



***Garra palaruvica*, A NEW CYPRINID FISH (CYPRINIFORMES: CYPRINIDAE) FROM KERALA, WESTERN GHATS, PENINSULAR INDIA**

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Abstract- *Garra palaruvica* sp. nov., a new cyprinid fish, is described from the Palaruvi Falls, Kallada River basin near Thenmala in Kerala, India. It is distinguished from all other Indian species of the genus *Garra* by intermediate development of mental disc and central pad, long maxillary barbels and well exposed isthmus region. Other characters are compared and in diagnoses with closely and distantly related species. This new species, with the morphology of its mental disc, shows close similarities with species of *Garra* from Arabia and Ethiopia.

Keywords- Freshwater fish, Kerala, Indian cyprinid, *Garra palaruvica*

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Introduction

Species of the bottom-dwelling genus *Garra* Hamilton [1], together, form the most widely distributed group of cyprinid fishes, ranging from Borneo to West Africa through southern China, South and Southeast Asia, the Middle East, the Arabian Peninsula and East Africa [2]. Species of *Garra* inhabit a wide range of substrates (muddy, sandy, rocky) in streams, rivers, pools and lakes. They are primarily freshwater species but are also reported from brackish waters [3]. The genus is represented by 11 species from the Western Ghats, one of the biodiversity heritage sites of India. These include *Garra mullya* [4], *G. gotyla stenorhynchus* [5], *G. bicornuta* [6], *G. McClellandi* [5], *G. menoni* [7], *G. hughi* [8], *G. kalakadensis* [9], *G. periyarensis* [10], *G. surendranathanii* [11], and the recently described *G. emarginata* and *G. mlapparaensis* from the Periyar river, Kerala [12]. From north and northeastern India 20 species have been reported. These include *G. lamta* [1], and the following 19 species: *G. gotyla* [13], *G. rupecula* [14], *G. nasuta* [15], *G. lissorhynchus* [16], *G. kempi* [17], *G. annandalei* [17], *G. naganensis* [17], *G. abhoyai* [17], *G. manipurensis* [18], *G. litanensis* [19], *G. compressus* [20], *G. elongata* [21], *G. nambulica* [22], *G. paralisso-rhynchus* [23], *G. arupi* [24], *G. kalpangi* [25], *G. namyaensis* [26], *G. dampensis* [27], *G. magnidiscus* [28].

During a recent identification (January 2013) on the fish collections of Manonmaniam Sundaranar University Museum of Natural History (MSUMNH), the authors observed *Garra* specimens with dramatic morphological differences in a single lot identified as *Garra mullya* collected from southern part of Western Ghats. These specimens were without a transverse groove on snout, lengthy maxillary bar-

bels, no chest scales, fewer pre-anal scales, fewer anal scale rows, and intermediate development of the mental disc and central pad, and a well-exposed isthmus region. Further investigation of these specimens and comparisons with a larger sample of *Garra mullya* and other species across India revealed that the lot represents an additional species of *Garra* described herein, making 12 described species from Peninsular India.

Materials and Methods

Measurements were taken to the nearest 0.1mm using digital calipers. Methods for measurements and counts follow those of Hubbs and Lagler [29] additional characters such as disc length, disc width, central-pad length, central pad width, post-dorsal length, and body depth followed by Kullander and Fang [30]. Head characters are expressed as proportion of Head Length (%HL), Head length and body characters are expressed as proportion of standard length (%SL). Number in parenthesis following meristic data denote numbers of specimens examined with that count. Type specimens were deposited in Southern Regional Station, Zoological Survey of India, Chennai (ZSI/SRS), Manonmaniam Sundaranar University Museum of Natural History (MSUMNH), Alwarkurichi, Tamil Nadu, India and Collections of M. Arunachalam, (CMA).

New Species Description

***Garra palaruvica* sp. nov.**

Holotype: ZSI/SRS F8661, 1 ex. Male. 43.91mm SL, Palaruvi, near Thenmala, Kallada River basin, Kollam (District), Kerala, India, (N 08° 53' 16.8" E 77° 7' 38.2"), Collectors: M. Arunachalam, A. Manimekalan, A. Johnson, M. Muralidharan, R. Soranam. 4 Nov. 2000.

Paratypes: MSUMNH 67, 5 ex. 28.24-36.29mm SL; CMA 25, 2 ex, 37.77-44.41mm SL. All other details are same as Holotype.

Diagnosis

Garra palaruvica sp. nov. is distinguished from all congeners from the Western Ghats by the intermediate development of the mental disc and central pad (vs. well developed), isthmus free from mental disc (vs. covered), and long maxillary barbel (vs. short). From *Garra mullya* the new species is diagnosed in having a naked breast (vs. scaled); fewer anal scale rows (2.5 vs. 3- 4.5); fewer pre-anal scale rows (15-17 vs. 19-23). From *Garra gotyla stenorhynchus* it is diagnosed by the absence of a proboscis (vs. single median proboscis); naked breast (vs. scaled); fewer pre-anal scale rows (15-17 vs. 20-23). From *Garra bicornuta* it is distinguished by greater number of circumpeduncular scale rows (15-16 vs. 12); greater number of pre-dorsal scale rows (11 vs. 8-9), absence of proboscis (vs. well developed and markedly trilobed); naked breast (vs. scaled). It is differentiated from *G. kalakadensis* by fewer caudal-fin rays (9+8 vs. 10+9); greater number of circumpeduncular scale rows (15-16 vs. 12-14); fewer pre-anal scale rows (15-17 vs. 17-20); naked breast (vs. scaled). From *Garra hughi* it is distinguished by presence of pre-dorsal scales (vs. absence).

Garra palaruvica is distinguished from *G. surendranathanii* by a greater number of number caudal-fin branched rays (9+8 vs. 8+8); fewer lateral-line scale rows (31-33 vs. 36); fewer anal scale rows (2.5 vs. 5.5-6.5); greater number of pre-anal scale rows (15-17 vs. 11-14); well developed scales on belly (vs. subcutaneous). From *G. periyarensis* it is diagnosed by fewer lateral-line scales rows (31-33 vs. 38-39); greater number of circumpeduncular scale rows (15-16 vs. 12); greater number of circumferential scales (20-22 vs. absent) and presence of scales in belly (vs. absent). From *G. menoni* it is distinguished by fewer lateral-line scale rows (31-33 vs. 32-36); well developed pre-pelvic scales (vs. subcutaneous) and from *G. hughi* by presence of pre-dorsal scales (vs. absent); fewer lateral-line scale rows (31-33 vs. 36-37); belly scaled (vs. scales absent);

Garra palaruvica differs from *G. mcClellandi* by greater number of pectoral-fin branched rays (13 vs. 15); fewer lateral-line scale rows (31-33 vs. 35); fewer anal scale rows (2.5 vs. 7); fewer pre-anal scale rows (15-17 vs. 20). From *G. mlapparaensis* it is diagnosed by fewer caudal-fin rays (9+8 vs. 10+9); fewer lateral-line scale rows (31-33 vs. 35); greater number of circumpeduncular scale rows (15-16 vs. 12); fewer pre-anal scale rows (15-17 vs. 24); breast naked (vs. scaled). From *G. emarginata* it is diagnosed in having fewer caudal-fin rays (9+8 vs. 10+9); fewer lateral-line scale rows (31-33 vs. 35); greater number of circumpeduncular scale rows (15-16 vs. 12) and fewer pre-anal scale rows (15-17 vs. 26);

Garra palaruvica is distinguished from species of *Garra* from north and north-eastern part of India by intermediate development of mental disc and central pad (vs. well developed), isthmus free from mental disc (vs. covered), and long maxillary barbel vs. (short) and other characters. It is diagnosed from *G. lissorhynchus* in having greater number of dorsal-fin rays (ii-iii, 8 vs. ii, 6); fewer of pre-dorsal scale rows (11 vs. 13); fewer anal scale rows (2.5 vs. 3.5); absence of W-shaped band on caudal-fin (vs. presence); greater number of pre-anal scale rows (15-17 vs. 8); belly scaled (vs. naked). From *G. numbulica* it is diagnosed in having fewer pre-dorsal scales (11 vs. 24); fewer anal scale rows (2.5 vs. 4.5); breast naked (vs. scales present); absence of W-Shaped band on caudal-fin (vs. present). It exhibits variations with *Garra annandalei* in having greater number of pre-dorsal scales (11 vs. 9); greater number of

lateral-line scales (36-37 vs. 34); fewer pre-anal scale rows (15-17 vs. 18). It is distinguished from *G. gotyla gotyla* by the absence breast scales (vs. presence); absence of median proboscis (vs. presence). From *G. elongata* it is distinguished by fewer lateral-line scale rows (31-33 vs. 39); greater number of circumpeduncular scale rows (15-16 vs. 12); greater number of pre-anal scale rows (15-17 vs. 13); well developed belly scales (vs. poorly developed).

Garra palaruvica is diagnosed from *G. naganensis* by fewer lateral-line scales (31-33 vs. 39); fewer pre dorsal scales (11 vs. 12); fewer anal scale rows (2.5 vs. 6); greater number of pre-anal scale rows (15-17 vs. 14); presence of belly scales (vs. absent), It is diagnosed from *G. paralissorhynchus* by greater number of dorsal-fin rays (ii-iii, 8 vs. ii, 6); fewer pre-dorsal scale rows (11 vs. 12); absence of W-shaped band on caudal-fin (vs. present); presence of belly scales (vs. absent). From *G. kempi* it is diagnosed by fewer lateral-line scales rows (31-33 vs. 40); fewer pre-dorsal scale rows (11 vs. 12); greater number of circumpeduncular scale rows (15-16 vs. 12); fewer anal scale rows (2.5 vs. 7). From *G. kalpanjii* it is distinguished by greater number of pectoral-fin rays (13 vs. 10-12); absence of proboscis on snout (vs. poorly developed). *Garra palaruvica* is distinguished from *G. gravelyi* in having greater number of pre-dorsal scales (11 vs. 8-9); naked breast (vs. scaled); from *G. arupi* by greater number of number of branched pectoral-fin rays (13 vs. 10-11); fewer anal scale rows (2.5 vs. 6-8) and naked breast (vs. scaled).

Garra palaruvica is distinguished from *G. manipurensis* by fewer caudal-fin rays (9+8 vs. 10+9); greater number of pre-anal scale rows (15-17 vs. 12); fewer anal scale rows (2.5 vs. 4.0). From *G. compressus* it is diagnosed by a greater number of pectoral-fin rays (13 vs. 11); fewer lateral-line scales (31-33 vs. 39-40); shape of suctorial disc (rounded vs. pentagonal); fewer anal scale rows (2.5 vs. 5.0); fewer pre-anal scale rows (15-17 vs. 21). From *G. litanensis* it is diagnosed by fewer caudal-fin rays (9+8 vs. 10+9); greater number of circumpeduncular scale rows (15-16 vs. 12); fewer pre-anal scale rows (15-17 vs. 21). It is diagnosed from *G. namyaensis* by greater number of lateral-line scale rows (31-33 vs. 31); fewer pre-dorsal scales (11 vs. 13); fewer anal scale rows (2.5 vs. 3-4). From *G. nasuta* the new species is diagnosed by absence of proboscis (vs. prominent trilobed proboscis), from *G. abhoyai* by greater number of dorsal-fin rays (ii-iii, 8 vs. i, 6); fewer pre dorsal scales (11 vs. 17); greater number of number of pre-anal scale rows (15-17 vs. 7) and from *G. rupecula* in having fewer pectoral-fin rays (13 vs. 14-15) and well-developed scales on belly and post pelvic-fin region (vs. naked).

Description

Morphometric and meristic data are presented in [Table-1] and [Table-2]. A small species of *Garra* with a moderately short head (length 3.4 to 3.7 times in SL), ventral surface of head flattened. The snout is rounded and smooth (length 2.3 to 3.0 times in HL); orbit in middle of head length (length 3.4 to 4.2 times in HL). Two nostril pores placed close to one another and separated by a curved nostril flap. Two pairs of barbels: rostral barbels located antero-laterally, maxillary located at the corner of mouth, both are equal in length; anterior barbels cross the margin of rostral cap. Rostral cap well-developed; curved ventrally and connected with lower lip at the corners of mouth; rostral cap covered by numerous tiny papillae.

The height of head at occiput is contained 1.3 to 1.5 and the width of head 1.4 to 1.6 in HL. Head depth at nostril 2.7 to 3.0 times in

HL; head depth at pupil 1.8 to 2.0 times in HL. Pupil of eye situated midway between snout tip to occiput. Snout rounded and smooth without any proboscis, transverse groove or tubercles. Inter-orbital region slightly convex, its width 1.9 to 2.6 times in HL.

Table 1- Morphometric characteristics of *Garra palaruvica* from Palaruvi, near Thenmalai, Kallada river, Kerala, India

S. No	Morphometric Characters	Garra palaruvica (N = 8, including Holotype)		
		Min	Max	Average
1	Standard length	28.24	44.41	36.67
2	Pre-anal length	74.35	77.59	75.71
3	Pre dorsal length	47.74	51.58	49.64
4	Pre pelvic length	50.86	54.68	52.79
5	Pre pectoral length	20.82	24.11	22.54
6	Pre occipital length	71.08	79.82	75.87
7	Snout to opercle	73.98	81.99	79.44
8	Upper jaw length	27.32	31.8	30.07
9	Snout length	32.63	41.94	36.85
10	Pre nasal length	25.29	33.54	29.4
11	Orbit width	23.67	28.96	26.25
12	Inter orbital width	33.87	42.58	37.54
13	Inter nasal width	26.21	29.1	27.49
14	Head width	59.5	67.45	64.57
15	Peduncle length	10.69	12.76	11.78
16	Dorsal origin to pelvic insertion	21.44	23.51	22.71
17	Dorsal spinous height	7.45	11.02	9.18
18	Anal fin height	17.28	19.62	18.26
19	Head depth at nostril	32.88	36.11	34.36
20	Head depth at pupil	47.97	53.96	50.55
21	Head depth at occiput	66.46	75.62	71.47
22	Peduncle depth	12.18	13.64	12.92
23	Caudal fin length	29.84	34.5	31.56
24	Dorsal fin height	22.35	25.71	24.02
25	Pectoral fin length	22.43	26.56	24.13
26	Pelvic fin length	18.09	22.19	19.64
27	Maxillary barbel length	16.44	19.9	18.3
28	Rostral barbel length	14.96	19.47	17.03
29	Occiput to dorsal origin	28.16	30.97	29.21
30	Occiput to pectoral insertion	17.83	19.87	18.74
31	Occiput to pelvic insertion	39.34	46.6	42.22
32	Dorsal insertion to pelvic insertion	14.85	17.33	16.13
33	Dorsal origin to pectoral insertion	26.05	26.98	26.5
34	Dorsal origin to anal origin	30.23	37.62	34.36
35	Dorsal insertion to caudal fin base	30.82	36.3	34.09
36	Dorsal insertion to anal origin	19.95	22.86	21.58
37	Dorsal insertion to anal insertion	22.95	28.72	26.51
38	Dorsal fin base length	15.02	17.98	16.2
39	Anal fin base length	7.59	9.16	8.4
40	Pectoral insertion to pelvic insertion	25.67	31.41	28.43
41	Pectoral insertion to anal origin	36.7	49.4	44
42	Pelvic insertion to anal origin	10.93	18.33	14.36
43	Head length	8.08	11.72	10.08
44	Total length	36.58	56.78	46.84
45	Post-dorsal length	49.38	53.58	51.98
46	Body depth	19.37	23.39	21.76
47	Distance b/w pect fin origin to vent	47.42	51.49	49.5
48	Distance b/w pelc fin origin to vent	14.96	20.68	18.1
49	Disc length	23.65	29.61	27.64
50	Disc width	35.58	40.98	38.27
51	Central pad length	14.76	19.98	16.38
52	Central pad width	22.95	27.85	25.4

Table 2- Meristic characteristics of *Garra palaruvica* from Palaruvi, near Thenmalai, Kallada river, Kerala, India

S. No	Meristic counts	Min	Max	Average
1	Unbranched dorsal fin rays	2	3	2.8
2	Branched dorsal fin rays	8	8	8.0
3	Unbranched anal fin rays	2	2	2.0
4	Branched anal fin rays	5	5	5.0
5	Unbranched pelvic fin rays	1	1	1.0
6	Branched pelvic fin rays	8	8	8.0
7	Unbranched pectoral fin rays	1	1	1.0
8	Branched pectoral fin rays	13	13	13.0
9	Caudal fin upper lobe	9	9	9.0
10	Caudal fin lower lobe	8	8	8.0
11	Lateral line scales	31	33	31.7
12	Pre dorsal scales	11	11	11.0
13	Upper transverse rows	4.5	4.5	4.5
14	Lateral line to pelvic scale rows	3	3	3.0
15	Lower transverse rows (anus)	4	4	4.0
16	Circumpeduncular scale rows	15	16	15.7
17	Circumferential scales	20	22	20.8
18	Transverse Breast	Absent	Absent	Absent
19	Anal scale rows	2.5	2.5	2.5
20	Pre-anal scale rows	15	17	15.7

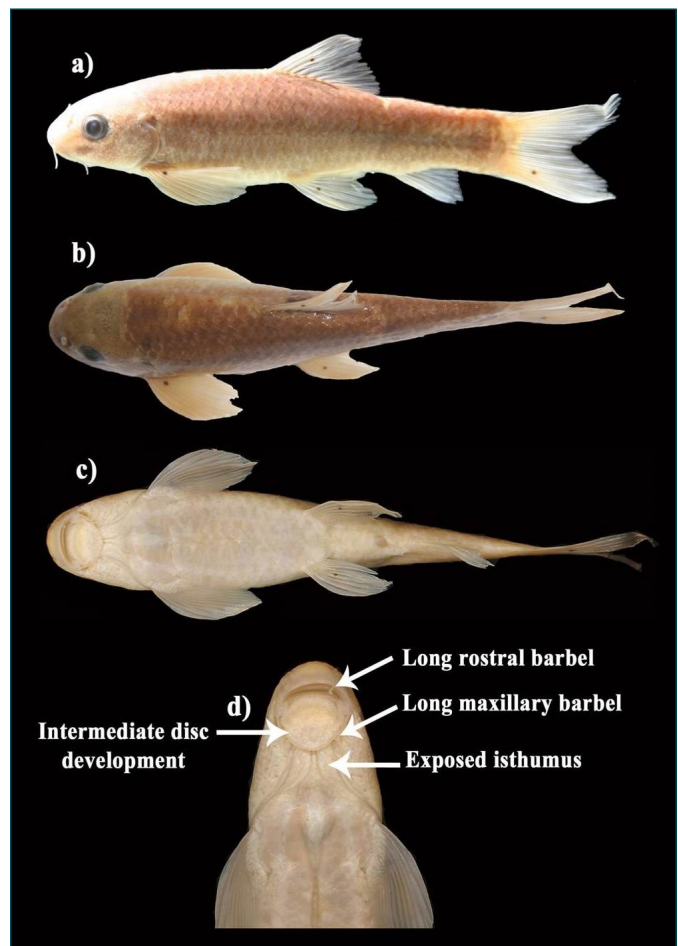


Fig. 1- *Garra palaruvica* Lateral (a), dorsal (b) and ventral (c) views, ventral view of mouth (d), Palaruvi, near Thenmala, Kallada river basin, Kollam (Dt), Kerala, India.

Body relatively sub-cylindrical, with flat ventral profile [Fig-1] Greatest depth at dorsal-fin origin; depth 4.2 to 5.1 times in SL and greatest width at pectoral-fin insertion. Dorsal profile of body more con-

vex from tip of supra-occipital process to dorsal fin origin. Dorsal-fin with ii-iii, 8 rays; fin inserted slightly anterior to vertical of pelvic-fin, first and second branched rays slightly longer than other branched rays. Dorsal fin origin vertically opposite to 11th scale of lateral line. Dorsal-fin base almost straight, slightly sloping posteroventrally; its height of fin 3.3 to 4.4 times in SL. Dorsal-fin base length contained in 6 scale rows. Dorsal-fin origin nearly closer to snout tip than caudal base. Profile from posterior end of dorsal-fin base to caudal fin base sloping downward. Ventral profile of body slightly convex from pectoral-fin to pelvic fin origin and straight from pelvic-fin to anal-fin origin.

Pectoral fin almost equal to head length and with i, 13 rays; its origin close to opercular opening. Fourth branched ray of pectoral-fin longest and when depressed flat not reaching pelvic fin origin; posterior end of depressed pectoral-fin separated from pelvic-fin origin by 3 scales. Pelvic-fins pointed, shorter than head length and with i, 8 rays; its origin vertically opposite 2nd branched ray of dorsal-fin. The depressed pelvic-fin covers anus, its second branched ray longest and not reaching anal fin origin. Pelvic fin separated from anal-fin origin by 2 scales. Pelvic fin origin vertically opposite to 12th row of lateral line scales.

Anal fin origin vertically opposite to 22nd lateral line scale with ii, 5 rays; its base nearly flat and length extending 3 scale rows. First branched ray of anal-fin longest, posterior end of anal-fin not reaching to caudal base. Vent closer to anal-fin origin than to pelvic-fin origin, separated from anal-fin origin by 2.5 scales rows.

Caudal-fin forked, both lobes are equal in length, rays 9+8. Lateral-line complete and with 31-33 scales; scales in transverse row above lateral line 4.5; below lateral line 3; scale rows between lateral-line and anal-fin origin 4, circumpeduncular scale rows 15-16; circumferential scales 20-21; pre-dorsal scale rows 11; scales between vent and anal fin origin 2.5. Number of pre-anal scale rows 15-17. Well developed scales present up to pectoral-fin insertion, breast naked [Fig-2]; mental disc small and developed intermediately; disc longer than wide, disc length 3.3 to 4.2 times in HL; disc width 1.6 to 1.7 times in HL; well exposure to isthmus region as compared to all the congeners in India [Fig-3]; disc arrangement similar comparable to species of *Garra* from Arabian and Ethiopian.

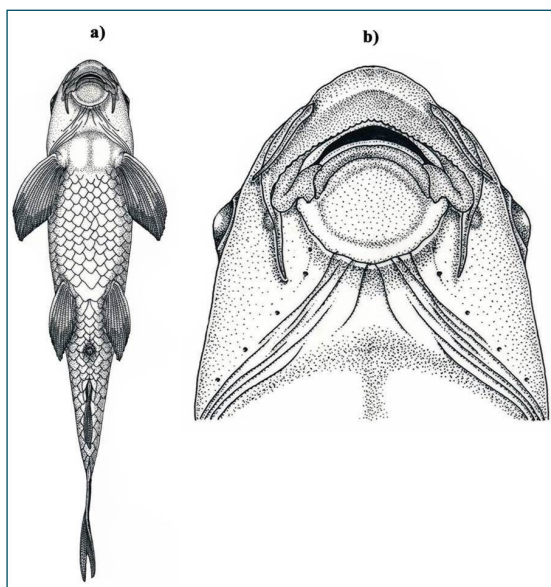


Fig. 2- Line drawings of *Garra palaruvida* ventral view (a) ventral view (b) of mouth.

Colouration

Dorsum and sides brownish in colour; lighter below lateral-line; ventral surface of head, breast and abdomen yellowish in colour; no spots or colouration in pelvic, pectoral or anal fins.

Etymology

Name is given as a noun in apposition after the name of the Palaruvi Falls in Kerala from where the specimen was first collected.

Habitat and Natural History

This species occurs in a second order mountain stream. Banks are highly confined with bedrock and the extension of bedrock into the streams forms nearly 80% of the substrate. Fishes were collected below the waterfall in a pooled area. The gradient of the stream is 5%. Where the species occurs is part of the Agasthiyamalai Biosphere Reserve in south Kerala. The riparian cover is tree canopy (90%). Recently, this stream was identified as a tourist spot for bathing in the waterfall [Fig-4].

Remarks

Menon [31] revised the genus *Garra* with the description of 37 species of which 8 species were from Africa. Lip and mouth structure are now considered to be important diagnostic tools for phylogenetic analyses [30]. More recently Stiassney and Getahun [32] diagnosed the African species of *Garra* based on rostral fold, breast with many or scattered scales, asquamate, presence and absence of scales on post-pelvic region and more emphatically the mental disc into three types; these include weakly developed, moderately developed and well developed. In all the species of the Indian genus *Garra* the disc is well developed and the frenum of rostral cap is continuous with lower lip. The central pad is well developed in all species and the latero-posterior flap is either granulated or papillated. The post labial fold in all species may be well developed with a papillated arch, and some species possess a semi horse-shoe shaped post labial fold that is papillated; a typical horse-shoe shaped labial fold is evident in *Discogobio*. Relative to *Garra* species from China *Garra palaruvida* is distinct in having the mental disc moderately developed and with free posterior and papillated margin. Maxillary barbel is longer as in species of *Garra* from Africa and Arabia and the exposed isthmus region is not present in any Indian species except the genus *Horallabiosa* [33]. Similarly, the long rostral and maxillary barbels exhibited in *Garra* are similar to the above genus. However, developmental stages of species of *Garra*, as shown in Hora [17], exhibit the isthmus region exposed but in adults the region is covered by the mental disc. In the present collection in the same locality we have specimens of equal size of *Garra mullya* and *G. palaruvida* which both possessed tubercles, revealing that the specimens of the species described herein are adults. Among the 17 species described from Africa [32], *G. geba* shows similarity with *G. palaruvida* in its disc structure, a structure that would be categorized as the intermediate type.

Petersula is a new genus of Ephemeroptera and its close relationship with *Kimminsula* complex from Sri Lanka [34] illustrates that many genera of the *Kimminsula* complex may reflect reflective an ancient Gondwanian fauna drifting India on the dispersal of these insect complex into hill streams of south India [35,36].

The description of *Petersula courtallensis* [34] is also from a falls habitat on the eastern side of Western Ghats. *Garra palaruvida* occurs on the western side of Western Ghats limited to a distance of 50km in distribution of both.

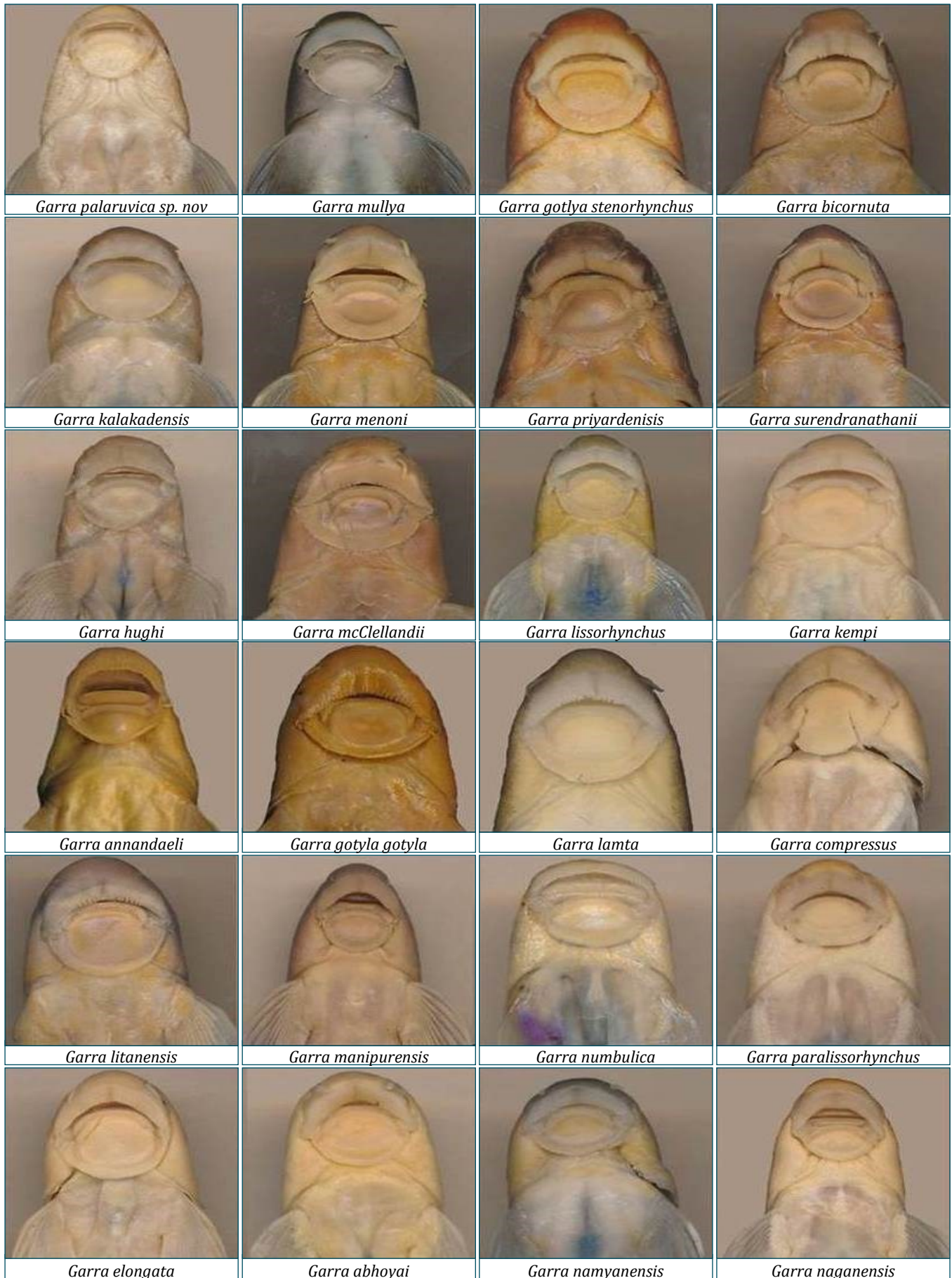


Fig. 3- Ventral views of mouth, of all the valid species of *Garra* from India

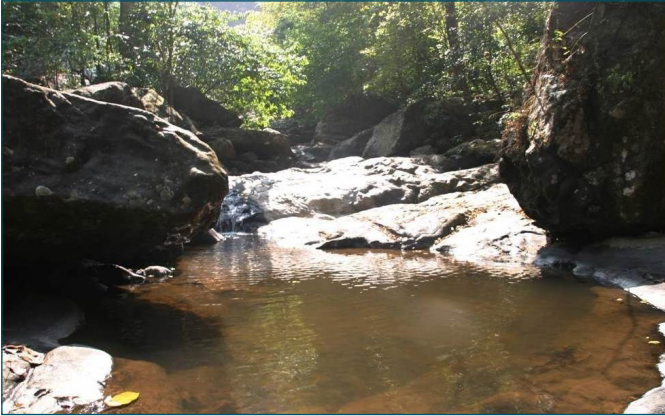


Fig. 4- Type locality of *Garra palaruvida*, Palaruvi, near Thenmala, Kallada river basin, Kollam (Dt.), Kerala, India

Comparative Materials Examined

Garra mullya MSUMNH C2, 4ex. 36.08-50.59mm SL; Beema river, Krishna basin, Maharashtra, India. 26th Nov.1998. Collectors: M. Arunachalam and Team.

Garra gotyla stenorhynchus MSUMNH C3, 15ex. 87.23-126.16mm SL; Nellithurai and Pillur, Bhavani River, Tamil Nadu, India. 2nd Feb. 2001. Collectors M. Arunachalam and Team.

Garra bicornuta MSUMNH C4, 19ex. 59.6-138.5mm SL, Thunga river at Thirthahalli, Karnataka, India. 19thJan.2004. Collectors M. Arunachalam and Team.

Garra kalakadensis MSUMNH C5, 10ex. 54.4-74.0 mm SL Kala-kad, Nambiyar River Basin, Tamil Nadu, India, 10th Feb.2001. M. Arunachalam and Team.

Garra hughii MSUMNH C6, 10ex. 47.0-62.6mm SL; Perumalmalai Stream, Kodaikanal, Tamil Nadu, India. 07th May.1996. Collectors M. Arunachalam and Team.

Garra menoni Holotype: ZSI/SRS, Chennai, F 553, 69.00 mm SL; Kunthi River, Silent valley, Kerala, India. 19th Jan. 1979. Collectors R.S. Pillai.

Garra mcClellandi MSUMNH C7, 1ex. 157.57mm SL; Noolpuzha, Wynaad Wildlife Sanctuary, Kabini Drainage, Tirunelli, Kerala, India. 13th Sep. 2008. Collectors M. Arunachalam and Team.

Garra periyarensis Holotype: ZSI, CLT, No V/F 9426, 156.00mm SL; Periyar River, Thanikkudy, Periyar Tiger Reserve, Kerala, India. 07thNov.1996. MSUMNH C8, 4ex. 142.5-160.1mm SL; Thuraiyar, Peachiparai range, Parambikulam Periyar Tiger Reserve, Kerala, India. 29th June. 2009. Collectors Dr. M. Arunachalam and Team.

Garra surendranathanii Holotype ZSI/WGRS/9390, 147.00mm SL; Orukomban, tributary of Chalakkudy river, Kerala, India. Collectors Shaji, Arun and Easa. 12th May1996. MSUMNH C9 3ex. 111.35-122.09mm SL; Orukomban, Kerala, India. 20th Dec. 2003. Collectors M. Arunachalam and Team.

Garra mlapparaensis data from Madhusoodana Kurup and Radhakrishnan (2010).

Garra emarginata data from Madhusoodana Kurup and Radhakrishnan (2010).

Garra lissorhynchus Topotype: ZSI Calcutta, FF 8098 / 1; 73.05 mm SL; Collected by: L. Kosygin.

Garra nambulica Paratype: ZSI Calcutta, 4139; 50.41 mm SL; Irengloic Stream flowing to Nambul River, Shingala Village, Imphal

West District, Manipur, India. 03rd Feb. 2004. MUMF 8002, Type series borrowed from Manipur University Museum of Fishes.

Garra annandalei Holotype ZSI Calcutta, F 6082 / 2-1; 60.17 mm SL; Kokha nallah, Koshi river, District: Barabakshetra. India. 30th Jan.1946.

Garra gotyla gotyla ZSI Calcutta, F 198/2; 121.92 mm SL; Kumaon Hills survey, Kosi River (Kosi Village – Almorah, 07th June1948.

Garra elongata ZSI Calcutta, FF 4157; 81.28 mm SL; Hill stream near Tollai, Ukhrul district, Manipur, India, 12th Nov. 1997. Collector, L. Kosygin.

Garra naganensis ZSI Calcutta, F 9970 / 1; 89.93 mm SL; Senapathi Stream, Naga hills, Assam, India). Collector L. Kosygin. Type series borrowed from MUMF.

Garra paralissorhynchus Paratype: ZSI Calcutta, 4158; 52.35mm SL; Location: Khuga River, Churachandrapur district, Manipur, India. 25th July 2000.

Garra kempii Holotype: ZSI Calcutta, F 7716 / 1; 88.51 mm SL; Sharjon River, below Damda, the Abor hills, India. 25th July 2000.

Garra abhoyai Type series from MUMF.

Garra manipurensis Type series from MUMF.

Garra compressus Type series from MUMF.

Garra litanensis Type series from MUMF.

Garra namyanensis Type series from MUMF.

Garra kalpangi data from Nebeshwar, Bagra and Das (2011).

Garra arupi data from Nebeshwar., Vishwanath and Das (2009).

Garra nasuta data from Menon (1964).

Garra rupecula data from Talwar and Jhingran (1991).

Garra dampansis data from Lalronunga, Lalnuntluanga and Lalramliana (2013).

Garra magnidiscus data from Tamang (2013).

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