NEW SPECIES

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Species

Garra chivaensis, a new labeonin species (Cyprinidae: Labeoninae) from Manipur, North-Eastern India

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General Note
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ABSTRACT

Garra chivaensis, a new labeonin species is described from the Chiva River at Chandel district, a headwater of the Chindwin River basin in Manipur, north-eastern India. It can be distinguished from its congeners of north-eastern India in having a unique combination of the following characters: snout without a proboscis and a transverse groove, 34-36 lateral line scales, 16 predorsal scales, 5.5/4.5 lateral transverse scales, absence of chest scales, presence of poorly developed belly scales, insertion of dorsal-fin

close to the base of caudal-fin than to the tip of snout, 6 branched dorsal-fin rays and position of vent close to anal-fin origin than to pelvic-fin origin. A key of proboscis absent species of *Garra* from the Chindwin basin of Manipur, north-eastern India is provided.

Keywords: *Garra*, New species, Chiva River, Manipur.

1. INTRODUCTION

Labeonin fishes of the genus *Garra* is characterised by an elongate cylindrical body, a crenulated rostral fold, lower lip expanded posteriorly to form an ovoid or circular callous pad, suctorial disc with a crescentic anteromedian fold, curved rostral cap ventrally and connected with the lower lip at the corners of mouth (Lothongkham *et al.*, 2014 and Stiassny & Getahun, 2007). They are adapted in the swiftly-flowing water by the oral suctorial disc of highly modified lower lip and horizontally pectoral and ventral-fins (Li *et al.*, 2008 and Zi- Ming *et al.,* 2009). Talwar & Jhingran (1991), Jayaram (1999) and Kottelat (2013) reported 19, 23 (24 in the key) and 46 species of *Garra* from the Inland fishes of India and Adjacent countries, the Indian Region and the inland waters of Southeast Asia respectively. Nandagopal & Arunachalam (2015) reported that the enigmatic genus *Garra* (Hamilton, 1822) was represented by 39 species from India viz., 14 from Southern Western Ghats and 25 from north and north-eastern India. Some species live in lakes (Stiassny & Getahun, 2007) whereas some are cave dwellers too (Banister, 1987, Mousavi-Sabet & Eagderi, 2016 and Mousavi-Sabet *et al.*, 2016).

Hora (1921) firstly described *Garra abhoyai* and *G. naganensis* from Manipur and also recorded *G. nasuta*. Roni & Vishwanath (2017) reported 25 valid species of *Garra* from the northeast India of which 15 species are from the Brahmaputra river drainage, and 10 species from Chindwin river drainage. Moyon & Arunkumar (2018) reported 14 species of *Garra* from the Chindwin basin of north eastern India viz., *G. abhoyai* Hora, 1921; *G. Chakpiensis* Nebeshwar & Vishwanath, 2015; *G. chindwinensis* Premananda *et al.,* 2017; *G. compressa* Kosygin & Vishwanath, 1998 [formerly known as *G. compressus*, changed by Kottelat, 2013]; *G. cornigera* Shangningam & Vishwanath, 2015; *G. Elongate* Vishwanath & Kosygin, 2000; *G. gravelyi* (Annandale, 1919); *G. litanensis* Vishwanath, 1993; *G. moyonkhulleni* Moyon & Arunkumar, 2018; *G. nambulica* Vishwanath & Joyshree, 2005; *G. namyaensis* Shangningam & Vishwanath, 2012; *G. paralissorhynchus* Vishwanath & Devi, 2005; *G. trilobata* Shangningam & Vishwanath, 2015 & *G. ukhrulensis* Nebeshwar & Vishwanath, 2015.

While conducting an ichthyological survey in Chiva River, a tributary of the Chindwin River basin in Chandel district of Manipur, 4 specimens of *Garra* were obtained and which does not fit into any known species of this genus. Further comparisons and examination reveal edit to be an undescribed species, which is herein described as *Garra chivaensis* sp.nov.

2. MATERIAL AND METHODS

All specimens were preserved in 10% formalin and deposited in the Manipur University Central Museum with Accession No. 130/NH/ MUM. General measurements were made point to point with dial-calliper and data recorded to nearest 0.1mm. Count and measurements were carried out on left side of specimens whenever possible. Subunits of head are presented as percentages of head length (%HL). Head length itself and measurements of the body parts are given percentages of standard length (%SL). Methods of counts, measurements and terminology follow Kottelat (2000), Kullander & Fang (2004) and Zhang (2005).

3. RESULTS

***GARRA CHIVAENSIS*, NEW SPECIES**

Holotype: 130/NH/ MUM, 86.6mm SL; 105.4 mm TL; India: Manipur: Chandel District, Khongjon village, Chiva River, 236 m asl, Latitude 24^0 15′ 13″N and 94^0 17′ 59″E: collected by W.A. Moyon and her party, 20 Jan. 2019.

Paratypes: 130/NH/ MUM, 3 exs; 65.2-97.0 mm SL, 80.3-117 mm TL, same data as holotype.

Diagnosis

Garra chivaensis sp. nov. is distinguished from the congeners of northeast India in having a unique combination of the following characters: margin of scales are greyish black, 6 branched dorsal-fin rays, 34-36 lateral line scales, 5.5/4.5 transverse scales, 16 predorsal scales, chest scaled, belly scales poorly developed, dorsal-fin closed to the base of caudal-fin than to the tip of snout, vent closed to anal-fin origin than to the pelvic-fin origin, predorsal length 52.5-53.8% SL, snout length 45.2-47.0%HL, disc width 45.4-

46.5%HL,disc length 27.4-28.0%HL, callous pad width 34.1-34.2%HL, callous pad length 18.0-21.5%HL and a rounded like black patch or blotch present at the upper base of caudal-fin (fig.1-2).

Figure 1 Dorsal, lateral and ventral views of *Garra chivaensis* sp. nov., 130/NH/ MUM, holotype 86.6 mm SL, India: Manipur: Chandel District: Khongjon village, Chiva River.

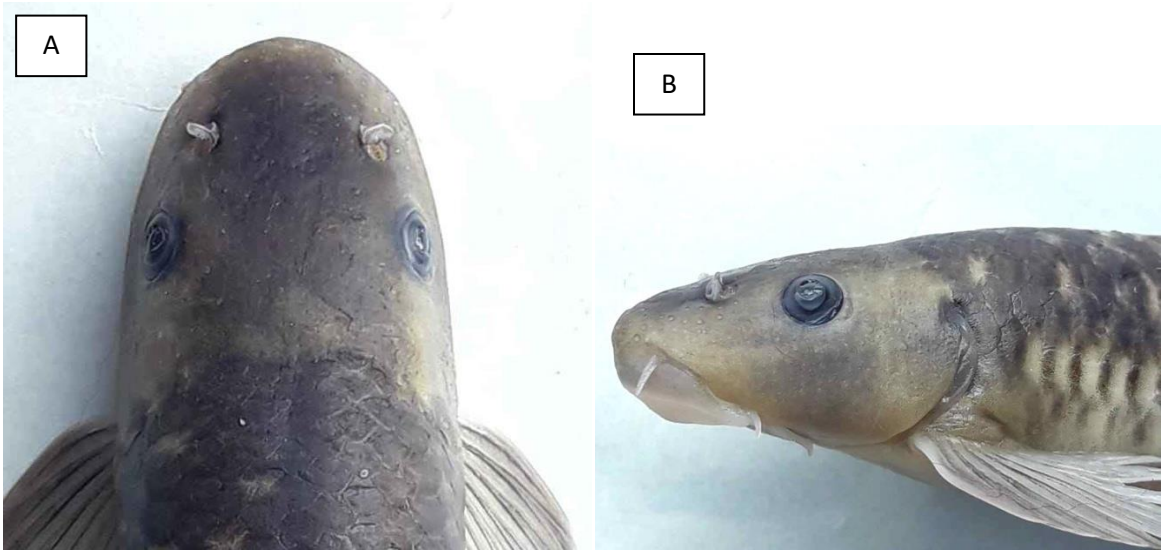

Figure 2 Snout morphology of *Garra chivaensis* sp. nov. 130/NH/ MUM, holotype 86.6 mm SL. A . Front view. B. Lateral view

Description

General body shape as in Figure 1. Morphometric data from the measurements of 4 specimens (ranging from 65.2-97.0 mm SL) are given in Table 1. Body elongate, cylindrical or rounded, slightly compressed in the region of the caudal peduncle. Dorsal head profile rising gently over snout, slightly convex, more or less continuous with dorsal body profile to dorsal-fin origin. Ventral profile from pectoral to pelvic-fin origin slightly convex and profile from pelvic to anal-fin origin straight. Head moderately large, depressed with slightly convex inter orbital area, height less than length, width lower than height. Snout moderately round with small tubercles scattered on tip and ventral regions of nostrils. Sublachrymal groove and rostral cap groove areas are also scattered by small tubercles. Eyes located dorsolaterally and close to the tip of snout. Sublachrymal groove postero-ventrally sloped. 2 pairs of barbels, rostral barbel antero-laterally located and more or less equal with eye diameter, maxillary barbel at the corner of mouth, shorter than rostral barbel. Rostral cap well developed fimbriateat the central portion and fully covering upper jaw. Mental adhesive disc elliptical, shorter than wide and narrower than head width. Width of central callous pad of adhesive disc 1.5-1.8 times of its length.

Figure 3 *Garra chivaensis* sp. nov., 130NH/MUM, holotype 86.6 mm SL. showing oromandibular structures.

Table 1 Morphometric data of *Garra chivaensis* sp. nov. Ranges include values of holotype.

	Holotype	Range	Mean	SD
	(a)	(b)	(c)	(d)
Standard length (mm)	86.8	65.2-97.0		
In % of Standard length (SL)				
Head length	26.9	24.9-26.9	25.9	1.6
Body depth	19.9	14.2-20.0	17.1	1.3
Head length at occiput	21.1	20.9-21.1	21.0	1.5
Head depth at eye	12.5	12.4-12.5	12.4	1.1
Head depth at nape	15.7	14.2-15.7	14.9	1.2
Head width	18.2	17.5-18.2	17.8	1.4
Body width at anal-fin origin	8.6	8.5-9.2	8.8	0.9
Body width at dorsal-fin origin	16.6	16.6-17.8	17.2	1.3
Caudal peduncle length	12.6	12.1-12.7	12.4	1.1
Caudal peduncle height	10.6	10.5-10.6	10.5	1.0
Dorsal-fin base length	12.3	11.4-12.3	11.8	1.1
Dorsal-fin length	19.0	19.0-20.5	19.7	1.4
Pectoral-fin length	20.0	19.8-20.1	19.9	1.4
Pelvic-fin length	18.1	16.3-18.1	17.2	1.3
Anal-fin base length	6.4	6.0-6.5	6.2	0.8
Anal-fin length	15.0	14.9-16.0	15.4	1.3
Predorsal length	52.5	52.5-53.8	53.1	2.4
Prepelvic length	51.8	51.8-58.8	53.1	2.4
Pre-anus length	67.2	67.2-68.4	67.8	2.7
Preanal length	75.4	75.4-79.0	77.2	2.9
Prepectoral length	18.8	18.8-19.9	19.3	1.4
Pelvic to anal distance	23.6	23.6-25.1	24.3	1.6
Snout length	12.2	11.4-12.2	11.8	1.1
Eye diameter	3.9	2.9-3.9	3.4	0.6
Vent to anal distance	9.4	9.4-10.5	9.9	1.0
Disc length	7.3	6.8-7.4	7.1	0.8
Disc width	12.2	11.3-12.2	11.7	1.1
Callous pad length	4.8	4.9-5.2	5.0	0.7
Callous pad width	9.2	8.3-9.2	8.7	0.9
Interorbital distance	12.2	11.4-12.2	11.8	1.1
In % of head length				
Snout length	45.3	45.2-47.0	46.1	2.2
Eye diameter	14.6	12.0-14.7	13.3	1.2
Interorbital distance	45.3	45.3-47.0	46.1	2.2
Disc width	45.4	45.4-46.5	45.9	2.2
Disc length	27.4	27.4-28.0	27.7	1.7
Callous pad width	34.1	34.1-34.2	34.1	1.9
Callous pad length	18.0	18.0-21.5	19.7	1.4
Head depth	58.1	58.1-58.6	58.1	2.5
Head width	67.5	67.5-72.2	69.8	2.7
Head height at occiput	78.6	78.6-86.1	82.3	3.0
In % of head depth				
Head width	116.1	116.1-123.2	119.6	3.6
Body depth	127.2	100.0-127.2	113.6	3.5
In % of caudal peduncle length				
Caudal peduncle depth	84	84-87.2	85.6	3.0
In % of pelvic to anal distance				
Anus to anal-fin distance	34.5	34.5-41.8	38.1	2.0
In % of disc width				
Disc length	60.3	60.1-60.4	60.2	2.5

Dorsal-fin with 2 simple and 6 branched rays; last simple ray shorter than head length; distal margin slightly concave; origin closed to the base of caudal-fin than to the tip of snout, inserted anterior to vertical through pelvic-fin origin. Pectoral-fin with 1 simple and 13 branched rays, shorter than headlength and subacuminate margin. Pelvic-fin with 1 simple and 8 to 9 branched rays, reaching anus, posterior margin straight, close to base of caudal-fin and nearer to anal-fin origin than to pectoral-fin origin. Anal-fin with 1 simple and 5 branched rays, not reaching base of caudal-fin, straight posterior margin, close to caudal-fin base than to pelvic-fin origin. Vent closer to anal-fin origin than to pelvic-fin origin. Caudal-fin forked with 2 unbranched each lobes and 16 branched rays.

Lateral line complete with 34-36 scales. Transverse scale rows 5.5/4.5. Circumpeduncular scale rows 16. Predorsal scales 16, scales irregularly arranged, smaller than flank scales. Chest scaleless. Belly scales poorly developed. 1 axillary scale at the base of pelvic-fin present. 4-5 scales between posterior ventral-fin to origin of vent and 5 in between vent to anal-fin origin.

Figure 4 Reproductive part of *Garra chivaensis* sp. nov.

Colouration in preservative

Body grey. Dorsal and lateral sides upto the horizontal line bases of pectoral, pelvic and anal-fins are greyish. Ventral side of tip of snout to the origin of anal-fin is deem white. Fin rays of dorsal, pectoral, pelvic and caudal-fins are blackish or greyish. A black spot at upper angle of gill opening. Margin of scales are greyish black. Upper and lower bases of caudal-fin bear black patch or blotch and a short black streak respectively (Fig. 5).

Figure 5 A black patch or blotch and a short black streak at the upper and lower bases of caudal-fin in *Garra chivaensis* sp. nov.

Local Name
Ngarim

Etymology
Named after its type locality, the Chiva River. An adjective.

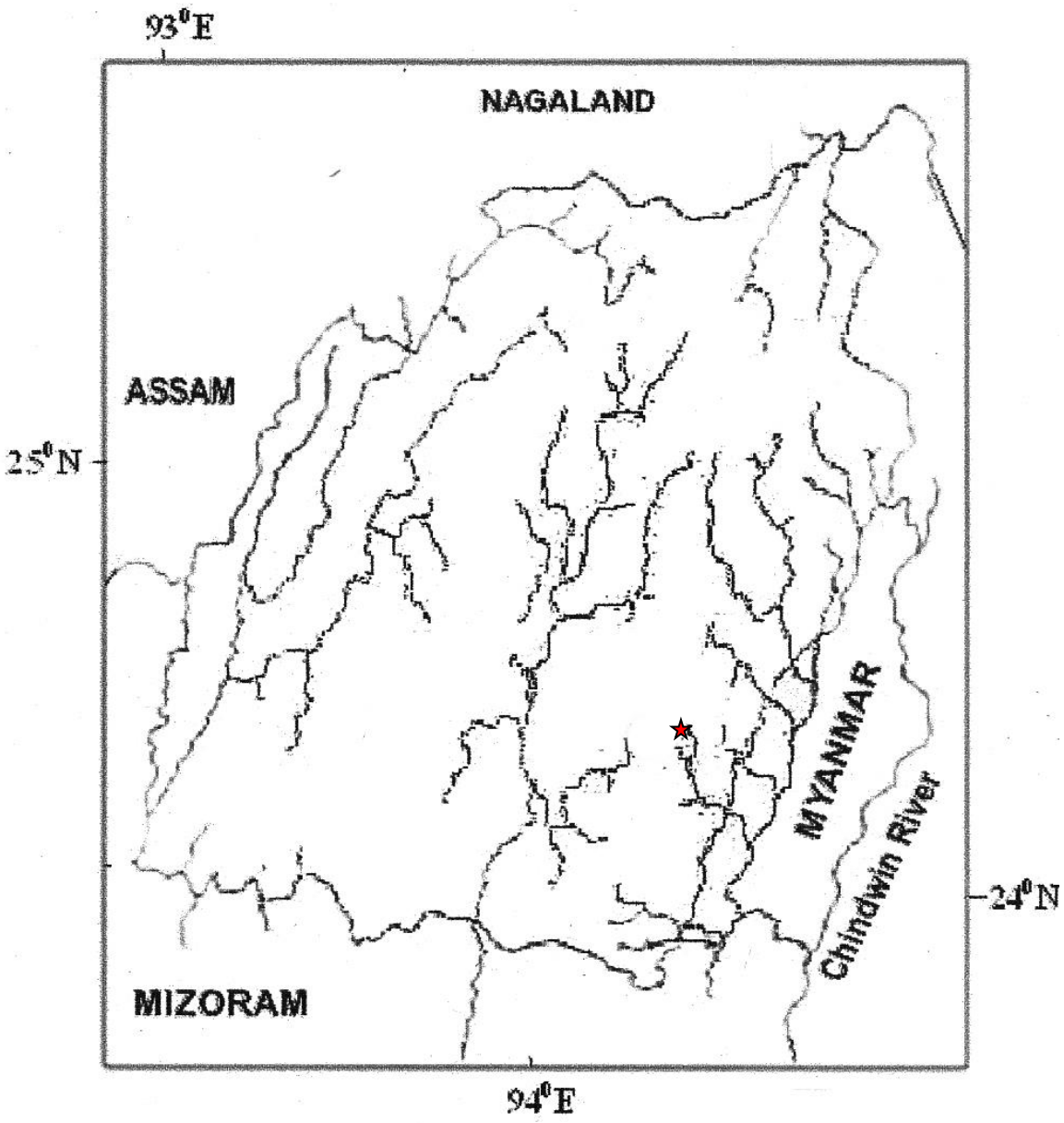

Figure 6 Map showing the type locality of *Garra chivaensis* sp. nov. indicated by ★ symbol.

Distribution and habitat
Garra chivaensis sp. nov. is presently known from the Chiva River in Chandel district, Manipur, India (Fig. 6). It inhabits medium to fast flowing clear water hill streams with a gravelly substrate covered with in algae growth and cobble bottoms. (Fig.7). Other associated species collected at the type locality includes *Neolissochilus hexagonolepis, Schizothorax chivae, Pethia* sp. *Opsarius* sp., *Physoschistura* sp., *Schistura* sp., *Glyptothorax chivomensis* etc.

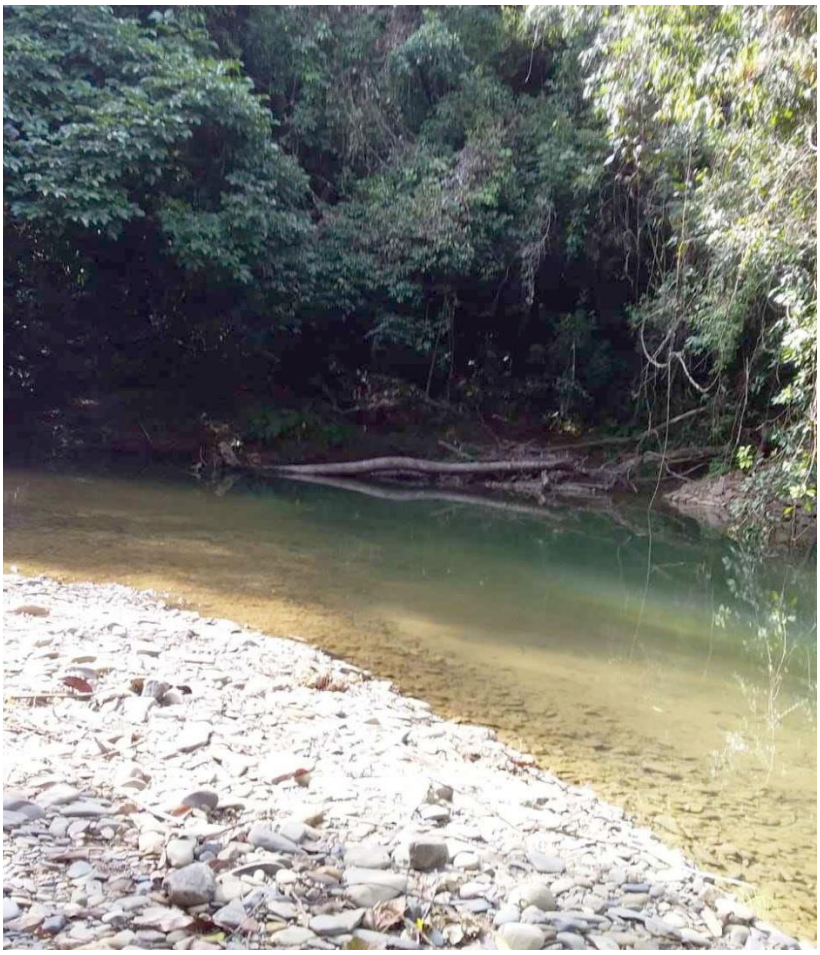

Figure 7 Type locality of *Garra chivaensis* sp. nov., Chiva River, Chandel district, Manipur, India

4. DISCUSSION

Menon (1964) divided 4 groups and 9 complexes of the genus *Garra*. Nebeshwar & Vishwanath (2017) divided 5 species group of this genus based on snout morphology. Recently, Sun *et al.* (2018) also divided it into 4 groups. 'W'- shaped black band on the caudal-finis one of the distinctive character of '*lissorhynchus* complex' of this genus (Menon, 1964). Due to the absence of this character, the new species *Garra chivaensis* is distinctly different form *G. abhoyai, G. nambulica, G. namyaensis and G. paralissorhynchus*. Unilobed proboscis group of *Garra* species recorded form the Chindwin basin of Manipur are *G. elongata* and *G. litanensis*. Biolobed proboscis group of *Garra* species recorded from the Chindwin basin of Manipur are *G. chindwinensis, G. cornigera* and *G. moyonkhulleni*. Trilobed proboscis species is only *G. trilobata*. Proboscis less group recorded from the Chindwin basin of Manipur are *G. chakpiensis, G. compressa*, *G. Ukhrulensis* and *G. chivaensis* sp. nov.

Garra chivaensis sp. nov. can be distinguished from *G. chakpiensis* in having less branched dorsal-fin rays (6 vs. 8.5-9.5), less lateral line scales (34-36 vs. 38-40), more predorsal scales (16 vs. 11-14), lateral transverse scales (5.5/4.5 vs. 4.5/5.5), lack of chest scales vs. deeply embedded scales, poorly developed belly scales vs. deeply embedded scales, central callous pad of adhesive disc width (34.1-34.2%HL vs. 15-18, length 18.0-21.5 & HL vs. 22-28), insertion of dorsal-fin closed to the base of caudal-fin vs. middle of standard length, absence vs. presence of one faint black midlateral stripe with diffuse margins over scale row of lateral line, shorter dorsal-fin length (19.0-20.5% SL vs. 21.7-24.1), shorter anal-fin (14.9-16%SL vs. 17.0-19.6) and wider disc 45.4-46.5%HL vs. 36-42).

Garra chivaensis sp. nov. can be distinguished from *G. compressa* in having less branched dorsal-fin rays (6 vs. 7), less lateral line scales (34-36 vs. 39-40), more transverse scales (5.5/4.5 vs. 3.2/2.5), more predorsal scales (16 vs. 12-13), absence vs. presence of reduce chest scales, insertion of dorsal-fin closed to the base of caudal-fin vs. nearer to tip of snout than base of caudal-fin, vent closed to anal-fin origin than pelvic-fin origin vs. slightly nearer to pelvic-fin origin than anal-fin origin, longer head (24.9-26.9%SL vs. 18.9-21.2), wider body (16.6-17.8%SL vs. 13.7-14.9), narrower head (67.5-72.2%HL vs. 76.7-88.4), more head height at occiput (78.6-86.1%HL vs. 57.3-63.4), shorter disc length (27.4-28.0%HL vs. 51.2-55.3), shorter disc (60.1-60.4% disc width vs. 87.4-89.8), deeper caudal peduncle (84-87.2% its length vs. 54.2-57.5), shorter distance between vent to anal-fin origin 34.5-41.8% between

ventral to anal-fin origin vs. 52.5-59.8 and absence vs. presence of dorsal-fin with transverse black bar and caudal-fin with longitudinal black streak respectively.

Garra chivaensis sp. nov. differs from *G. ukhrulensis* in having less branched dorsal-fin rays (6 vs. 7.5-8.5), less lateral line scales (34-36 vs. 40-41), absence vs. presence of one faint blackish mid-lateral stripe on body, wider central callous pad of adhesive disc (34.1-34.2%HL vs. 26-30), width of head lesser than its height vs. width greater than height, insertion of dorsal-fin closed to the base of caudal-fin than tip of snout vs. middle of standard length, median region of belly (poorly developed scales vs. naked), shorter caudal peduncle (12.1-12.7%SL vs. 13.2-16.8), slender caudal peduncle (10.5-10.6%SL vs. 11.8-13.6), shorter dorsal-fin base (11.4-12.3% SL vs. 12.7-15.5), shorter anal-fin base (6.0-6.5% SL vs. 7.8-9.0), shorter anal-fin (14.9-16.0% SL vs. 17.0-21.7), longer predorsal (52.5-53.8% SL vs. 48.4-51.9), shorter snout (45.3-47.0%HL vs. 48-52), smaller eye (12.0-14.7%HL vs. 15-20) and longer central callous pad of adhesive disc (18.0-21.5% HL vs. 12-16) respectively.

The congeners recognised in the Irrawaddy River basin are *Garra bispinosa, G. gravelyi, G. qiaojiensis, G. rotundinasus* and *G.tengchongensis*. *Garra chivaensis* sp. nov. can be easily distinguished from *G. bispinosa* in lacking proboscis vs. bilobed proboscis, less unbranched dorsal-fin (2 vs. 4), shorter adhesive disc (27.4 28.0%HL vs. 38-43), shorter dorsal-fin (19.0-20.5%SL vs. 20.9-23.4) and longer head (24.6-26.9%SL vs. 22.6-24.6) respectively.

Garra chivaensis sp. nov. is distinguished from *G. gravelyi* in having slender body depth (14.2-20.0%SL vs. 21.0-25.7), longer head (24.9-26.9%SL vs.20.0-21.9), longer predorsal (52.5-53.8%SL vs.43.2-43.3), slender head (58.1-58.6%HL vs.70.9-79.3), narrower eye (12.0-14.7%HL vs.22.4-27.7), shorter adhesive disc (60.1-60.4% its width vs. 77.5-92.5), deeper caudal peduncle (84.0-87.2% its length vs. 66.6-80.6), longer distance between vent to anal-fin origin (34.5-41.8% of distance pelvic to anal-fin origin vs. 20.8-28.5), less number of dorsal-fin rays (2 simple and 6 branched rays vs. 4 simple and 7 branched rays), more lateral line scales (34-36 vs. 32-34), more transverse scales (5.5/4.5 vs. 3.5-4.5/3.5), and more predorsal scales (16 vs. 8-9) respectively.

Garra chivaensis sp. nov.can be further distinguished from *G. qiaojiensis* in lacking vs. having proboscis on snout, less unbranched dorsal-fin rays (2 vs. 4), shorter disc (27.4-28.0%HL vs. 48-55) and more circumpeduncular scales (16 vs. 12); from *G. Rotundinasus* in lacking vs. having a poorly developed proboscis on snout, less perforated lateral line scales (34-36 vs. 36-37), more scales above the lateral line (5.5 vs. 2.5), more predorsal scales (16 vs. 10-11), longer head (24.9-26.9%SL vs. 19.9-21.7), more head height (20.9-21.1%SL vs. 12.5-14.4), shorter caudal peduncle (12.1-12.7%SL vs. 14.6-16.1), longer predorsal (52.5-53.8%SL vs. 45.5-48.0), shorter snout (45.2-47.0%HL vs. 47.2-58.6), shorter disc (27.4-28.0%HL vs. 45.2-60.8), narrower disc (45.5-46.5%HL vs. 68.8-82.3), less number of unbranched and branched dorsal-fin rays (2 vs. 4 and 6 vs. 8) and more circumpeduncular scales (16 vs. 12) respectively.

Garra tengchongensis is a proboscis less species of the upper Irrawaddy River basin in Tengchong country, Yunnan Province, China. The new species, *Garra chivaensis* further differs from *G. tengchongensis* in having less unbranched and branched dorsal-fin rays (2/6 vs. 4/8), less unbranched anal-fin rays (1 vs. 3), less lateral line scales (34-36 vs. 37-38), more transverse scales (5.5/4.5 vs. 3.5-4/3), more predorsal scales (16 vs. 12-14), more circumpenducular scales (16 vs. 12), longer pectoral-fin (19.8-20.1%SL vs. 11.8-14.3), smaller eye (12.0-14.7%HL vs. 17.0-23.3), shorter disc (27.4-28.0%HL vs. 36.1-42.5), absence of chest or breast scales vs. presence of breast scales, insertion of dorsal-fin (close to the base of caudal-fin than to the tip of snout vs. close to tip of snout than to caudal-fin base), position of vent (close to anal-fin origin than to pelvic-fin origin vs. located almost in midway from pelvic to anal-fin origin and dorsal-fin (without darkened midband vs. with darkened mid band) respectively.

5. Key of the proboscis absent species of *Garra* from the Chindwin basin of Manipur, North-eastern India.

1. Dorsal-fin with a darkened band 2
   Dorsal-fin without a darkened band 3
2. Lateral line scales 39-40, body depth 17.0-17.6%SL..... *G. compressa*
3. Presence of one faint blackish mid-lateral stripe on body 4
   Absence of one faint blackish mid-lateral stripe on body.....5
4. Predorsal scales irregularly arranged, lateral line scales 40-41,
   disc width 43-48%HL .....*G. ukhrulensis*
   Predorsal scales 11-14, lateral line scales 38-40,disc width 36-42%HL...*G. chakpiensis*
5. Predorsal scales 16, lateral line scales 34-36, disc width 45.4-46.5%HL..... *G.chivaensis*
6. Comparative materials

Garra bispinosa: Data from Zhang (2005) and Sun *et al* (2018)

Garra chakpiensis: MUMF 4308, holotype 83.0 mm SL, MUMF 4309/25, 25, 57.0-133.7 mm SL, India: Manipur: Chandel district, Chakpi River at Tangpool, Chindwin basin.

Garra chindwinensis: Data from Premananda *et al* (2017).
Garra compressa: MUMF 2316, holotype 70.8 mm SL, MUMF 2314, 2315, 2, 86.9-85.0 mm SL; India: Manipur: Ukhrul district: Wanze stream at Khamsom, Chindwin basin [formerly known as *Garra compressus,* changed by Kottelat, 2013].
Garra cornigera: MUMF 12061, holotype 76.0mm SL, MUMF 12062-12067, 6, 38.6-71.9 mm SL, India: Manipur: Ukhrul district: Sanalok river, Chindwin basin.
Garra elongata: MUMF 2311, holotype 86.2 mm SL; MUMF 2308-2310, 3 paratypes, 72.0-80.8 mm SL; India: Manipur: Ukhrul district: a small stream near Tolloi, Chindwin basin.
Garra gravelyi: Data from Menon (1964)
Garra litanensis: MUMF 68/1, holotype, 92.5 mm SL; MUMF 69/1-5, 5 paratypes, 69.0-74mm SL; India: Manipur Ukhrul district: Litan stream at Litan, Chindwin basin.
Garra moyonkhulleni: 100/NH/ MUM, holotype 99.0 mm SL, 100/NH/MUM, 3, 84.7-93.5 mm SL; India: Manipur: Chandel district: Lokchao river at north eastern side of Lokchao bridge, Chindwin basin.
Garra qiaojiensis: Data from Zhang (2005 and 2006).
Garra rotundinasus: Data from Zhang (2006).
Garra tengchongensis: Data from Zhang & Chen (2002).
Garra trilobata: MUMF 12051, holotype 118.5 mm SL; MUMF 12052- 12057, 6, 92.9-134.4 mm SL; India: Manipur; Ukhrul district: Sanalok river, Chindwin basin.

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Conflict of Interest: The authors declare that there are no conflicts of interests.

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