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# *Garra tamangi*, a new species of cyprinid fish (Teleostei: Cypriniformes) from Arunachal Pradesh, northeastern India

Shantabala Devi Gurumayum[1*], Laishram Kosygin[2]

1. Zoological survey of India, Arunachal Pradesh Regional Centre, Senki Valley, Itanagar, Arunachal Pradesh 791 113, India
2. Zoological Survey of India, Freshwater Fish Section, 27 J.L. Nehru Road, Kolkata–700016, India

*Corresponding author: E-mail: [1]santaguru@rediffmail.com

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## ABSTRACT

*Garra tamangi,* a new species of labeonine cyprinid fish is described from the Dikrong River, Brahmaputra River drainage in Arunachal Pradesh, northeastern India. *Garra tamangi* is distinguished from all its congeners in the Ganga-Brahmaputra River drainage in having roughly a triangular proboscis, trilobed with two small lobes that are more or less anteriorly free and a large median lobe anteroventrally tuberculated, moderately protruding forming a short horizontal notch between it and inferior side of the snout. Other distinguishing combinations of characters are given against its respective congeners in the discussion section.

Key words: Southeast Asia, Labeoninae, taxonomy, Upper Brahmaputra River basin, Dikrong River.

## 1. INTRODUCTION

Species of cyprinid genus *Garra* are elongate, small- to medium-sized, bottom-dwelling fishes usually found in fast flowing waters, where they adhere to the surface of the rocks using the highly modified lower lip which act as a sucker (Zi-ming*et al*., 2009). There are currently 17 species of *Garra* recognized from the upper Brahmaputra River basin in Arunachal Pradesh, Northeast India, viz.,*G. lamta* (Hamilton 1822), *G. nasuta* (McClelland 1838), *G. rupecula*(McClelland 1839), *G. lissorhynchus* (McClelland 1842), *G. annandalei* Hora 1921, *G. kempi* Hora, 1921, *G. naganensis* Hora 1921, *G. arupi* Nebeshwar*et al*., 2009,*G. kalpangi* Nebeshwar*et al.* 2011, *G. magnidiscus* Tamang, 2013, *G. alticaputus* Arunachalam *et al*., 2013, *G. kimini* Arunachalam *et al.*, 2013, *G. minimus* Arunachalam *et al*., 2013, *G. nigricauda* Arunachalam *et al*., 2013, *G. arunachalensis* Nebeshwar & Vishwanath, 2013, *G. birostris* Nebeshwar & Vishwanath, 2013 and *G. quadratirostris* Nebeshwar & Vishwanath, 2013.

While conducting an ichthyological survey in the Brahmaputra River basin in Arunachal Pradesh, India, five specimens of an unnamed *Garra* were collected from the Dikrong River, which are described here as *G. tamangi,* new species.

## 2. MATERIALS AND METHODS

Sampling of fish were carried out using a cast net of diameter 3m with a 7mm mesh size, in shallow to moderate running water (50-150 cm deep). The specimens were preserved in 10% formaldehyde in the site and later transferred to 70% ethanol for preservation. Measurements were made point to point with digital slide calipers and data recorded to tenths of a millimeter. Counts and measurements were made on the left side of specimens whenever possible, following Nebeshwar & Vishwanath (2013). Fin rays were counted under a stereo-zoom binocular microscope. Number in parenthesis following a count indicates the frequency of that count. Abbreviations used: MUMF: Manipur University Museum of Fishes, Imphal, RGUMF: Rajiv Gandhi University Museum of Fishes, Itanagar, NHPC National Hydel Project Corporation. Type specimens are deposited in the Zoological Survey of India (ZSI), Kolkata and Arunachal Pradesh Regional Centre (APRC), Itanagar.

## 3. NEW SPECIES

### 3.1. *Garra tamangi*, new species

**Types–Holotype:** ZSI/APRC/P-1175,153.9 mm SL, India, Arunachal Pradesh,Dikrong River at Hoj near NHPC Hydel complex, a tributary of Brahmaputra River basin, Papum Pare district,Collectors: S.D. Gurumayumand L. Tamang, 24March 2015 (Figure 1).



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**Figure 1**
*Garatamangi*, ZSI FF 5423, paratype, 104.6mm SL; India: Arunachal Pradesh: Dikrong River at Hoj; dorsal, lateral and ventral views

**Paratypes:** ZSI FF 5423, 1ex., 82.0-104.6 mm SL, same data as holotype, ZSI/APRC/P-1176,3exs., 67.9-153.9 mm SL, same data as holotype.

**Diagnosis**– *Garra tamangi* is distinguished from all congeners in the Ganga-Brahmaputra River drainage in havingroughly a triangular proboscis, trilobed with two small lobes anteriorly free and a large median lobe antero ventrally tuberculated. di-,tri-and tetracuspid tubercles on snout, pectoral-fin branched rays 13-14, lateral line scales 33-34, predorsal scales 10-11, head length 24.8-27.9% SL, snout length 56-98% HL, eye diameter 14-19% HL, mental disc length 39-41% HL and width 53-59% HL, central callous pad length 22-27% HL and width 29-34% HL, transverse scale rows above lateral line 4, transverse scale rows between lateral line and pelvic-fin origin 2½.

**Table 1** Morphometric data of holotype and 4 paratypes of *Garra tamangi* (ranges includes holotype data).

| | Holotype | Range | Mean±SD |
|---|---|---|---|
| Standard length (mm) | 153.9 | 66.5-153.9 | 94.6±36.7 |
| **In percent of standard length** | | | |
| Head length | *25.2* | 24.8-27.5 | 26.2±1.2 |
| Head depth at eye | 15.1 | 14.9-16.5 | 15.6±0.7 |
| Head width at opercle | 19.5 | 19.5-21.9 | 20.1±1.0 |
| Head width at nare | 17.1 | 17.0-18.3 | 17.3±0.5 |
| Body depth | 22.0 | 20.7-22.3 | 21.6±0.7 |
| Body depth at anus | 18.6 | 16.7-18.6 | 17.3±0.7 |
| Body width at dorsal-fin origin | 19.5 | 19.5-22.3 | 20.4±1.1 |
| Body width at anal-fin origin | 11.4 | 11.0-12.9 | 11.8±0.7 |
| Caudal peduncle length | 15.6 | 14.7-16.5 | 15.6±0.6 |
| Caudal peduncle height | 14.4 | 12.6-14.4 | 13.4±0.7 |
| Dorsal-fin length | 29.1 | 24.5-29.1 | 26.0±1.8 |
| Dorsal-fin base length | 19.3 | 16.6-19.3 | 17.5±1.2 |
| Pectoral-fin length | 22.1 | 22.1-25.1 | 23.5±1.4 |
| Pelvic-fin length | 21.0 | 20.9-22.0 | 21.3±±0.5 |
| Anal-fin length | 19.9 | 19.0-20.6 | 19.6±0.7 |
| Anal-fin base length | 7.4 | 6.2-7.6 | 7.0±0.7 |
| Length of upper caudal-fin lobe | 29.6 | 24.3-31.4 | 28.3±2.6 |
| Length of lower caudal-fin lobe | 29.8 | 26.3-31.9 | 29.0±2.0 |
| Length of median caudal-fin rays | 14.8 | 12.1-14.9 | 13.8±1.2 |
| Preanal length | 78.6 | 76.2-82.1 | 79.0±2.6 |
| Preanus length | 72.3 | 69.0-73.1 | 71.7±1.7 |
| Prepelvic length | 50.6 | 21.8-78.0 | 51.2±19.9 |
| Predorsal length | 46.8 | 45.5-49.2 | 47.6±1.4 |
| Prepectoral length | 22.9 | 22.1-24.6 | 23.3±0.9 |
| Vent-anal length | 5.6 | 5.0-6.7 | 5.7±0.7 |
| **In percent of head length** | | | |
| Snout length | 62 | 56-98 | 67±17.6 |
| Eye diameter | 14 | 14-19 | 17±1.9 |
| Interorbital space | 46 | 43-46 | 45±1.4 |
| Mental disc length | 41 | 39-41 | 41±1.1 |
| Mental disc width | 59 | 53-59 | 56±2.7 |
| Callous pad length | 24 | 22-27 | 24±1.8 |
| Callous pad width | 34 | 29-34 | 33±2.0 |



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**Description**– Morphometric data in Table 1. Body elongate, slightly compressed laterally, more compressed in caudal peduncle region. Dorsalhead profile rising abruptly over snout,slightly concave above the orbit, then dorsal body profile rising gradually to dorsal-fin origin. Ventral profile more or less straight to anal-fin origin. Head moderately large, with slightly convex interorbital distance; height less than length; width greater than height. Eyes placed dorsolaterally in posterior half of head. Snout moderately rounded with well-developed transverse lobe covered with 15-25uni- to tetracuspid tubercles, demarcated posteriorly by moderately deep with 5-11 medium-sized tubercles each on lateral surface of snout. Proboscis tri-lobe, moderately elevated upwards, delineated sharply from depressed rostral surface by narrow transverse groove; width smaller than internarial space; with 8-17 small- to medium sized tubercles (Fig. 2). Depressed rostral surface creased and bulgy as transverse fold. Sublachrymal groove curves ventrally, and connected to rostral cap groove.

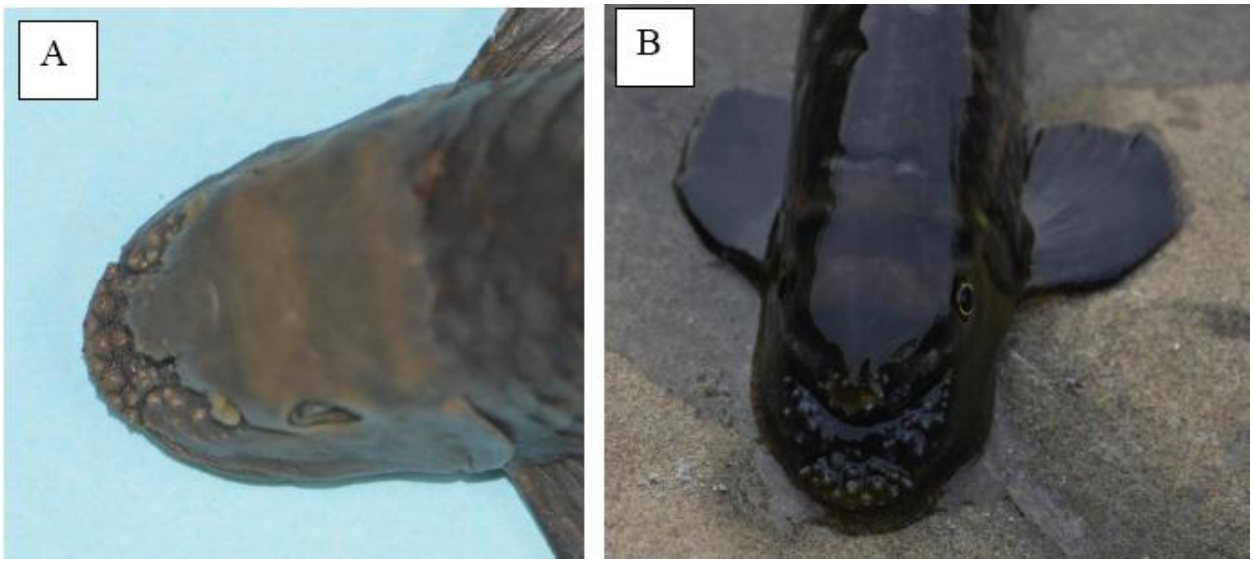


**Figure 2 (A & B)** Proboscis of *Garra tamangi*, ZSI/APRC/P-1175, holotype, 153.9 mm SL; Arunachal Pradesh, India.

Barbels in two pairs: rostral barbell anterolaterally located, shorter than eye diameter; maxillary barbel at corner of mouth, shorter than rostral barbel. Rostral cap well-developed, moderately fimbriate, about one sixth of length of its distal margin on each lateral extremity smooth; papillate ventral surface moderately wide. Upper lip in the form of a thin band of weakly developed papillae in one row. Except median margin, upper jaw covered by rostral cap. Disc elliptical, shorter than wide and slightly narrower than head width through roots of maxillary barbel; papillae on anteromedian fold of same size, small and regularly arranged; groove between anteromedian fold and central callous-pad narrow and moderately deep; papillae on inner half of whole length of lateroposterior flap larger and coarsely arranged; anterior marginal surface of central callous- pad with coarsely arranged small elongated papillae; posteriormost margin of lateroposterior flap extending slightly beyond vertically to posterior margin of eye.

Dorsal-fin with 3 (5) simple and 8½ (2) or 9 (3) branched rays; last simple ray almost equals head length; distal margin concave; origin midway between snout tip and caudal-fin base, inserted anterior to vertical from pelvic-fin origin; last branched ray not extending vertically to anal-fin origin.

Pectoral fin with 1 simple and 13½ (2) or 14½ (3) branched rays, shorter than head length, not extending to base of pelvic fin. Pelvic fin with 1 simple and 7½ (5) branched rays, not extending to base of anal fin; origin slightly closer to analfin origin than to pectoral-fin origin, inserted below base of third branched reachingbase of caudal fin; distal posterior margin concave; origin closer to caudal-fin base than topelvic-fin origin. Anus closer to anal-fin originthan to pelvic-fin origin. Caudal-fin forked; tip oflobes pointed; upper lobe slightly longer.

Lateral line complete with 33(2) or 34(3) scales. Transverse scale rows above lateral line 4 (5) and between lateral line and pelvic-fin origin 2½(5). Predorsal scales 10(4) or 11(1); scales regularly arranged. Chest and belly scaled. One long axillary scale at base of pelvic fin, its tip reaching posterior end of pelvic-fin base.



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**Colour**– In formalin, head, dorsum and side dark brown or dark grey. Mouth, chest, and abdomen pale yellowish. Anal, pelvic, and pectoral fins greyish white. Dorsal and caudal-fins faintly dark greyish. A faint blackish spot immediately anterior to upper angle of gill opening. Base of last 6 branched dorsal-fin rays faintly spotted. About 4 to 5 longitudinal faint stripes present along caudal peduncle.

**Distribution and habitat**– *Garra tamangi* is presently known only from the Dikrong River (a tributary of the Brahmaputra River basin) at Hoj near NHPC complex, about 30 km from Itanagar, Papum Pare district, Arunachal Pradesh, north eastern India (Fig. 3& 4).The habitat mostly consists of medium to large dark to grayish brown boulders irregularly placed, with pebbles, cobbles, concrete in certain places and heavy sand deposits somewhere nearby banks. The river water was clear and cool. The river banks consist of shrubs, small trees, and larger trees somewhere. Other associated fish collected in the type locality belongs to genus *Bangana*, *Labeo*, *Barilius*, *Devario* and *Chagunius*.

**Etymology**– The species is named after LakpaTamang in recognition of his assistance to the authors during the field work in Arunachal Pradesh.

**Figure 3** Type locality of *Garra tamangi,* Dikrong River at Hoj, Arunachal Pradesh, India.

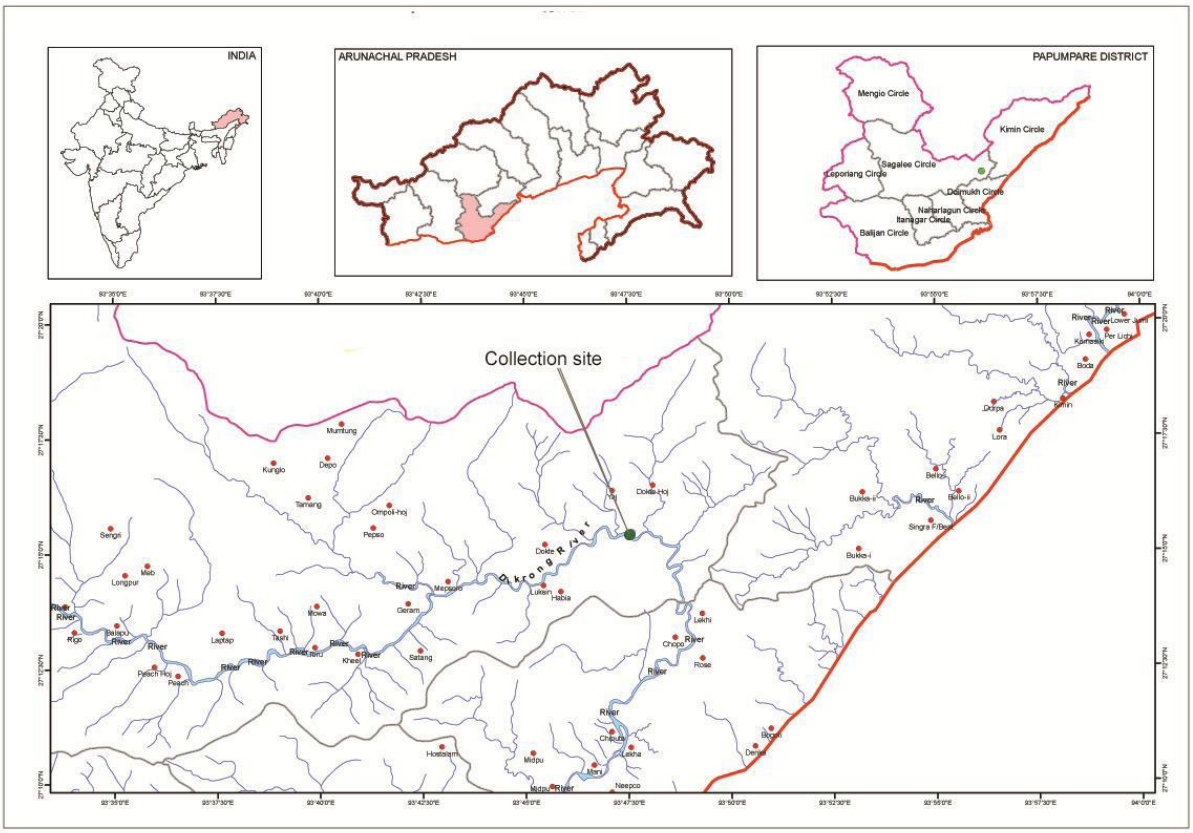


**Figure 4** Map of Arunachal Pradesh, India, showing the type locality of *Garra tamangi*

## 4. DISCUSSION

Nebeshwar and Vishwanath (2013) considered *Garra* specimens in different river systems having a series of black spots along the base ofdorsal fin rays but with various shapes of prominent proboscis, different shapes and distribution of tubercles, varying oral morphology and morphometric and meristic characters as different species. Moreover, Kottelat (2001) has already stated that highly specialized rheophilic fish species have restricted geographical distribution ranges. *Garra tamangi,* is characterized in havingentirely a triangular proboscis, trilobed with two lateral lobes more or less anteriorly free and a short median lobe, slightly protruding, consisting of tubercles on its antero ventral surfaces, presence of these characters apparently distinguishes*G. Tamangi* from all its congeners from Ganga-Brahmaputra River basin and neighboring drainages. However, comparisonsaremet out with the following congeners having weak to prominent proboscis on snout, viz.*G. lamta*, *G. nasuta*, *G. arupi, G. kalpangi*, *G. magnidiscus*, *G. arunachalensis, G. birostris, G. quadratirostris, G. gotyla*, *G. moltisalsi,G. alticaputus*, *G. kimini*, *G. minimus*, *G. nigricauda* from Ganga-Brahamputra River basin along the base of the Himalaya; *G. elongata*and *G. litanensis* from Chindwin River drainage in Manipur; *G. stenorhynchus* from southern India (Nilgiri Hills), Tamil Nadu; *G. bispinosa, , G. fuligonosa, G. orientalis, G.qiaojiensis* from Irrawaddy River basin in China, and *G. Cyrano* (Nam Mang basin) Laos.

The identity of *Garra nasuta* is confusing as the original description and the illustration of McClelland (1838), reproduced as fig. 9 in Nebeshwar & Vishwanath (2013) do not shows appropriate distinguishing diagnostic characters from its congeners. However, the figure clearly shows pit between the nares which is absent in *G. tamangi*. Moreover, the figure shows probably a moderately broad proboscis with anteriorly truncated margin in *G. nasuta*, while *G. tamangi* have narrow median lobe with anteriorly narrow truncated margin, distinctly different when viewed externally.

*Garra tamangi* differs from *G. lamta* in lacking (vs. having) a broad mid-lateral stripe on the body. Further, it is distinguished from *G. lamta* in having more predorsal scales 10-11 (vs. 8-10).

*Garra tamangi* differs from *G. arupi* in having higher number of tubercles on transverse lobe (15-25 vs. 6-9), longer snout (56-98% HL vs. 50.0-53.2), smaller eye (14-19% HL vs. 20.7-27.0), fewer lateral line scales (33-34 vs. 35-36), and submarginal transverse



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band on dorsal fin absent (vs. present); from *G. kalpangi* in having more transverse scale rows above lateral line (4 vs. 3½), more number of branched pectoral fin rays (13½-14½ vs. 10-12), transverse groove on snout present (vs. absent), and transverse lobe with well developed (vs. weakly developed) tubercles. It can be further distinguished in having outer margin of mental disc close to (vs. far away from) the pectoral-fin origin (compare Fig. 1 with Nebeshwar*et al*., 2011: fig. 2).

*Garra tamangi* differs from *G. magnidiscus* in having (vs. lacking) proboscis on snout. It can be further differentiated in having fewer lateral line scales (33 or 34 vs. 40-42) and transverse scale rows between lateral line and pelvic-fin origin (2½ vs. 3-3½), deeper caudal peduncle (12.6-14.4% SL vs. 10-11), shorter predorsal - (45.5-49.2% SL vs. 50-54) and adhesive mental disc length (39-41% HL vs. 46-55).

*Garra tamangi* differs from *G. arunachalensis* in having a longer dorsal-fin length(24.5-29.1% SL vs. 16.4-20.1),shorter mental disc length (39-41 % HL vs. 45-53), smaller central callous pad(length 22-27%HL vs. 32-38 and width 29-34% HL vs. 39-48), fewer lateral line scales (33-34 vs. 35), and presence (vs. absence) of di-, tri-and tetracuspid tubercles on snout.

*Garra tamangi* is easily distinguished from its sympatric species *G. birostris* in having trilobed (vs. bilobed) proboscis, fewer transverse scale rows above lateral line (4 vs. 4½) and between lateral line and pelvic-fin origin (2½ vs. 3½). It can be further distinguished from *G. birostris* in having three comparatively smaller (vs. larger) medial tubercles on transverse lobe (compare Fig. 2 with Nebeshwar & Vishwanath, 2013:fig. 5c). It also differs from *G. quadratirostris* in having fewer lateral line scales (33-34 vs. 37), and presence (vs. absence) of di-, tri- and tetracuspidtubercles on snout. Further, it can be easily distinguished from*G. quadratirostris* in having snout with narrower (vs. broader) proboscis (compare Fig. 2 with Nebeshwar & Vishwanath, 2013: fig. 6 c). It differs from *G. gotyla* in having higher number of tubercles on transverse lobe of snout (12-15 vs. 9-13), fewer transverse scale rows above lateral line (4 vs. 4½) and between lateral line and pelvic-fin origin (2½ vs. 3-3½). It can be further differentiated from *G. gotyla* in having closely (vs. distantly) situated tubercles on transverse lobe of snout (compare Fig. 2 with Nebeshwar & Vishwanath, 2013: fig. 7c).

*Garra tamangi* easily differs from *G.montisalsi* in having moderately (vs. strongly) projecting proboscis, not extending (vs. extending) forward to the level of the tip of the snout. Further, it can be differentiated in having dorsal profile of proboscis moderately (vs. strongly) arched (compare Fig. 1 with Nebeshwar & Vishwanath, 2013:fig. 10).

*Garra tamangi* differs from *G. alticaputus* in having a well developed (vs. subcutaneous) scales on breast, and proboscis on snout weakly developed (vs. well developed median proboscis). It further differs from *G. alticaputus* in having larger adhesive mental disc (length 39-41% HL vs. 32.5-38.0 and width 53-59% HL vs. 44.6-51.9). This can befurther justified externally by comparing Fig. 2 here and fig. 6 in Arunachalam *et al*., 2013, which clearly shows that the outer margin of mental disc of *G. tamangi* is close to pectoral-fin origin whereas far away in case of *G. alticaputus*; from *G. kimini* in having a longer head (24.8-27.9% SL vs. 15.68-19.64), fewer transverse scale rows between lateral line and pelvic-fin origin (2½ vs. 3½), and the posterior margin of adhesive mental disc close to (vs. far away) from the pectoral-fin origin; compare Fig.1 with Arunachalam *et al*., 2013: fig. 10); from*G. minimus* in having a well developed (vs. weakly developed) proboscis, deeper (vs. shallower) transverse groove on snout, fewer lateral line scales (33-34 vs. 35-37), more transverse scale rows above lateral line (4 vs. 3½), deeper caudal peduncle (12.6-14.4% SL vs. 7.46-12.2), and longer snout (56-98% HL vs. 31.38-55.95); from *G. nigricauda* in having fewer branched pectoral-fin rays (13½-14½ vs. 14-16), lateral line scales (33-34 vs. 35-36) and transverse scale rows above lateral line (4 vs. 4½), longer preanal length (76.2-82.1% SL vs. 69.82-76.14), smaller central callous pad (length 22-27% HL vs. 27.37-35.55 and breadth 29-34 vs. 35.71-49.74), and deeper caudal peduncle (12.6-14.4% SL vs. 9.71-11.65).

*Garra tamangi* differs from *G. elongata* in lacking (vs. having) a transverse black band on dorsal fin and longitudinal black band in the middle of the caudal fin, fewer lateral line - (33-34 vs. 39-40) and predorsal scales(10-11 vs. 13), more branched pectoral-fin rays (13-14 vs. 11-12). It can be further distinguished in having a well developed (vs. weakly developed) proboscis on snout; from *G. litanensis* in having longer head (24.8-27.5% SL vs. 19.9-23.5), longer and deeper caudal peduncle (length 14.7-16.5% SL vs. 12.2-14.9 and depth 12.6-14.4% SL vs. 11.9-12.2), longer prepectoral - (22.1-24.6% SL vs. 18.4-22.3) and preanal length (76.2-82.1% SL vs. 65.3-67.5), longer pectoral-fin -(22.1-25.1% SL vs. 18.5-20.0) and anal-fin length (19.0-20.6% SL vs.16.2-17.9.

*Garra tamangi* differs from *G. stenorhynchus* in having a forward projection of the proboscis not reaching (vs. reaching beyond) the transverse groove on the snout, and shorter predorsal length (45.5-49.2% SL vs. 62.9).

*Garra tamangi* differs from *G. salweenica* in having a shallower body at anus (16.7-18.6% SL vs. 21.73), shorter predorsal length (45.5-49.2% SL vs. 53.26), and broader mental disc (51.33% HL vs. 53-59).

*Garra orientalis* and *G. fuliginosa* from Irrawaddy River basin in China shares with *G. tamangi* the presence of tribole proboscis on snout. However, *G. tamangi* can be differentiated from *G. orientalis* in having dorsal fin with 8½ (vs. 8) rays, transverse scale rows between lateral line and pelvic fin origin 2½ (vs. 3), a series of black spots present (vs. absent) at the base of the dorsal fin; from *G. fuliginosa* in lacking (vs. having) a black blotch on the caudal-fin base, and having (vs. lacking) a series of black spots at the base of the dorsal fin rays; from *G. qiaojiensis* in having trilobe (vs. unilobe) proboscis, dorsal-fin rays with 8½ (vs. 8) rays, longer head (24.8-27.5% SL vs. 21.8-23.9) and snout (56-98% HL vs. 48.9-54.6), shorter mental disc (length 39-41% HL vs. 48.7-55.9 and width 53-59% SL vs. 62.5-70.8).

*Garra tamangi* can be easily distinguished from*G. cyrano* (Kottelat2000, 41: fig. 6)in havinga shorter (vs. longer) proboscis with a shallow (vs. deep)horizontal notch between it and inferior surface of snout. *Garra tamangi* can be distinguished from *G. bispinosa* in having a trilobed (vs. bilobed) proboscis, longer head (24.8-27.5% SL vs. 22.6-24.6), dorsal-fin (24.5-29.1% SL vs. 20.9-23.4) and pectoral-fin lengths (22.1-25.1% SL vs. 19.1-21.6).

## 5. COMPARATIVE MATERIAL

*Garra arunachalensis*:MUMF 4304 (holotype), 121.0 mm. SL; India: Arunachal Pradesh: Lower Divang valley district: Deopani River at Roing (Brahmaputra basin). Additional data from Nebeshwar & Vishwanath (2013).

*Garra birostris*: MUMF 4302, holotype, 102.0 mm. SL; India: Arunachal Pradesh: Papum Pare district: Dikrong River at Doimukh (Brahmaputra basin). Additional data from Nebeshwar & Vishwanath (2013).

*Garra quadratirostris*: MUMF 4306, holotype, 108.0 mm. SL; India: Sikkim: Tista River at Rangpo. Additional data from Nebeshwar & Vishwanath (2013).

*Garra gotyla*: MUMF 4300, neotype, 104.3 mm. SL; India: Sikkim: Tista River at Rangpo. Additional data from Nebeshwar & Vishwanath (2013).

*Garra arupi*: RGUMF-0184, holotype, 60.0 mm SL; RGUMF-0185, 15, 50.0-72.4 mm SL; India: Arunachal Pradesh; Deopani River at Roing, Lower Dibang Valley.

*G. gotyla stenorhynchus*=*G. stenorhynchus*: ZSI/F-1748/1; India: Tamil Nadu: Nilgiri Hills. Additional data from Menon (1964).

*Garra lamta*: ZSI F 9971/1, India: Uttar Pradesh: A small Stream flowing near Matwatal.

*Garra montisalsi*: ZSI F 9953/1, type, 106.7 mm. SL; India: Punjab: Nilwan ravine near Shapur salt ranges. Additional data from Nebeshwar & Vishwanath (2013).

*Garra salweenica*: ZSI F 11602/1, holotype, 98.0 mm. SL; Myanmar: S. Shan States: Salween River at TakawKeng. Additional data from Hora & Mukerji (1934).

Comparative data for species which could not be examined are derived from the following literature sources: *Garra elongata* from Vishwanath & Kosygin (2000);*G. litanensis* from Vishwanath (1993); *G. bispinosa, G. fuligonosa, G. orientalis, G. qiaojiensis* and *G. cyrano* from Zhang (2005).

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