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Ichthyofauna of Genus: *Garra* Hamilton-Buchanan 1822, recorded in River Siang of Arunachal Pradesh, India

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Abstract
Garra is a genus of ray-finned fish in the family Cyprinidae. These fish are one example of the log suckers, sucker mouthed barbs and other cyprinids commonly kept in aquaria to keep down algae. The genus was established by Buchanan-Hamilton in 1822 [7] as a subgenus of *Cyprinus.* Garras are slim cyprinids with a flat belly and a sucking mouth; their shape indicates that they are at least in tendency rheophilic. They are distinguished from other cyprinids by a combination of features: As in their closest relatives, their lower lip is expanded at its posterior rim to form a round or oval sucking pad, the vomero-palatine organ is much reduced or completely lost, the pectoral fins have at least the first two rays enlarged and usually unbranched, the supraethmoid is wider than long when seen from above, and the cleithrum is narrow and elongated to the front. Garras are not or barely noticeably sexually dimorphic and generally cryptically coloured benthic freshwater fish. They are omnivorous, eating alga, plankton and small invertebrates that they suck off substrate like rocks or logs. There are five species of *Garra* are recorded in River Siang of Arunachal Pradesh, these are *Garra annandalei, Garra gotyla gotyla, Garra kempi, Garra lissorhynchus* and *Garra mcclellandi.*

Keywords: *Garra*, Cyprinidae, River Siang, Arunachal Pradesh.

1. Introduction
River Siang, a hill-stream of 1st order river; had colluvial valley segment and pool-riffle type of reach. Pools, riffles and runs were generally found to dominate the micro-habitat type with frequent occurrence of trench pools. River Siang was said to be more entrenched based on V-shaped valley segment. The substrate type had been found to be dominated by gravels and cobbles with frequently occurring quite large number of boulders and some bed rocks. River Siang was the unique in the ichthyofaunal diversity. Fish sampling was carried out with the help of different kinds of nets such as cast net, gill net and traps, lines and hooks, *etc*. More than 50% of fish species of River Siang belongs to the Order Cypriniformes whereas other fishes were represented by the Orders *viz.*, Siluriformes, Perciformes, Clupeiformes, Synbranchiformes, Osteoglossiformes, Tetradontiformes and Beloniformes. In the present study on fish diversity, it was revealed that the number of fishes was recorded higher in pre-monsoon and monsoon seasons in all the study years. In this regard, the present objective is the numbers of different species of *Garra* are available in River Siang of Arunachal Pradesh.

2. Materials and Methods
2.1 Study Site
The River Siang, is largest river of Brahmaputra river system, originates from Chema Yungdung Glacier near Kubi at 5150 m in Tibet. In Tibet it is popularly known as Tsang-Po, flows in West–East direction. After traversing a distance of about 1625 km river in Tibet and then it takes a turn in south direction, enters the territory of India near Tuting in the Upper Siang district of Arunachal Pradesh and flows through North–South direction in East Siang district towards Assam and finally it merges with Lohit and Dibang in Assam and it becomes the mighty River Brahmaputra (Das *et. al.* 2014 a, b; Das and Kar 2015) [3, 4, 5] (Figure 1).

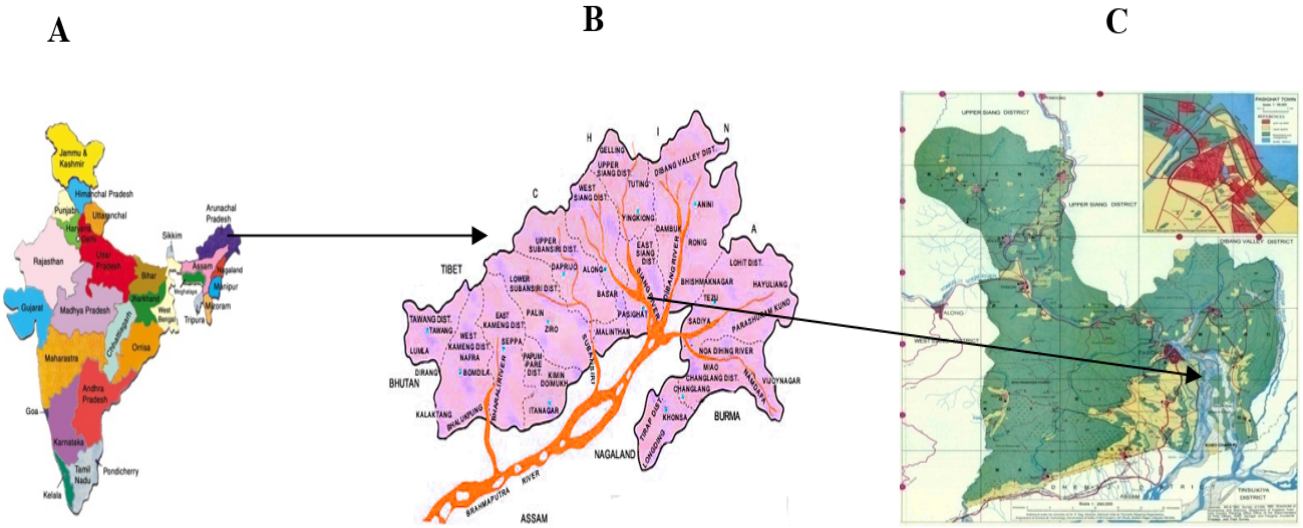

Fig 1: Map of (A) India indicating Arunachal Pradesh, (B) Arunachal Pradesh indicating to East Siang District, (C) In East Siang district highlighting River Siang (Study Area) of Arunachal Pradesh.

2.2. Freshwater Survey
Fish samples were collected from River Siang during January 2012 to December 2014 through experimental fishing; using cast nets (dia.3.7 m and 1.0 m), gill nets (vertical height 1.0 m-1.5 m; length 100 m -150 m), drag nets (vertical height 2.0 m), triangular scoop nets (vertical height 1.0 m) and a variety of traps and with hook and lines in certain places (where netting is not possible). River was surveyed and classified into different habitat units based on morphology (Bisson *et al.*, 1982) [2] and finally divided in to six (6) different study sites covering upstream, mid-stream and downstream stretches of the river. General survey of the fish biodiversity was done using standard procedures (Armontrout, 1990) [1].

2.3. Fish Measurement
The morphometric study included measurement of Total length (TL), Standard length (SL). Body depth (BD) Snout length, Post orbital length, Head length (HL), Pre dorsal length, Prepelvic distance, Eye diameter (ED), length of Caudal Peduncle, and Length of caudal fin. SL was the distance from the tip of the snout to the mid base of the caudal fin and TL was the distance from the tip snout to the furthest tip of the caudal fin. BD was the greatest vertical distance across the body. The measurements were done using Vernier Calliper Scale and Digital Sartorious Electronic Balance.

2.4. Fish Preservation and Identification
Fish species had been preserved, at first, in concentrated formaldehyde in the field. After that, the fishes were transferred to laboratory and preserved in 10 % formalin. The small size fishes were preserved in 5% aqueous formalin solution and big size fishes in 10% aqueous formalin solution and kept in the air-tight plastic bottles.

In the laboratory, the fishes were identified by following standard literature, notably, Day (1878) [6], Rainboth (1996) [16], Sen (2000) [17], Talwar and Jhingran (1991) [18], Jayaram (1999, 2010) [9, 10], Nath and Dey (1997, 2000) [14], Vishwanath (2000, 2002) [19, 20], and Kar (2007, 2013) [12, 13] and www.fishbase.org. All the fishes were kept in the Assam University Fish Museum (AUFM) for preservation and record. After labeling the fishes were drawn and photographed with the help of digital camera (Nikon Coolpix L-810).

2.5. Results and Discussion
In River Siang we had recorded *Garra annandalei, Garra gotyla gotyla, Garra kempi, Garra lissorhynchus* and *Garra mcclellandi.* They are described as follows:

3. Genus: *Garra* Hamilton- Buchanan 1822 [7]
Garra Hamilton-Buchanan, 1822 [7], *Fish Ganges* pp. 343 (type- species, *Cyprinus (Garra) lamta*, by subsequent designation), - Menon, 1964, *Mem. Indian. Mus*. 14 (4), p. 173-260, 13 pls. (world-revision).

Diagnosis: Body short, sub- cylindrical, ventral surface flat. Head slightly depressed anteriorly. Snout blunt, much diversified, smooth or with pores. Mouth inferior, transverse. Eyes small, in the posterior half of head, lateral, not visible from below ventral surface. One pair of barbel present, often only rostral pair. Dorsal fin inserted slightly ahead of pelvic fins, with 10 rays (9 branched) and no spine. Paired fins horizontally inserted and not plaited. Anal fin short with 6 rays. Caudal fin emarginated. Scales moderate. Lateral line complete with 34 scales.

3.1. *Garra annandalei* Hora, 1921
***Key to Species*:** Presence of one pair of Barbels**.** Proboscis absent**.** No dark spots at base of branched dorsal fin rays. Distance between vent and anal fin 2.78 in that between origins of pelvic and anal fin. Caudal peduncle length 1.2 in head length (Figure 2 and Plate 1).

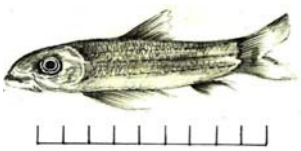

Fig 2: *Grra annandalei*

Plate 1: *Garra annandalei*

Snout length = 0.9 cm, Post orbital length = 1.2 cm, Head length = 1.6 cm, Pre-dorsal length = 3.1 cm, Pre-pelvic distance= 3.4 cm, Standard length = 6.4 cm, Total length = 8.1 cm, Eye diameter = 0.3 cm, Length of caudal peduncle = 1.0 cm, Length of caudal fin = 2.1 cm, Body depth = 1.5 cm and Weight = 6.67 g.

***Distribution*:** Arunachal Pradesh (Siang, Dibang, Lohit, Simen, Subansisri, Kamneg, Saren, Jia Bharali), Assam, Brahmaputra river system, Himalaya of India. Bangladesh. Nepal.

3.2. *Garra gotyla gotyla* (Gray, 1830) [8]

***Key to Species*:** Proboscis well developed with well-defined lateral tubercular area. Body depth less than 5 times the standard length. Breast and belly scaled. Distance of vent from anal fin 4.6 times in inter distance between pelvic fin origin and anal fin. (Figure 3 and Plate 2).

Fig 3: *Garra gotyla gotyla*

Plate 2: *Garra gotyla gotyla*

Snout length = 0.9 cm, Post orbital length = 1.2 cm, Head length = 1.6 cm, Pre-dorsal length= 3.1 cm, Pre-pelvic distance = 3.4 cm, Standard length = 6.4 cm, Total length = 8.5 cm, Eye diameter = 0.3 cm, Length of caudal peduncle = 1.0 cm, Length of caudal fin = 2.1 cm, Body depth = 1.5 cm and Weight = 6.67 g.

***Distribution*:** River Siang, Brahmaputra, Subansiri, Jiri, Bihar, Orissa, West Bengal of India. Bangladesh. Myanmar.

3.3. *Garra kempi* Hora, 1921

***Key to Species*:** Dorsal fin inserted almost midway between tip of snout and base of caudal fin. Lateral line scale 38. Vent situated almost midway between anterior origin of anal and pelvic fins (Figure 4 and Plate 3).

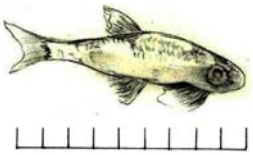

Fig 4: *Garra kempi*

Plate 3: *Garra kempi*

Snout length = 0.9 cm, Post orbital length = 1.2 cm, Head length = 1.6 cm, Pre-dorsal length = 3.1 cm, Pre-pelvic distance = 3.4 cm, Standard length = 7.4 cm, Total length = 8.1 cm, Eye diameter = 0.3 cm, Length of caudal peduncle = 1.0 cm, Length of caudal fin = 2.1 cm, Body depth = 1.5 cm and Weight = 14.54 g.

***Distribution*:** River Siang, Brahmaputra, Subansiri, Jiri, Bihar, Orissa, West Bengal of India. Bangladesh. Myanmar.

3.4. *Garra lissorhynchus* (McClelland, 1842)

***Key to Species*:** Presence of one pair of Barbels**.** Proboscis absent**.** No dark spots at base of branched dorsal fin rays. Presence of complete lateral line having 34 scales. Dorsal fin inserted distinctly nearer tip of snout than to caudal fin base**.** Tip of snout not marked off by a deep transverse groove. A pale lateral band without any lateral stripes present**.** Dorsal fin with a light black bar across and caudal fin with broad W-shaped bands. Back and post pelvic regions scaled (Figure 5 and Plate 4).

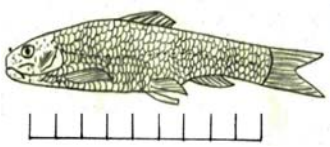

Fig 5: *Garra lissorhynchus*

Plate 4: *Garra lissorhynchus*

Snout length = 0.9 cm, Post orbital length = 1.2 cm, Head length = 1.6 cm, Pre-dorsal length = 3.1 cm, Pre-pelvic distance = 3.4 cm, Standard length = 5.4 cm, Total length = 6.1 cm, Eye diameter = 0.3 cm, Length of caudal peduncle = 1.0 cm, Length of caudal fin = 2.1 cm, Body depth = 1.5 cm and Weight = 7.67 g.

***Distribution*:** River Siang, Brahmaputra, Subansiri, Jiri, Orissa, West Bengal of India. Bangladesh and Myanmar.

3.5. *Garra mcclellandi* (Jerdon, 1849) [11]

***Key to Species*:** No such dark spots at base of branched dorsal fin rays. Vent located at considerable distance in advance of base of anal fin. Distance of vent from base of anal fin 5 times in that between anterior origins of pelvic and anal fin. Lateral line scale 36. Dorsal fin inserted distinctly nearer tip of snout than base of caudal fin (Figure 6 and Plate 5).

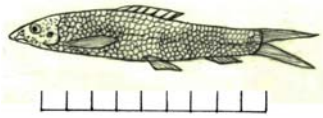

Fig 6: *Garra mcclellandi*

Plate 5: *Garra mcclellandi*

Snout length = 0.9 cm, Post orbital length = 1.2 cm, Head length = 1.6 cm, Pre-dorsal length = 3.1 cm, Pre-pelvic distance = 3.4 cm, Standard length = 11.4 cm, Total length = 13.6 cm, Eye diameter = 0.3 cm, Length of caudal peduncle = 1.0 cm, Length of caudal fin = 2.1 cm, Body depth = 1.5 cm and Weight = 26.67 g.

***Distribution*:** River Siang, Brahmaputra, Subansiri, Jiri of Assam and Arunachal Pradesh, Bihar, Orissa, West Bengal of India. Bangladesh, Myanmar and Thailand.

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