. *Species* **55**: 84-93.
- Hora, S.L. and Mukerji, D.D. 1934. Note on fishes in the Indian Museum. XXIII. On a collection of fish from the S. Shan States, Burma. *Rec. Indian Mus*, **36**: 353-370.
- M'Clelland, M. 1838. Observation on six new species of cyprinidae with an outline of a new classification of the family. *J. Asiatic Soc. Bengal*, **7**: 941-948.
- Menon, A.G.K. 1964. Monograph of the cyprinid fishes of the *Garra* Hamilton. *Memoirs of the Indian Museum*, **14**: 173-260.
- Nebeshwar K. & Vishwanath W. 2013. Three new species of *Garra* (Pisces: Cyprinidae) from north-eastern India and redescription of *G. gotyla*. *Ichthyol. Explor. Freshwaters*, **24**(2): 97-120.
- Nebeshwar, K., Bagra, K and Das, D.N. 2012. *Garra kalpangi*, a new cyprinid fish species (Pisces: Teleostei) from upper Brahmaputra basin in Arunachal Pradesh, India. *J. Threatened Taxa*, **4**(2): 2353-2362.
- Shangningam, B. and W. Vishwanath. 2015. Two new species of *Garra* from the Chindwin basin, India (Teleostei: cyprinidae). *Ichthyol Explor. Freshwaters*, **26**(3): 263-272.
- Thoni, R.J., Gurung, D.B. and Mayden, R.L. 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. and L. Kosygin, 2000. *Garra elongata*, a new species of the subfamily Garrinae from Manipur, India (Cyprinidae, Cypriniformes). *J. Bombay nat. Hist. Soc.*, **97**(3): 408-414.
- Vishwanath, W. 1993. On a collection of fishes of the genus *Garra* Hamilton from Manipur, India, with Description of a new species. *J. Freshwater Biol.*, **5**(1): 59-68.
- Zhang, E. 2005. *Garra bispinosa*, a new species of cyprinid fish (Teleostei: cypriniformes) from Yunnan, Southwest China, *The Raffles Bull. Zool.*, Suppl. **13**: 9-15.
- Zhang, E. 2006. *Garra rotundinasus* a new species of cyprinid fish (Pisces: Teleostei) from the upper Irrawaddy River basin, China. *The Raffles Bull. Zool.*, **54**: 447-453.
- Zi-ming Ch, Sheng Z, Jun-xing Y. 2009. A new species of the genus *Garra* from Nujiang River Basin, Yunnan, China (Teleostei: Cypriniformes). *Zool. Res*, **30**(4): 438-444.