ON A RECENT PIONEERING TAXONOMIC STUDY OF THE FISHES FROM RIVERS DIYUNG, VOMVADUNG, KHUALZANGVADUNG, TUIKOI AND MAHUR IN DIMA HASAO DISTRICT OF ASSAM (INDIA)

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ABSTRACT

Ichthyofauna surveys in Diyung, Vomvadung, Khualzangvadung, Tuikoi, and Mahur rivers under Dima Hasao District of Assam resulted in the first report of 21 species of fish belonging to 19 genera, eight families, and four orders. These include Cypriniformes, Siluriformes, Synbranchiformes, and Perciformes. The species composition is highest in Vomvadung River with 11 species, followed by Diyung with eight species, Khualzangvadung with six species, Mohur with three species, and Tuikoi with two species. The conservation status of *Systomus clavatus*, *Tor tor*, *Neolissochilus hexagonolepis*, *Neolissochilus hexastichus* is near threatened, and *Pterocryptis barakensis* is endangered.

RÉSUMÉ: Sur une étude taxonomique récente des poissons des rivières Diyung, Vomvadung, Khualzangvadung, Tuikoi et Mahur dans le district de Dima Hasao à Assam (Inde).

L'étude de l'ichtyofaune dans les rivières Diyung, Vomvadung, Khualzangvadung, Tuikoi et Mahur sous le district de Dima Hasao de l'Assam a abouti au premier rapport de 21 espèces de poissons appartenant à 19 genres, huit familles et quatre ordres. Ceux-ci incluent les cypriniformes, les iluriformes, les Synbranchiformes et les Perciformes. La composition en espèces est la plus élevée dans la rivière Vomvadung avec 11 espèces suivies par la rivière Diyung avec huit espèces, Khualzangvadung avec six espèces, Mohur avec trois espèces et Tuikoi avec deux espèces. L'état de conservation de *Systomus clavatus*, *Tor tor*, *Neolissochilus hexagonolepis*, *Neolissochilus hexastichus* est presque menacé et *Pterocryptis barakensis* est en danger.

REZUMAT: Analiza unui studiu taxonomic recent inovator al peștilor din râurile Diyung, Vomvadung, Khualzangvadung, Tuikoi și Mahur din districtul Hasao, Assam (India).

Sondajul ihtiofaunei din râurile Diyung, Vomvadung, Khualzangvadung, Tuikoi și Mahur din districtul Hasao, provincia Assam a avut ca rezultat raportarea în premieră a 21 de specii de pești, încadrate în 19 genuri, opt familii și patru ordine. Acestea includ Cipriniforme, Siluriforme, Synbranchiforme și Perciforme. Cea mai bogată componentă a speciilor se află pe râul Vomvadung, cu 11 specii, urmat de râul Diyung cu opt, Khualzangvadung cu șase, Mahur cu trei și Tuikoi cu două. Statutul de conservare al speciilor *Systomus clavatus*, *Tor tor*, *Neolissochilus hexagonolepis* și *Neolissochilus hexastichus* este aproape amenințat, iar cel al lui *Pterocryptis barakensis* este amenințat.

INTRODUCTION

The aquatic biodiversity is under pressure due to human-induced impacts, including effects on fish and their habitats (Adom, 2018; Shao et al., 2019; Kar, 2000; Bănăduc et al., 2020; Lacerda et al., 2020), studies regarding fish fauna are needed.

India is one of the mega biodiversity countries in the World (Jayaram, 2003, 2010). Out of 2,500 species of fishes in India, 930 are freshwater (FW) inhabitants, and 1,570 are marine (Kar, 2003, 2007, 2013; Jayaram, 2010). This bewildering ichthyodiversity of this region has been attracting many ichthyologists from different regions of the world.

Concomitantly, the North-Eastern (NE) region of India has been identified as a “Hotspot” for Biodiversity by the World Conservation Monitoring Centre (WCMC, 1998). The hills and the undulating valleys of this area give rise to numerous torrential hill streams, which lead to big rivers and finally become part of the Ganga-Brahmaputra-Barak-Chindwin-Kolodnye-Gomati-Meghna system (Kar, 2000, 2007, 2013).

The fish fauna of the North-East (NE) India mainly features elements of the Indo-Gangetic region; and partly of the Myanmar and South-Chinese regions (Yadava and Chandra, 1994). There have been a significant number of works on the fish and fisheries. Ghosh and Lipton (1982) had reported 172 species. Sen (1985) reported 187 species from Assam and its environs. Sinha (1994) had compiled a list of 230 species of fishes from NE India. Nevertheless, Nath and Dey (1997) recorded 131 species of fishes from the drainages in Arunachal Pradesh alone. Sen (2000) comprehensively compiled a list of 267 species of fishes from NE India. Further, according to Sen (2000), of the 806 species of fishes inhabiting India's freshwaters (Talwar and Jhingran, 1991), the NE region of India is represented by 267 species belonging to 114 genera under 38 families and ten orders. It is 33.13% of the total Indian FW fishes. Further, of the 267 species, Cypriniformes dominates with 145 species, followed by Siluriformes (72), Perciformes (31), Clupeiformes (seven), Anguilliformes (three), Cyprinodontiformes (three), Osteoglossiformes (two), Synbranchiformes (two), Syngnathiformes (one) and Tetraodontiformes (one). Kar (2003) reported 133 species of fishes through a pilot survey conducted in 19 rivers spread in Barak drainage (Assam), Mizoram, and Tripura. Kar (2005) further reported the occurrence of 103 species of fishes through an extensive survey conducted in six principal rivers in Barak Valley (Assam), Mizoram, and Tripura. Kar (2007) and Sen (2007) have carried out a detailed study on fishes' biodiversity in North-East India with particular reference to Barak drainage, Mizoram, and Tripura.

The tropical Asian ichthyofauna constitutes a substantial part of the total lotic fish community. The Indian Peninsula supports 930 species of native FW fishes, which belong to 87 families (Kottelat, 1989; Kar and Sen, 2007; Jayaram, 2009). Several of tropical Asian FW fish share the African riverine ecosystems, both regarding the family and the generic level. Cyprinids, certain Siluriform catfishes, Channids, Mastacembelids, and Notopterids, are shared between the two regions. At the generic level, *Anabas*, *Clarias*, *Garra*, *Labeo*, and *Mastacembelus* occur in both African and Asian rivers. Tilapia, which have been introduced into India from Africa, have become widespread all over southern Asia. They have also replaced the native population in some places due to their dominance. There is a large-scale abundance of Cyprinids and Balitorids in Asia, in contrast to the predominance of Characids and Cichlids in Africa.

Incidentally, research on the ecology of the tropical fish communities is limited (Dudgeon, 1995). Further, there have been studies on fish diets and resource partitioning in specific Sri Lankan hill streams (Wikramanayake and Moyle, 1989). Niche' segregation is dependent on seasonality, diet, and habitat utilization, as was revealed from their studies. Also, there are morphological segregation and specialization in these fish communities.

MATERIAL AND METHODS

Fish samples were collected through experimental fishing using cast nets (diameter 3.7 m – 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. Camouflaging technique was also used to catch the fishes. Fishes have been preserved at first in concentrated formaldehyde in the field itself and then in 10% formalin. Fishes have been identified after standard literature (Day, 1873, 1885, 1878, 1889; Shaw and Shebbeare, 1937; Misra, 1959; Menon, 1974, 1999; Talwar and Jhingran, 1991; Jayaram, 1981, 1999, 2010) and fishbase.org (2019). The arrangement of classification, followed here, is that of Greenwood et al. (1966) and Jayaram (1981, 1999, 2010).

RESULTS AND DISCUSSION

The ichthyological survey in rivers of Dima Hasao District resulted in a pioneering reports and the first record of eight fish species in river Diyung, 11 species in river Vomvadung, seven species in river Khualzangvadung, two species in river Tuikoi, and three species in river Mahur. These comprise the Cypriniformes – *Barilius bendelisis*, *Barilius barila*, *Devario aequipinnatus*, *Danio dangila*, *Pethia conchoni*, *Esomus danrica*, *Systomus clavatus*, *Tor tor*, *Neolissochilus hexagonolepis*, *Neolissochilus hexastichus*, *Garra lamta*, *Garra gotyla*, *Crossocheilus burmanicus*, *Psilorhynchus balitora*, and *Acanthocobitis botia*. Siluriformes – *Pterocryptis barakensis*, *Mystus bleekeri*, and *Olyra longicaudata*; Synbranchiformes – *Mastacembelus armatus*; and, Perciformes – *Badis badis* and *Channa gachua*.

Phylum: Chordata

Class: Actinopterygii

Order: Cypriniformes

Family: Cyprinidae

1. Genus *Barilius* Hamilton, 1822

Barilius Hamilton, 1822, Fish Ganges, 266, 384 (Type species: *Cyprinus barila* Hamilton).

Generic characters: Body moderately elongate and compressed. Abdomen rounded. Head sharply pointed; might have "peral organs" and tubercles. Mouth anterior or obliquely directed upwards. Eyes large and superior in the anterior half of the head, not visible from below the ventral surface. Upper jaw longer than lower. Characteristic muscular pads present in front of the bases of the pectoral fins. Dorsal fin inserted opposite the inter-space between pelvic and anal fins, nearer to caudal-fin base than to the tip of the snout. Caudal fin forked. Scales moderate. Lateral line concave. The body usually covered with vertical bands.

Material examined: two individuals, 05.11.2014, river Diyung, one individual, 31.01.2017, river Vomvadung, three individuals, 31.10.2014, river Khualzangvadung, two individuals, 14.11.2014, river Tuikoi and six individuals, 30.10.2014, River Mahur, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Anal fin short with seven-eight branched rays. Each scale usually has a black spot on it.

1.1. *Barilius bendelisis* (Hamilton, 1807)

Distribution: Throughout India, including Diyung, Vomvadung, Khualzangvadung, Tuikoi, and Mahur Rivers in Dima Hasao District, Assam (first report); Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, Sri Lanka, and Thailand.

IUCN Status: Least Concern (LC).

Material examined: one individual, 14.11.2014, river Tuikoi, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Body with 14 or 15 short vertical bars extending from back to lateral line.

1.2. *Barilius barila* (Hamilton, 1822)

Distribution: Throughout North East India, river Tuikoi, Dima Hasao District, Assam (first report); Bihar, Delhi, Jammu and Kashmir, Madhya Pradesh, Mysore, Orrisa, Rajasthan, Uttar Pradesh, West Bengal. Bangladesh, Myanmar, and Nepal.

IUCN Status: Least Concern (LC).

2. Genus *Devario* Heckel, 1843

Devario Heckel, 1843, Ichthyologie (von Syrien) in von Russesa, Ereisen in Europa, Asia and Africa 1 (2): 1015 (Type species: *Cyprinus devario* Hamilton monotypy).

Generic characters: Mainly differentiated from *Danio* by a short and wide pre-maxillary ascending process, a short maxillary barbel, a “P stripe” extending to median caudal-fin rays. Infraorbital five or not or slightly reduced.

Material examined: one individual, 31.01.2017, river Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: A lateral band along the sides of the body with thinner golden bands above and below it.

2.1. *Devario aequipinnatus* (McClelland, 1839)

Distribution: Throughout India, including river Vomvadung in Dima Hasao District in Assam (first report). Bangladesh, Myanmar, Tenasserim provinces, Nepal, Sri Lanka, and Thailand.

IUCN Status: Data Deficient (DD).

3. Genus *Danio* Hamilton, 1822

Danio Hamilton, 1822, Fishes of the Ganges, 321. 390 (Type species: *Cyprinus (Danio) dangila* Hamilton, by subsequent designation).

Generic characters: Body elongate, compressed, abdomen rounded, head moderate, blunt, snout obtuse, mouth anterior; cleft of mouth shallow and protractile, directed obliquely upwards. The end of the lower jaw in line with the dorsal profile and with a symphysial knob. Eyes large, centrally placed, not visible from below ventral surface. Lower jaw prominent with a knob at the symphysis. One or two pairs of barbels, rudimentary or none. Dorsal fin inserted opposite inter-space between anal and pelvic fins, nearer to caudal fin base than to tip of snout, with 10 or 19 rays. Anal fin with nine to 14 rays. Caudal fin emarginated, lunate, or forked. Scales moderate. Lateral line concave, complete with 32 to 42 scales. A stripe on the anal-fin rays. Two or more pigmented stripes on the caudal fin rays.

Material examined: one individual, 31.01.2017, River Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Barbels very long. Anterior lateral bands break up into a network.

3.1. *Danio dangila* (Hamilton, 1822).

Distribution: Throughout Northeast India, including river Vomvadung in Dima Hasao District in Assam (first report); Bihar, West Bengal, Eastern Himalayas, Madhya Pradesh, Uttar Pradesh, Bangladesh, Bhutan, Nepal, and Myanmar.

IUCN Status: Least Concern (LC).

4. Genus *Esomus* Swainson, 1839

Esomus Swainson, 1839, Nat. Hist. Fishes, 2: 285 (Type-species, *Esomus vittatus* Swainson, by monotypy).

Generic characters: Body elongate and strongly compressed. Abdomen rounded. Head small, snout blunt. Mouth small, obliquely directed upwards without a symphyseal knob. Two pairs of barbels; maxillary pair very long and extends up to anal fin. Dorsal fin inserted in the inter-space between pelvic and anal fins; nearer to the anal fin than to the pelvic fins, with six rays and no spine. Anal fin with five branched rays. Caudal fin forked. A lateral line may be absent or present with 27 to 34 scales.

Material examined: one individual, 31.01.2017, river Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Body with a broad lateral band on sides, 27-30 scales in lateral series.

4.1. *Esomus danrica* (Hamilton, 1822)

Distribution: Throughout India, including river Vomvadung in Dima Hasao District in Assam (first report); Afghanistan, Bangladesh; Myanmar; Nepal; Pakistan, Sri Lanka, Thailand, and South Vietnam.

IUCN Status: Least Concern (LC).

5. Genus *Tor* Gray, 1834

Tor Gray, 1834, Illustrations of Indian Zoology, 2, Pl.96 (type-species, *Cyprinus tor* Hamilton, by monotypy).

Generic characters: Body elongate, moderately compressed. Abdomen rounded. Head small, broadly pointed. Snout angularly rounded, often with tubercles. Mouth inferior, usually arched. Eyes large; not visible from below ventral surface. Lips fleshy, continuous at angles of the mouth. Posterior lip with a median lobe and the post-labial groove continuous. Four barbels; one pair each of maxillary and rostral. Dorsal fin inserted above pelvic fins, with 12 to 13 rays and a strong, stout, smooth spine. Anal fin with seven or eight rays. The caudal fin deeply forked. Scales large. Lateral line complete with 22 to 37 scales.

Material examined: one individual, 05.11.2014, river Diyung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Head relatively smaller than body depth. Lateral line scales 22-27.

5.1. *Tor tor* (Hamilton, 1822)

Distribution: Throughout North east India including river Diyung in Dima Hasao District (first report); West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Ganga, and Narmada river system, Eastern Himalayas. Bangladesh, Bhutan, China, Myanmar, Nepal, and Pakistan.

IUCN Status: Near Threatened (NT).

6. Genus *Neolissochilus* Rainboth, 1985

Neolissochilus Rainboth, 1985, Beaufortia 35 (3): 26 (Type species: *Barbus stracheyi* Day, 1871, by original designation).

Generic characters: Body deep anteriorly. Trunk and peduncle are smoothly tapering from anterior end to posterior end. Abdomen rounded. Head broad. Snout blunt. Mouth oblique, terminal to horizontal or inferior. Species with horizontal mouth often have the lobe of the snout overhanging the upper lip. Mouth smoothly rounded when the lower jaw is blunt. Eyes in the upper half of head; visible both from dorsal and ventral surfaces. Lips thick. Cheeks with many tubercles. Labial fold interrupted. Scales large and heavy.

Material examined: three individuals, 03.11.2014, 11 individuals, 05.11.2014, river Diyung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Mouth nearly truncate. Edge of lower jaw sharp.

6.1. *Neolissochilus hexagonolepis* (McClelland, 1839)

Distribution: Throughout North east India including river Diyung in Dima Hasao District in Assam (first report), Northern India, Darjeeling, and Eastern Himalaya. South and South-Eastern Asia.

IUCN Status: Near Threatened (NT).

Material examined: three individuals, 03.01.2014, river Diyung, one individual, 31.01.2017, river Vomvadung, one individual, 29.11.2014, river Mahur, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Mouth rounded smoothly, the edge of lower jaw blunt.

6.2. *Neolissochilus hexastichus* (McClelland, 1839)

Distribution: Arunachal Pradesh, Assam including rivers Vomvadung, Mahur, in Dima Hasao District in Assam (first report); Meghalaya, Mizoram, Nagaland, Rivers from Kashmir to Sikkim; Myanmar.

IUCN Status: Near Threatened (NT).

7. Genus *Pethia* Pethiyagoda, Meegaskumbura and Maduwage, 2012

Pethia, 2012, Pethiyagoda, Meegaskumbura and Maduwage: 80 (Type species: *Barbus nigrofasciatus* Gunther, 1868. Type by original designation).

Generic characters: Body short to moderately long, deep, and compressed. Abdomen rounded. Head short. Snout obtuse, conical, or pointed; sometimes, it may have tubercles. Mouth arched, anterior or inferior. The upper jaw may be protractile. Eyes moderate to large, dorsolateral; they are not visible from below the ventral surface. Lips thin, cover the jaws, without any horny covering. Jaws simple without any tubercle at the symphysis. Barbels four, two or may be absent. Dorsal fin short inserted nearly opposite to pelvic fins. Anal fin short. Caudal fin forked. Scales small, moderate, or large.

Material examined: two individuals, 31.01.2017, river Vomvadung, two individuals, 31.10.2014, river Khuolzangvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Barbel absent, lateral line incomplete, and caudal peduncle with a black blotch.

7.1. *Pethia conchoni* (Hamilton, 1822)

Distribution: Throughout North east India including river Vomvadung and river Khuolzangvadung in Dima Hasao District, Assam (first report); Bihar, Uttar Pradesh, Punjab, Maharashtra, Orissa, Eastern, and western Himalaya, Deccan, Afghanistan, Bangladesh, Myanmar, Nepal, Pakistan, and Sri Lanka.

IUCN Status: Least Concern (LC).

8. Genus *Systomus* McClelland, 1838

Systomus McClelland, 1838, 948 (Masc. *Systomus immaculatus* McClelland 1839. Type by subsequent designation).

Generic characters: Last simple dorsal-fin ray strongly serrated; soft dorsal fin rays usually eight. Presence of two pairs of well-developed barbels rostral and maxillary; some may have small maxillary barbels. Many of them have a longitudinal stripe extending the length of the body dorsal to the lateral line.

Material examined: one individual, 30.10.2014, river Mahur, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Presence of 40-42 lateral line scales and 14 pre-dorsal scales.

8.1. *Systomus clavatus* (McClelland, 1845)

Distribution: North east India including River Mahur, in Dima Hasao District in Assam (first report); Himalayan foothills. Bangladesh, Myanmar, Nepal.

IUCN Status: Near Threatened (NT).

9. Genus *Garra* Hamilton, 1822

Garra Hamilton, 1822, Fish Ganges: 343, 393 (Type species: *Cyprinus (Garra) lamta* by later designation).

Generic characters: Body short, sub-cylindrical. Ventral surface flat. Head little depressed anteriorly. Snout blunt; smooth or with pores; with or without a deep, transverse groove-like depression. Mouth inferior, transverse, semi-circular. Eyes small; in the posterior half of the head; lateral; not visible from below ventral surface. Lips thick and fleshy. Upper and lower lips are continuous without any lateral lobes. A proboscis may or may not be present. A suctorial disc of semi-cartilaginous pad present on the chin. Scales moderate.

Material examined: nine individuals, 03.11.2014, 13 individuals, 04.11.2014, river Diyung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: A well-developed median proboscis and a transverse lobe at tip covered with spiny tubercles.

9.1. *Garra gotyla* (Gray, 1832)

Distribution: Throughout Northeast India, including River Diyung in Dima Hasao District, Assam (first report); The Himalayas, Chotanagpur plateau, and mountains of the Indian Peninsula area. Afghanistan, Bangladesh, Bhutan, Myanmar, Nepal, and Pakistan.

IUCN status: Least Concern (LC).

Material examined: 51 individuals, 03.11.2014, river Diyung, two individuals, 31.01.2017, river Vomvadung and two individuals, 31.10.2014, river Khualzangvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Snout rounded and smooth with a deep, transverse groove at the tip.

9.2. *Garra lamta* (Hamilton, 1822)

Distribution: Throughout North east India including rivers Diyung, Vomvadung, Khualzangvadung in Dima Hasao District, Assam (first report), Eastern Himalayas, and Western Ghats. Myanmar, and Nepal.

IUCN status: Least Concern (LC).

10. Genus *Crossocheilus* Kuhl and VanHasselt, 1823

Crossocheilus Kuhl van Hasselt, 1823, Algem-Konst. Letter-Bode, 2. P. 132 (Type species: *Crossocheilus oblongus* Kuhl and van Hasselt).

Generic characters: Body elongate with a comparatively smaller head. Mouth inferior, lower lip without a suctional disc and margin of upper lip uniserial papillated. Barbels one or two pairs. Dorsal fin without spine branched dorsal-fin rays eight-nine. Paired fins are horizontally placed.

Material examined: one individual, 04.11.2014, river Diyung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Presence of a dorsal fin with nine branched rays. Absence of maxillary barbels.

10.1 *Crossocheilus burmanicus* Hora, 1936

Distribution: Arunachal Pradesh, Assam including river Diyung, in Dima Hasao District (first report); Manipur, Mizoram, Nagaland, Myanmar.

IUCN Status: Least Concern (LC).

Family: Psilorhynchidae**11. Genus *Psilorhynchus* McClelland, 1839**

Psilorhynchus McClelland, 1839, Asiatic Researches, 19: 300, 428 (Type species: *Cyprinus sucatio* Hamilton, by subsequent designation).

Generic characters: Body spindle-shaped, arched dorsally and flattened ventrally; anteriorly depressed. Ventral surface markedly flattened. Snout flat obtusely pointed anteriorly. A shallow depression may be present on the cheek. Mouth small, inferior, transverse. Eyes large, dorsolateral in the posterior half of the head; not visible from below ventral surface. Lips entire, fleshy, continuous at the angle of mouth; reflected off from both the jaws; and, with glands and folds. Presence of a distinct lateral groove on either side passing along the sides of the snout. The upper jaw overhangs the mouth. Absence of barbels. Dorsal fins inserted ahead of pelvic fins with 10-12 rays. Pectoral fins simple with four-six rays. Anal fin short with seven rays. Caudal fin forked; upper lobe longer. Scales relatively large along the lateral line. Lateral line complete with 32-34 scales.

Material examined: one individual, 31.10.2014, river Khuolzangvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Pectoral fin with six-seven simple rays. Lateral line scales 30-34.

11.1. *Psilorhynchus balitora* (Hamilton, 1822)

Distribution: Throughout Northeast India, including: river Khuolzangvadung, Dima Hasao District, Assam (first report), North and West Bengal, Jamuna River; Bangladesh, Myanmar, and Nepal.

IUCN Status: Least Concern (LC).

Family: Nemacheilidae**12. Genus *Acanthocobitis* Peters, 1861**

Acanthocobitis Peters, 1861, 712 (Fem. *Acanthocobitis longipinnis* Peters 1861. Type by monotypy).

Generic characters: Body deeper than in most other nemacheilines, strongly compressed posteriorly. Head slightly compressed. Nostrils are placed close together. Snout blunt. Presence of a slight indication of an adipose keel. Upper lip covered by two or three rows of papillae. Lower lip broad on both the sides; interrupted in the middle and with

numerous papillae. Dorsal fin with 10-18 branched rays. Edge of dorsal fin straight or slightly convex. Caudal fin slightly emarginated, linear or convex. Scales large all over the body. Lateral line complete; or, extend, at least up to under the dorsal fin. Presence of conspicuous black spot at the upper extremity of the caudal fin.

Material examined: one individual, 31.10.2014, river Khuolzangvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Dorsal fin with nine-11 branched rays. Lateral line complete.

12.1. *Acanthocobitis botia* (Hamilton, 1822)

Distribution: Throughout India except the Malabar coast and south of river Krishna. The first report in river Khuolzangvadung, Dima Hasao District, Assam. Bangladesh, Bhutan, China, Myanmar, Nepal, Pakistan, Sri Lanka, Thailand, and Yunan.

IUCN Status: Least Concern (LC)

13. Genus *Schistura* McClelland, 1839

Schistura McClelland, 1839, Asiat. Res., 19: 306, 439 (Type species: *Cobitis* (*Schistura*) *rupecula* McClelland by subsequent designation).

Generic characters: Body elongate of almost uniform depth; compressed posteriorly. Head either depressed or compressed. Snout usually blunt. The posterior nostril may be prolonged as a tube in some species. Lips with a few furrows; medially interrupted. Upper lip slightly furrowed; continuous or with a narrow median interruption. Lower lip interrupted in the middle; moderately furrowed. Processus dentiform of upper jaw present with a corresponding incision on the lower jaw in many species. Dorsal fin short; inserted ahead or opposite to pelvic fins; with seven-eight rays; rarely 10. An auxillary pelvic lobe may be present. Caudal fin slightly emarginated, forked, or truncate (never rounded); with a black bar. A general absence of adipose crest. If present, mostly in the posterior part of the body. Lateral line complete or incomplete. Presence of scales on the body generally. Usually, the presence of a characteristic color pattern.

Material examined: one individual, 31.10.2014, river Khuolzangvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Body with dark crossbars of varying forms, transverse bars at the caudal fin base.

13.1. *Schistura* sp.

Distribution: Throughout Asia, Europe, and some parts of Ethiopia. The first report in river Khuolzangvadung, Dima Hasao District, Assam.

Order: Siluriformes

Family: Bagridae

14. Genus *Mystus* Scopoli, 1777

Mystus Scopoli (ex Gronow), 1777, 451 (Masc. *Bagrus halepensis* Valenciennes 1840. Type by subsequent designation).

Generic characters: Body short or moderately elongated. Head short, flattened. Snout obtuse or rounded. Mouth sub-terminal, transverse. Eyes anteriorly situated, relatively large. Teeth are numerous. The upper surface of the head mostly smooth with one or two median longitudinal grooves of varying length. An occipital process long or short situated superficially and concealed under skin. Four pairs of barbels; one each of maxillary, nasal, and two of mandibular. Two dorsal fins; an anterior rayed dorsal with seven or eight rays and a spine; a

posterior smooth low adipose fin of varying lengths. Pectoral fins with seven to 11 rays and a strong spine serrated along the inner edge. Pelvic fins with six rays. Anal fin with nine to 14 rays. Caudal fin forked, bilobed with unequal lobes; lobes may be rounded, pointed, or prolonged into filamentous extensions. Lateral line simple, complete.

Material examined: one example, 31.01.2017, river Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Presence of three broad conspicuous dark bands separated by two pale lines on each side of the lateral line.

14.1. *Mystus bleekeri* (Day, 1877).

Distribution: North and North-East (NE) India including river Vomvadung in Dima Hasao District, Assam (first report), Mahanadi headwaters, Baroda, Godavari, Kerala, Maharashtra, Tamil Nadu. Bangladesh, Bhutan, Indonesia, Myanmar, Malaya, Nepal, Pakistan, Sumatra, and Thailand.

IUCN Status: Least Concern (LC).

15. Genus *Olyra* McClelland, 1842

Olyra McClelland, 1842, Calcutta J. nat. Hist. 2., p. 588 (Type species: *Olyra longicaudata* McClelland by subsequent designation).

Generic characters: Loach-like, elongate, small-sized fishes with body long, slender, flattened in front of pelvis and compressed behind. Nostrils widely separated; anterior tubular; nearer to snout than to eyes; posterior with nasal barbels. Mouth not wide, not fleshy. Labial groove widely interrupted. Barbels eight; generally well-developed. Gill openings very wide and extend as far as forward to the eyes. Gill membranes extensive and united with each other across the isthmus. Rayed dorsal fin short and without a spine. Adipose dorsal fin long, low, smooth; not confluent with either rayed dorsal or caudal. Paired fins inserted horizontally. Pectoral fins with a sharp serrated spine. Anal fin of moderate length; embedded in the skin; not confluent with caudal. Caudal fin long, lanceolate or forked; upper part better developed than lower. Lateral line present; may be indistinct.

Material examined: one individual, 31.01.2017, river Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Presence of 18-23 anal fin rays. Upper lobe of caudal fin almost twice as long as lower.

15.1. *Olyra longicaudata* McClelland, 1842

Distribution: Arunachal Pradesh, Assam including river Vomvadung, Dima Hasao District, Assam (first report), Meghalaya, Mizoram, Nagaland, Tripura, and West Bengal. Myanmar.

IUCN Status: Least Concern (LC).

Family: Siluridae

16. Genus *Pterocryptis* Peters, 1861

Pterocryptis Peters, 1861, Monotst. Konig. Akad. Wissens. Berlin 7: 712 (Type species: *Pterocryptis gangetica*).

Generic characters: Body laterally compressed. Head broader than the body and somewhat flattened. Dorsal profile straight over the body, descending gently from dorsal fin to snout tip. Snout with rounded anterior profile and extends beyond gape. Anterior nostril is located anteromedial to maxillary barbel base, at the tip of the short wide tube, the posterior rim of which is higher than the anterior one. Posterior nostril located posteromedial to

maxillary barbel base bordered by well-developed fleshy membranes. Eyes small. Gape of mouth horizontal, extending to or just beyond vertical to anterior margin of eyes. Two or three pairs of well-developed barbels, maxillary and mandibular; additional pairs of mandibular barbels may be present, when three pairs. Gill membranes free from each other and also from the isthmus. Rayed dorsal fin inserted just anterior to ventral at the level of pelvis, with four to five rays and no spine. Pectoral fins are extending to pelvic-fin base, spine serrated along the inner edge. Pelvic fins are reaching anal fin. Anal fin continuous with the caudal or separated by a narrow notch. Caudal fin emarginated, lobes may be unequal. Minute sensory pores may be present on the head.

Material examined: three individuals, 03.11.2014, river Diyung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Anal fin with 65-77 rays and confluent with caudal fin.

16.1 *Pterocryptus barakensis* Vishwanath and Sharma 2006

Distribution: Barak drainage, Assam including river Diyung in Dima Hasao District (first report), Manipur.

IUCN Status: Endangered (EN).

Order: Synbranchiformes

Family: Mastacembelidae

17. Genus *Mastacembelus* Scopoli, 1777

Mastocembelus Scopoli, 1777, Introd. Hist. Nat. 458 (Type species: *Ophidium mastacembelus* Banks and Solander, by subsequent monotypy).

Generic characters: Body eel-like elongated, compressed, long, pointed. Snout long, conical. Mouth inferior. Cleft narrow. Eyes small, superior; situated in the middle of the head; not visible from below the ventral surface. Rim of anterior nostrils with two finger-like fimbriae and two flaps. Pre-opercle generally spiny at its angle. A pre-orbital spine may be absent. Dorsal fin inserted above the middle of pectoral fins, with 32-40 detached, depressible spines and 67-90 rays. Anal fin with three spines and 46-90 rays. Caudal fin rounded. Dorsal and anal fins may or may not be confluent with the caudal. Presence of scales on the body.

Material examined: one individual, 31.10.2014, river Khuoljangvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Body with zig-zag lines and a row of spots along the soft dorsal fin base.

17.1. *Mastacembelus armatus* (Lacepede, 1800)

Distribution: Throughout India including river Khuoljangvadung, Dima Hasao District, Assam (first report). Bangladesh, Bhutan, Baluchistan, Cambodia, Indonesia, China, Hainan Island, Java, Malaysia, Myanmar, Nepal, Pakistan, Sri Lanka, Sumatra, Thailand, and Vietnam.

IUCN Status: Least Concern (LC).

Order: Perciformes

Family: Badidae

18. Genus *Badis* Bleeker, 1853

Badis Bleeker, 1853, Verh. Bat. Genootsch, 25: 106 (Type species, *Labrus buechanani* Bleeker = *Labrus badis* Hamilton-Buchanan, by autonomy).

Generic characters: Body moderately elongated, compressed. Abdomen rounded. Head usually large, compressed. Snout bluntly rounded. Mouth relatively small, slightly upturned, terminal, and slightly protractile; cleft does not extend to the eyes anterior margin. Eyes large; not visible from below ventral surface. Lips thin. Lower jaw longer. Opercle with one sharp spine. A single dorsal fin inserted above the base of pectoral fins; the spiny portion more extended than the soft portion; with 16-18 spines and seven-10 rays. Anal fin with three spines and six-eight rays. Caudal fin rounded. Scales ctenoid and are of moderate size. Lateral line interrupted or absent with 26-33 scales, when present. Some of the unique characters include black stripe along the middle of the dorsal fin; dark bars on the trunk; modified in adults, displayed as two narrow vertical lines; dark pigment on the caudal-fin base differentiated into three vertically-aligned blotches.

Material examined: one individual, 31.01.2017, river Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Scales in lateral row 26-28. A row of dark spots along the base of the dorsal fin.

18.1. *Badis badis* (Hamilton, 1822).

Distribution: Throughout India, including river Vomvadung, Dima Hasao District, Assam, (first report). Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, and Thailand.

IUCN Status: Least Concern (LC)

Family: Channidae

19. Genus *Channa* Scopoli, 1777

Channa Scopoli, 1777, Introd. Hist. Nat.: 459 (Type species, *Channa orientalis* Bloch and Schneider, by subsequent designation).

Generic characters: Body elongated, sub-cylindrical anteriorly. Abdomen rounded. Head large depressed with plate-like scales. Snout somewhat obtuse. Mouth reasonably large; opening moderate to wide; may extend to below orbit. Eyes lateral, moderate; in the anterior part of the head. The lower jaw protrudes beyond the upper. Gill openings wide. Membranes of two sides connected beneath the isthmus. Dorsal fin long; inserted almost above the pectoral fins with 29-55 rays and no spine. Anal fin long with 21 to 36 rays. Both dorsal and anal fins are free from caudal fin. Caudal fin rounded; scales small; cycloid or ctenoid; scales on the head are more extensive than those on the body. Lateral line abruptly curved or almost interrupted with 37 to 110 scales.

Material examined: two individuals, 31.01.2017, river Vomvadung, Dima Hasao District, Assam. Collectors: Kar and Party.

Key to species: Presence of 22 anal fin rays and 39-50 lateral line scales.

19.1 *Channa gachua* (Hamilton, 1822)

Distribution: Arunachal Pradesh, Assam including river Vomvadung, Dima Hasao District, Assam, (first report), Manipur, Nagaland, Maharashtra, and West Bengal. Afghanistan in the west to Indonesia through South and Central Asia.

IUCN Status: Least Concern (LC).

The river Diyung (25°27'36"N; 92°59'42"E; altitude 989 m a.s.l.), one of the most significant rivers in the region, originates from the Borail Hills in Dima Hasao District of Assam and after receiving several small streams, it joins the river Kopili of the Brahmaputra drainage. In river Diyung, eight species of fish were recorded, including the Cypriniformes – *Barilius bendelisis* (Hamilton, 1807), *Tor tor* (Hamilton, 1822), *Neolissochilus hexagonolepis* (McClelland, 1839), *Neolissochilus hexastichus* (McClelland, 1839), *Garra lamta* (Hamilton, 1822), *Garra gotyla* (Gray, 1832), *Crossocheilus burmanicus* Hora, 1936 and Siluriformes – *Pterocryptis barakensis* Vishwanath and Nabeshwar Sharma 2006. The river Vomvadung (25°34'72"N; 93°02'02"E) originates from the Diyungbra region in the hills of Dima Hasao District and ends in river Diyung. Eleven species of fish were recorded in river Vomvadung, which includes the Cypriniformes – *Neolissochilus hexastichus* (McClelland, 1839), *Devario aequipinnatus* (McClelland, 1839), *Danio dangila* (Hamilton, 1822), *Garra lamta* (Hamilton, 1822), *Pethia conchoni* (Hamilton, 1822), *Esomus danrica* (Hamilton, 1822), *Barilius bendelisis* (Hamilton, 1807), Siluriformes – *Mystus bleekeri* (Day, 1877), *Olyra longicaudata* (McClelland, 1842) and Perciformes – *Badis badis* (Hamilton, 1822) and *Channa gachua* (Hamilton, 1822). The river Khualzangvadung (25°34'64"N; 93°01'8"E), ends in river Mahur after originating from the Nuomzang region in the hills of Dima Hasao District. In river Khualzangvadung, the six species recorded include the Cypriniformes – *Barilius bendelisis* (Hamilton, 1807), *Psilorhynchus balitora* (Hamilton, 1822), *Pethia conchoni* (Hamilton, 1822), *Acanthocobitis botia* (Hamilton, 1822), *Garra lamta* (Hamilton, 1822), *Schistura* sp. and the Synbranchiformes – *Mastacembelus armatus* (Lacepede, 1800). The River Tuikoi (25°34'07"N; 93°01'08"E) originates from the Muollien region in the hills of Dima Hasao District and ends in river Jinam. Two species of Cypriniformes – *Barilius bendelisis* (Hamilton, 1807) and *Barilius barila* (Hamilton, 1822) were recorded from the Tuikoi River. The river Mahur (25°32'05"N; 93°13'08"E) originates from the Pangmuol region in the hills of Dima Hasao District and ends in river Diyung. Three species of Cypriniformes – *Barilius bendelisis* (Hamilton, 1807), *Systemus clavatus* (McClelland, 1845), and *Neolissochilus hexastichus* (McClelland, 1839) were recorded from the river Mahur. The conservation status of *Systemus clavatus*, *Tor tor*, *Neolissochilus hexagonolepis*, *Neolissochilus hexastichus* are near threatened and *Pterocryptis barakensis* is endangered.

A glimpse into these studied rivers' habitat inventory parameters indicated that the rivers Diyung, Vomvadung, Khualzangvadung, Tuikoi, and Mahur exhibited mostly "fall", "cascade" "riffle-pool" types of micro-habits in their upstream rheophilic stretches in the hills of Dima Hasao District of Assam. However, riffle-pools were also found in some of these rivers' mid-stream stretches at little lower altitudes. Accordingly, the substrata also did reveal variations according to the stretches of the rivers at different altitudes. The fall and cascade regions had portrayed mostly bedrock and boulders, while the riffle-pool regions mainly depicted cobbles and gravels. These micro-habitats and substrata are essential breeding grounds for these hill stream fishes. Unfortunately, their harvests by people for different purposes have been damaging the microhabitats causing irreparable losses to the fishes breeding grounds. The coveted fishes, not finding a substratum for anchorage (with suckers, etc.), are often lost to oblivion, being driven away by the hill stream' fast torrents, causing colossal loss to the biodiversity. Aquatic sanctuaries are to be declared in specific stretches of the rivers to protect the precious fishes.

The sampled fish have been taxonomically characterized based on their morphometric and meristic features (Tabs. 1a, 1b, 2a, 2b, 2c, 3a, 3b, 4 and 5).

Table 1a: Morphometrics and meristic counts of fishes from river Diyung.

Morphometrics	<i>Barilius bendelisis</i> (n = 2)	<i>Tor tor</i> (n = 1)	<i>Crossocheilus burmanicus</i> (n = 1)	<i>Neolissochilus hexastichus</i> (n = 3)
Weight (g)	11.42-20.57	19.01	26.14	9.19-31.43
Total Length (cm)	10.8-12.9	12.9	14.9	10.1-14.4
Standard Length (cm)	8.7-10.3	9.8	11.6	7.7-11.4
Head Length (cm)	2.2-2.6	3.2	2.5	2.2-3.2
Head Depth (cm)	1.6-1.8	1.9	1.7	1.7-2.6
Head Breadth (cm)	1.1-1.3	1.5	1.5	1.1-1.8
Pre-Orbital Length (cm)	0.7	1.2	1.2	0.7-1.0
Post-Orbital Length (cm)	1.2-1.3	2.0	1.8	1.2-1.7
Snout Length (cm)	0.7	1.2	1.2	0.7-1.0
Eye Diameter (cm)	0.5	0.7	0.6	0.5-0.7
Pre-Dorsal Length (cm)	4.9-5.9	5.6	5	4.0-5.8
Post-Dorsal Length (cm)	4.8-5.7	6.5	8.4	5.2-6.9
Length of Dorsal fin base (cm)	1.0-1.4	1.3	1.9	1.2-1.8
Height of Dorsal fin (cm)	1.5-2.2	2.3	2.9	1.9-2.6
Pre-Pectoral Length (cm)	2.2-2.8	2.9	2.3	2.0-3.0
Post-Pectoral Length (cm)	8.5-10.5	9.4	12	8.1-11.4
Length of Pectoral fin base (cm)	0.4-0.5	0.4	0.6	0.3-0.5
Height of Pectoral fin (cm)	1.7-2.2	2.1	2.2	1.7-2.3
Pre-Pelvic Length (cm)	4.3-5.2	5.4	5.5	4.0-5.8
Post-Pelvic Length (cm)	6.6-7.8	6.6	8.1	5.9-8.8
Length of Pelvic fin base (cm)	0.3-0.4	0.4	0.6	0.3-0.5
Height of Pelvic fin (cm)	1.2-1.7	1.7	2.1	1.5-2.2
Pre-Anal Length (cm)	6.4-7.5	7.7	8.9	5.8-8.2
Post- Anal Length (cm)	3.7-4.3	4.1	4.6	3.6-5.3
Length of Anal fin base (cm)	1.1-1.3	0.6	0.8	0.7-0.9
Height of Anal fin (cm)	1.3-1.6	1.6	2.0	1.5-2.3
Body Depth (cm)	2.1-2.6	2.7	2.0	2.0-3.5
Length of Caudal Peduncle (cm)	1.5-1.7	1.6	2	1.4-2.5
Height of Caudal Peduncle (cm)	0.8-1.0	1.1	1.3	0.9-1.4
No. of Pectoral Fin Rays	12	15	12	16
No. of Spines in Pectoral Fin Rays	0	0	0	0
No. of Pelvic Fin Rays	9	9	9	9
No. of Spines in Pelvic Fin Rays	0	0	0	0
No. of Anal Fin Rays	9	7	7	7
No. of Spines in Anal Fin Rays	0	0	0	0
No. of Dorsal Fin Rays	8-9	10	9	9
No. of Spines in Dorsal Fin Rays	0	1	0	1
No. of Caudal Fin Rays	19	20	19	19
Shape of Caudal fin	Forked	Forked	Forked	Forked
No. Lateral Line Scales	40-42	26	38	23-25
No. of Scales above Lateral Line	7.5	4.5	5.5	4.5
No. of Scales below Lateral Line	4.5-5.5	4.5	5.5	4.5
No. of Nasal Barbels	0	0	0	0
No. of Rostral Barbels	2	2	2	2
No. of Maxillary Barbels	2	2	0	2
No. of Mandibular Barbels	0	0	0	0
Pre-Dorsal Scales	17-19	11	13	7-8

Table 1b: Morphometrics and meristic counts of fishes from river Diyung.

Morphometrics	<i>Neolissochilus hexagonolepis</i> (n = 14)	<i>Garra gotyla</i> (n = 22)	<i>Garra lamta</i> (n = 51)	<i>Pterocryptis barakensis</i> (n = 3)
Weight (g)	8.26-143.03	11.79-46.3	3.83-15.36	42.03-47.36
Total Length (cm)	10.20-22.4	9.9-15.4	6.0-10.7	18.0-19.3
Standard Length (cm)	7.8-18.6	8.0-12.5	4.6-8.6	15.9-17.2
Head Length (cm)	2.3-4.9	1.9-2.9	1.2-2.0	2.7-2.9
Head Depth (cm)	1.4-4.9	1.4-2.2	0.8-1.5	1.8-2.5
Head Breadth (cm)	1.1-3.2	1.4-2.2	0.9-1.5	2.1-2.6
Pre-Orbital Length (cm)	0.6-1.7	0.9-1.6	0.6-1.1	0.9-1.2
Post-Orbital Length (cm)	1.2-2.5	1.4-2.1	0.8-1.5	1.2-1.6
Snout Length (cm)	0.6-1.7	0.9-1.6	0.6-1.1	0.9-1.2
Eye Diameter (cm)	0.5-0.8	0.4-0.6	0.3-0.4	0.3-0.4
Pre-Dorsal Length (cm)	4.0-9.1	3.4-5.7	2.2-3.7	4.0-4.3
Post-Dorsal Length (cm)	5.4-12.2	5.3-7.5	3.0-5.3	14.2-16.1
Length of Dorsal fin base (cm)	1.0-3.1	1.4-2.1	0.6-1.4	0.1-0.2
Height of Dorsal fin (cm)	1.7-4.1	1.7-3.0	1.0-1.9	0.4-0.5
Pre-Pectoral Length (cm)	1.9-4.4	1.7-2.6	1.0-2.0	2.7-2.8
Post-Pectoral Length (cm)	8.1-18.5	8.0-12.5	5.1-8.9	15-16.3
Length of Pectoral fin base (cm)	0.3-0.9	0.5-0.8	0.3-0.5	0.6-0.8
Height of Pectoral fin (cm)	1.6-4.0	1.4-2.3	1.1-1.6	1.5
Pre-Pelvic Length (cm)	4.0-9.2	3.8-6.5	2.4-4.1	5.1-5.2
Post-Pelvic Length (cm)	6.0-13.5	4.2-9.0	3.5-5.8	12.6-14.1
Length of Pelvic fin base (cm)	0.3-0.8	0.3-0.6	0.3-0.5	0.7
Height of Pelvic fin (cm)	1.6-3.1	1.4-2.4	0.9-1.5	1.0-1.1
Pre-Anal Length (cm)	6.0-13.4	5.9-9.7	3.7-6.5	5.9-6.3
Post- Anal Length (cm)	3.6-8.0	3.3-5.5	2.0-3.8	1.7-1.8
Length of Anal fin base (cm)	0.5-1.3	0.5-0.9	0.4-0.8	10.1-11.4
Height of Anal fin (cm)	1.3-3.2	1.0-2.5	0.9-1.6	0.4-1.1
Body Depth (cm)	1.9-4.6	1.5-3.0	0.9-1.9	2.8-3.1
Length of Caudal Peduncle (cm)	1.4-3.7	1.4-2.4	0.8-1.7	0.6
Height of Caudal Peduncle (cm)	0.8-2.1	0.9-1.6	0.6-1.2	1.2-1.3
No. of Pectoral Fin Rays	12-17	14-16	14	12-15
No. of Spines in Pectoral Fin Rays	0	1	0	1
No. of Pelvic Fin Rays	9	8-10	9	10
No. of Spines in Pelvic Fin Rays	0	0	0	0
No. of Anal Fin Rays	7	7	6	68-70
No. of Spines in Anal Fin Rays	0	0	0	0
No. of Dorsal Fin Rays	8-10	9-10	9	3-4
No. of Spines in Dorsal Fin Rays	1	0	0	0
No. of Caudal Fin Rays	17-20	19-20	18	17-18
Shape of Caudal fin	Forked	Forked	Forked	Round
No. Lateral Line Scales	26-30	30-35	31-34	0
No. of Scales above Lateral Line	3.5-4.5	4.5	3.5-4.5	0
No. of Scales below Lateral Line	3.5-4.5	4.5-5.5	5.5-6.5	0
No. of Nasal Barbels	0	0	0	0
No. of Rostral Barbels	2	2	2	0
No. of Maxillary Barbels	2	2	2	2
No. of Mandibular Barbels	0	0	0	2
Pre-Dorsal Scales	9-12	8-13	9-12	0

Table 2a: Morphometrics and meristic counts of fishes from river Vomvadung.

Morphometrics	<i>Barilius bendelisis</i> (n = 1)	<i>Devario aequipinnatus</i> (n = 1)	<i>Danio dangila</i> (n = 1)	<i>Esomus danrica</i> (n = 1)
Weight (g)	22.85	4.83	4.34	1.01
Total Length (cm)	12.5	8.1	8.1	4.8
Standard Length (cm)	10.6	6	6.3	3.8
Head Length (cm)	2.6	1.5	1.4	0.9
Head Depth (cm)	2.3	1.3	1.2	0.7
Head Breadth (cm)	1.4	0.8	0.8	0.5
Pre-Orbital Length (cm)	0.8	0.5	0.5	0.3
Post-Orbital Length (cm)	13	0.9	0.9	0.6
Snout Length (cm)	0.8	0.5	0.5	0.3
Eye Diameter (cm)	0.5	0.4	0.4	0.3
Pre-Dorsal Length (cm)	6	3.6	0.37	2.5
Post-Dorsal Length (cm)	5.5	3.5	3.5	2.0
Length of Dorsal fin base (cm)	1.5	1.3	1.1	0.5
Height of Dorsal fin (cm)	2.4	1.4	1.3	0.8
Pre-Pectoral Length (cm)	3.2	1.5	1.4	1.0
Post-Pectoral Length (cm)	9.8	6.4	6.5	3.7
Length of Pectoral fin base (cm)	0.8	0.3	0.4	0.2
Height of Pectoral fin (cm)	2.1	1.4	1.5	1.1
Pre-Pelvic Length (cm)	5.4	3	3.1	2.0
Post-Pelvic Length (cm)	7.4	4.9	5	2.6
Length of Pelvic fin base (cm)	0.5	0.2	0.2	0.1
Height of Pelvic fin (cm)	1.9	1	1	0.8
Pre-Anal Length (cm)	7.8	4.2	4.4	2.8
Post- Anal Length (cm)	3.9	2.8	2.6	1.6
Length of Anal fin base (cm)	1.7	1.1	1.1	0.4
Height of Anal fin (cm)	1.4	1.2	1.2	0.7
Body Depth (cm)	2.8	1.7	1.6	0.8
Length of Caudal Peduncle (cm)	1.7	1	1.1	0.6
Height of Caudal Peduncle (cm)	1.2	0.7	0.7	0.4
No. of Pectoral Fin Rays	10	12	12	8
No. of Spines in Pectoral Fin Rays	0	0	0	0
No. of Pelvic Fin Rays	7	7	7	5
No. of Spines in Pelvic Fin Rays	0	0	0	0
No. of Anal Fin Rays	8	12	13	6
No. of Spines in Anal Fin Rays	0	0	0	0
No. of Dorsal Fin Rays	7	11	11	7
No. of Spines in Dorsal Fin Rays	0	0	0	0
No. of Caudal Fin Rays	16	19	19	12
Shape of Caudal fin	Forked	Forked	Forked	Forked
No. Lateral Line Scales	42	33	34	24
No. of Scales above Lateral Line	7.5	6.5	6.5	3.5
No. of Scales below Lateral Line	4.5	2.5	2.5	3.5
No. of Nasal Barbels	0	0	0	0
No. of Rostral Barbels	0	2	2	2
No. of Maxillary Barbels	2	2	2	2
No. of Mandibular Barbels	0	0	0	0
Pre-Dorsal Scales	17	12	12	11

Table 2b: Morphometrics and meristic counts of fishes from river Vomvadung.

Morphometrics	<i>Neolissochilus hexastichus</i> (n = 1)	<i>Pethia conchonius</i> (n = 2)	<i>Garra lamta</i> (n = 2)	<i>Mystus bleekeri</i> (n = 1)
Weight (g)	11.55	3.27-5.14	12.85-17.99	14.48
Total Length (cm)	11.1	6.4-7.0	9.9-11.4	11.9
Standard Length (cm)	8.6	4.8-5.3	7.8-8.9	9.3
Head Length (cm)	2.2	1.3-1.4	2.0-2.3	2.4
Head Depth (cm)	1.6	1.2-1.4	1.4-1.5	1.7
Head Breadth (cm)	1.1	0.7-0.9	1.5-1.7	1.8
Pre-Orbital Length (cm)	0.7	0.3	0.9-1.1	1
Post-Orbital Length (cm)	1.2	0.7	1.3-1.5	1.5
Snout Length (cm)	0.7	0.3	0.9-1.1	1
Eye Diameter (cm)	0.5	0.4	0.4	0.4
Pre-Dorsal Length (cm)	4.3	2.5-2.7	3.6-4.4	3.6
Post-Dorsal Length (cm)	5.7	3.5-3.6	5.4-6.0	7.9
Length of Dorsal fin base (cm)	1.3	0.8-1.0	1.3-1.6	1.4
Height of Dorsal fin (cm)	2.4	1.1-1.2	1.9-2.4	2.1
Pre-Pectoral Length (cm)	2.1	1.3	1.7-2.0	2.2
Post-Pectoral Length (cm)	9.1	5.0-5.4	8.0-9.2	9.8
Length of Pectoral fin base (cm)	0.3	0.3	0.5-0.6	0.4
Height of Pectoral fin (cm)	1.8	1.1	1.6	1.7
Pre-Pelvic Length (cm)	4.4	2.4-2.5	4.1-4.7	4.5
Post-Pelvic Length (cm)	6.8	4.0-4.3	5.5-6.4	7.4
Length of Pelvic fin base (cm)	0.4	0.3	0.4	0.3
Height of Pelvic fin (cm)	1.6	1.0-1.1	1.5-1.6	1.6
Pre-Anal Length (cm)	6.8	3.5-4.0	5.8-6.9	6.4
Post- Anal Length (cm)	4.0	2.5	3.3-3.7	4.5
Length of Anal fin base (cm)	0.6	0.5-0.6	0.6-0.7	1
Height of Anal fin (cm)	1.6	0.8	1.5-1.7	1.8
Body Depth (cm)	1.9	1.7-2.0	1.8-2.0	2.1
Length of Caudal Peduncle (cm)	1.6	0.9-1.0	1.6-1.7	2
Height of Caudal Peduncle (cm)	1	0.7	1.1-1.3	1.1
No. of Pectoral Fin Rays	12	11	14	7
No. of Spines in Pectoral Fin Rays	0	0	0	1
No. of Pelvic Fin Rays	9	8	9	6
No. of Spines in Pelvic Fin Rays	0	0	0	0
No. of Anal Fin Rays	6	6	6	7
No. of Spines in Anal Fin Rays	0	0	0	
No. of Dorsal Fin Rays	9	8	9	7
No. of Spines in Dorsal Fin Rays	1	1	0	1
No. of Caudal Fin Rays	19	18	18-19	14
Shape of Caudal fin	Forked	Forked	Forked	Forked
No. Lateral Line Scales	28	23-24	34	0
No. of Scales above Lateral Line	3.5	4.5	3.5	0
No. of Scales below Lateral Line	3.5	5.5	5.5	0
No. of Nasal Barbels	0	0	0	2
No. of Rostral Barbels	2	0	2	0
No. of Maxillary Barbels	2	0	2	2
No. of Mandibular Barbels	0	0	0	4
Pre-Dorsal Scales	8	7	9-10	0

Table 2c: Morphometrics and meristic counts of fishes from river Vomvadung.

Morphometrics	<i>Olyra longicaudata</i> (n = 1)	<i>Badis badis</i> (n = 1)	<i>Channa gachua</i> (n = 2)
Weight (g)	2.04	1.55	16.13-17.81
Total Length (cm)	8.2	4.7	12.1-12.3
Standard Length (cm)	7.1	3.7	9.8-10.3
Head Length (cm)	1.2	1.1	3.1-3.2
Head Depth (cm)	0.6	0.9	1.5-1.6
Head Breadth (cm)	0.9	0.6	2.0-2.1
Pre-Orbital Length (cm)	0.4	0.2	0.6-0.8
Post-Orbital Length (cm)	0.5	0.5	1.1-1.3
Snout Length (cm)	0.4	0.2	0.8
Eye Diameter (cm)	0.1	0.3	0.5
Pre-Dorsal Length (cm)	2.5	1.1	3.6-3.7
Post-Dorsal Length (cm)	5.2	1.4	2.5-3.0
Length of Dorsal fin base (cm)	0.7	2.3	5.1-5.7
Height of Dorsal fin (cm)	0.7	0.9	1.1-1.3
Pre-Pectoral Length (cm)	1.2	1.2	3.1-3.3
Post-Pectoral Length (cm)	7.0	3.5	9.1-9.3
Length of Pectoral fin base (cm)	0.2	0.2	0.5-0.6
Height of Pectoral fin (cm)	0.7	0.7	1.9-2.2
Pre-Pelvic Length (cm)	2.5	1.2	3.6-3.8
Post-Pelvic Length (cm)	5.6	3.3	5.7-9.1
Length of Pelvic fin base (cm)	0.2	0.2	0.2
Height of Pelvic fin (cm)	0.8	0.8	0.8-0.9
Pre-Anal Length (cm)	3.9	2.6	5.4-5.8
Post- Anal Length (cm)	2.2	1.6	3.4-3.5
Length of Anal fin base (cm)	2.3	0.7	3.3-3.9
Height of Anal fin (cm)	0.7	0.8	0.8-1.2
Body Depth (cm)	0.7	1.0	1.6-1.8
Length of Caudal Peduncle (cm)	1.1	0.7	1.2-1.5
Height of Caudal Peduncle (cm)	0.5	0.6	1.0-1.1
No. of Pectoral Fin Rays	6	10	11
No. of Spines in Pectoral Fin Rays	1		0
No. of Pelvic Fin Rays	7	6	6
No. of Spines in Pelvic Fin Rays			0
No. of Anal Fin Rays	13	6	32
No. of Spines in Anal Fin Rays		3	0
No. of Dorsal Fin Rays	5	16	37
No. of Spines in Dorsal Fin Rays		4	0
No. of Caudal Fin Rays	12	14	14
Shape of Caudal fin	Rounded	Rounded	Rounded
No. Lateral Line Scales	0	32	40-44
No. of Scales above Lateral Line	0	2.5	4.5
No. of Scales below Lateral Line	0	6.5	5.5
No. of Nasal Barbels	2	0	0
No. of Rostral Barbels	0	0	0
No. of Maxillary Barbels	2	0	0
No. of Mandibular Barbels	4	0	0
Pre-Dorsal Scales	0	6	10

Table 3a: Morphometrics and meristic counts of fishes from river Khualzangvadung.

Morphometrics	<i>Barilius bendelisis</i> (n = 3)	<i>Pethia conchonius</i> (n = 2)	<i>Garra lamta</i> (n = 2)	<i>Psilorhynchus balitora</i> (n = 1)
Weight (g)	2.76-3.27	1.92-5.03	3.29-5.09	1.23
Total Length (cm)	6.4-6.8	5.2-6.7	6.4-7.7	5.1
Standard Length (cm)	5.0-5.4	3.9-5.0	4.9-5.8	4
Head Length (cm)	1.3-1.5	1.0-1.4	1.4-1.6	1
Head Depth (cm)	0.9-1.0	1.0-1.5	0.9-1.0	0.6
Head Breadth (cm)	0.6-0.8	0.6-0.8	1.1-1.2	0.7
Pre-Orbital Length (cm)	0.4	0.3-0.4	0.7-0.8	0.4
Post-Orbital Length (cm)	0.8	0.6-0.8	1	0.7
Snout Length (cm)	0.4	0.3-0.4	0.7-0.8	0.4
Eye Diameter (cm)	0.4	0.3-0.4	0.3	0.4
Pre-Dorsal Length (cm)	2.9-3.2	2.1-2.6	2.5-2.7	1.9
Post-Dorsal Length (cm)	2.8-3.1	2.4-3.3	3.0-3.8	2.5
Length of Dorsal fin base (cm)	0.5-0.6	1.1	0.9-1.1	0.5
Height of Dorsal fin (cm)	0.9-1.1	1.0-1.1	1.1-1.4	0.9
Pre-Pectoral Length (cm)	1.3-1.5	1.1-1.3	1.3-1.5	0.9
Post-Pectoral Length (cm)	5.0-5.5	4.0-5.2	4.9-6.2	4.2
Length of Pectoral fin base (cm)	0.3	0.2-0.3	0.4	0.4
Height of Pectoral fin (cm)	1.1-1.2	0.8-1.0	1.1-1.2	0.9
Pre-Pelvic Length (cm)	2.7-3.1	2.0-2.6	2.6-3.2	2.1
Post-Pelvic Length (cm)	3.6-4.2	3.1-4.0	3.4-4.3	3.8
Length of Pelvic fin base (cm)	0.2	0.2-0.3	0.3	0.2
Height of Pelvic fin (cm)	0.7-0.8	0.8-1.0	1.0-1.2	0.8
Pre-Anal Length (cm)	3.8-4.1	2.9-3.6	3.8-4.7	3.3
Post-Anal Length (cm)	2.1-2.4	1.9-2.3	2.0-2.6	1.5
Length of Anal fin base (cm)	0.5-0.6	0.2-0.3	0.4-0.5	0.2
Height of Anal fin (cm)	0.8	0.9-1.0	1.0-1.2	0.6
Body Depth (cm)	1.3-1.5	1.5-2.3	1.1-1.3	0.7
Length of Caudal Peduncle (cm)	0.9-1.1	0.9-1.0	1.0-1.1	0.5
Height of Caudal Peduncle (cm)	0.4-0.5	0.4-0.5	0.5-0.8	0.3
No. of Pectoral Fin Rays	12	12	13	13
No. of Spines in Pectoral Fin Rays	0	0	0	0
No. of Pelvic Fin Rays	8	8	9	8
No. of Spines in Pelvic Fin Rays	0	0	0	0
No. of Anal Fin Rays	9	6	6	5
No. of Spines in Anal Fin Rays	0	0	0	0
No. of Dorsal Fin Rays	8	8	9	8
No. of Spines in Dorsal Fin Rays	0	1	0	0
No. of Caudal Fin Rays	18	18	18	14
Shape of Caudal fin	Forked	Forked	Forked	Forked
No. Lateral Line Scales	37-40	23	29	35
No. of Scales above Lateral Line	7.5-8.5	4.5	3.5	3.5
No. of Scales below Lateral Line	4.5-5.5	4.5	4.5	3.5
No. of Nasal Barbels	0	0	0	0
No. of Rostral Barbels	2	0	2	0
No. of Maxillary Barbels	2	0	2	0
No. of Mandibular Barbels	0	0	0	0
Pre-Dorsal Scales	16-18	9	9	10

Table 3b: Morphometrics and meristic counts of fishes from river Khualzangvadung.

Morphometrics	<i>Paracanthocobiti sbotia</i> (n = 1)	<i>Schistura</i> sp. (n = 1)	<i>Mastacembelusar matus</i> (n = 1)
Weight (g)	7.23	1.48	6.73
Total Length (cm)	9.3	5.9	13.2
Standard Length (cm)	3.6	4.8	12.5
Head Length (cm)	1.8	1.2	2.4
Head Depth (cm)	1	0.6	0.9
Head Breadth (cm)	1	0.7	0.6
Pre-Orbital Length (cm)	0.8	0.5	0.9
Post-Orbital Length (cm)	0.6	0.7	0.7
Snout Length (cm)	0.8	0.5	0.9
Eye Diameter (cm)	0.3	0.2	0.3
Pre-Dorsal Length (cm)	3.7	2.6	2.8
Post-Dorsal Length (cm)	4.4	2.7	0.8
Length of Dorsal fin base (cm)	1.2	0.8	10
Height of Dorsal fin (cm)	1.4	0.8	0.5
Pre-Pectoral Length (cm)	1.7	1.2	2.5
Post-Pectoral Length (cm)	7.5	4.7	10.5
Length of Pectoral fin base (cm)	0.4	0.2	0.4
Height of Pectoral fin (cm)	1.4	0.9	0.6
Pre-Pelvic Length (cm)	4	2.7	0
Post-Pelvic Length (cm)	5.2	3.2	0
Length of Pelvic fin base (cm)	0.3	0.2	0
Height of Pelvic fin (cm)	1.1	0.8	0
Pre-Anal Length (cm)	5.8	3.9	7.7
Post- Anal Length (cm)	2.9	1.7	0.7
Length of Anal fin base (cm)	0.6	0.4	0.3
Height of Anal fin (cm)	1.0	0.7	0.5
Body Depth (cm)	1.4	0.7	1.2
Length of Caudal Peduncle (cm)	1.4	0.8	0.2
Height of Caudal Peduncle (cm)	0.4	0.6	0.6
No. of Pectoral Fin Rays	13	10	15
No. of Spines in Pectoral Fin Rays	0	0	0
No. of Pelvic Fin Rays	7	8	0
No. of Spines in Pelvic Fin Rays	0	0	0
No. of Anal Fin Rays	5	6	60
No. of Spines in Anal Fin Rays	0	0	2
No. of Dorsal Fin Rays	11	9	73
No. of Spines in Dorsal Fin Rays	0	0	37
No. of Caudal Fin Rays	19	18	14
Shape of Caudal fin	Rounded	Forked	Rounded
No. Lateral Line Scales	160	95	275
No. of Scales above Lateral Line	15	13	10
No. of Scales below Lateral Line	19	14	15
No. of Nasal Barbels	4	4	0
No. of Rostral Barbels	0	0	0
No. of Maxillary Barbels	2	2	0
No. of Mandibular Barbels	0	0	0
Pre-Dorsal Scales	48	38	19

Table 4: Morphometrics and meristic counts of fishes from river Tuikoi.

Morphometrics	<i>Barilius bendelisis</i> (n = 2)	<i>Barilius barila</i> (n = 1)
Weight (g)	13.07-13.10	17.36
Total Length (cm)	11.3	12.6
Standard Length (cm)	8.5	9.5
Head Length (cm)	2.4-2.5	2.8
Head Depth (cm)	1.8-1.9	2.1
Head Breadth (cm)	1.3-1.4	1.4
Pre-Orbital Length (cm)	0.8	0.9
Post-Orbital Length (cm)	1.3	1.6
Snout Length (cm)	0.8	0.9
Eye Diameter (cm)	0.5	0.7
Pre-Dorsal Length (cm)	4.0-4.3	4.7
Post-Dorsal Length (cm)	5.8-6.0	6.7
Length of Dorsal fin base (cm)	1.3	1.6
Height of Dorsal fin (cm)	2.3-2.4	2.6
Pre-Pectoral Length (cm)	2.3-2.4	2.5
Post-Pectoral Length (cm)	8.6-9.1	10
Length of Pectoral fin base (cm)	0.4	0.4
Height of Pectoral fin (cm)	1.9-2.1	2.2
Pre-Pelvic Length (cm)	4.5	4.9
Post-Pelvic Length (cm)	6.3-6.8	7.5
Length of Pelvic fin base (cm)	0.3	0.4
Height of Pelvic fin (cm)	1.8	1.9
Pre-Anal Length (cm)	6.6-6.7	7.4
Post- Anal Length (cm)	3.8-4.1	4.6
Length of Anal fin base (cm)	0.6-0.7	0.8
Height of Anal fin (cm)	1.7-1.8	2.0
Body Depth (cm)	2.3	2.5
Length of Caudal Peduncle (cm)	1.6	1.8
Height of Caudal Peduncle (cm)	0.9-1.0	1.2
No. of Pectoral Fin Rays	14	14
No. of Spines in Pectoral Fin Rays	0	0
No. of Pelvic Fin Rays	9	9
No. of Spines in Pelvic Fin Rays	0	0
No. of Anal Fin Rays	7	7
No. of Spines in Anal Fin Rays	0	0
No. of Dorsal Fin Rays	9	9
No. of Spines in Dorsal Fin Rays	1	1
No. of Caudal Fin Rays	20	20
Shape of Caudal fin	Forked	Forked
No. Lateral Line Scales	28-29	27
No. of Scales above Lateral Line	4.5	4.5
No. of Scales below Lateral Line	4.5	4.5
No. of Nasal Barbels	0	0
No. of Rostral Barbels	2	2
No. of Maxillary Barbels	2	2
No. of Mandibular Barbels	0	0
Pre-Dorsal Scales	10-11	11

Table 5: Morphometrics and meristic counts of fishes from river Mahur.

Morphometrics	<i>Barilius bendelisis</i> (n = 6)	<i>Neolissochilus hexastichus</i> (n = 1)	<i>Systomus clavatus</i> (n = 1)
Weight (g)	5.89-16.32	3.99	11.87
Total Length (cm)	8.4-12.4	7.6	10.5
Standard Length (cm)	6.8-9.9	5.8	8.2
Head Length (cm)	1.8-2.4	1.7	2.1
Head Depth (cm)	1.2-2.0	1.2	1.8
Head Breadth (cm)	0.9-1.2	0.9	1.2
Pre-Orbital Length (cm)	0.5-0.8	0.4	0.7
Post-Orbital Length (cm)	0.9-1.2	1	1.2
Snout Length (cm)	0.5-0.8	0.4	0.7
Eye Diameter (cm)	0.4-0.5	0.5	0.5
Pre-Dorsal Length (cm)	3.9-5.8	2.9	3.9
Post-Dorsal Length (cm)	3.5-5.2	3.7	5.5
Length of Dorsal fin base (cm)	0.9-1.3	1.1	1.6
Height of Dorsal fin (cm)	1.4-2.3	1.7	2.4
Pre-Pectoral Length (cm)	1.7-2.8	1.6	2
Post-Pectoral Length (cm)	6.3-9.6	6	8
Length of Pectoral fin base (cm)	0.3-0.5	0.2	0.4
Height of Pectoral fin (cm)	1.5-2.1	1.3	2.0
Pre-Pelvic Length (cm)	3.4-5.1	3.0	4.1
Post-Pelvic Length (cm)	4.4-7.1	4.4	5.9
Length of Pelvic fin base (cm)	0.3	0.3	0.4
Height of Pelvic fin (cm)	1.0-1.8	0.1	1.6
Pre-Anal Length (cm)	4.9-7.3	4.5	6
Post- Anal Length (cm)	2.2-3.9	2.8	3.6
Length of Anal fin base (cm)	0.8-1.4	0.5	0.7
Height of Anal fin (cm)	1.0-1.5	0.9	1.5
Body Depth (cm)	1.9-2.5	1.6	2.2
Length of Caudal Peduncle (cm)	1.2-1.7	0.9	1.5
Height of Caudal Peduncle (cm)	0.7-1.0	0.7	1
No. of Pectoral Fin Rays	13	12	13
No. of Spines in Pectoral Fin Rays	0	0	0
No. of Pelvic Fin Rays	8-9	9	8
No. of Spines in Pelvic Fin Rays	0	0	0
No. of Anal Fin Rays	9-10	7	6
No. of Spines in Anal Fin Rays	0	0	0
No. of Dorsal Fin Rays	8-9	9	7
No. of Spines in Dorsal Fin Rays	0	1	1
No. of Caudal Fin Rays	18	19	18
Shape of Caudal fin	Forked	Forked	Forked
No. Lateral Line Scales	40-43	29	38
No. of Scales above Lateral Line	7.5-8.5	3.5	6.5
No. of Scales below Lateral Line	4.5-5.5	3.5	4.5
No. of Nasal Barbels	0	0	0
No. of Rostral Barbels	2	2	0
No. of Maxillary Barbels	2	2	2
No. of Mandibular Barbels	0	0	0
Pre-Dorsal Scales	18-19	9	11

CONCLUSIONS

The taxonomic study of fish collected from five rivers in the Dima Hasao District of Assam, namely Diyung, Vomvadung, Khualzangvadung, Tuikoi, and Mahur, resulted in the first record of 21 species of fish belonging to 19 genera, eight families and four orders. The species composition is highest in Vomvadung River with 11 species followed by Diyung with eight species, Khualzangvadung with six species, Mohur with three species and Tuikoi with two species. The conservation status of *Systomus clavatus*, *Tor tor*, *Neolissochilus hexagonolepis*, and *Neolissochilus hexastichus* are near threatened and *Pterocryptis barakensis* is endangered. The micro-habitats and substrata in the rivers surveyed are essential breeding grounds for these hill stream fishes and need protection.

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