

Original Research

*Macrogathus siangensis*, a new spiny eel from Brahmaputra basin, Arunachal Pradesh, Northeast India (Teleostei: Synbranchiformes)

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**ABSTRACT:**

*Macrogathus siangensis*, new species, from the Siang River, Brahmaputra drainage, northeast India, is distinguished from all other congeners by the following combination of characters: lack of rostral tooth plates, dorsal-fin spines 15-19, dark spots like imperfect ocelli along the base of dorsal soft branched fin rays 7-11, dark blotches at the mid-lateral sides of body 22-27, dorsal fin rays with two rows of parallel greyish streaks, caudal fin rays with 4-6 striated greyish streaks and body width 59.0-67.4% of its depth. A key to *Macrogathus* species of northeast India including the newly described one is provided.

**Keywords:**

*Macrogathus siangensis* sp.nov., Siang river, Mastacembelid diversity, Northeast India.

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## INTRODUCTION

Fish of the genus *Macrogathus* Lacepede are distributed throughout the tropical Asia (Taki, 1975), most of the Indian subcontinent and continental portions of Southeast Asia (Roberts, 1980) and restricted to the freshwaters of Africa and Asia (Roberts, 1986). This mastacembelid fishes come under the order Perciformes (Menon, 1974; Jayaram, 1981; Talwar and Jhingran, 1991; Yang and Zhou, 2011), Mastacembeliformes (Sen, 1985; Yazdani, 1990) and Synbranchiformes (Travers, 1984a,b; Jayaram, 1999; Khachonpisitsak *et al.*, 2008; Britz, 2009, 2010; Vreven, 2005b and Vreven and Stiassny, 2009) respectively. Sufi (1956), Roberts (1980, 1986) and Vreven (2005b) revised the mastacembelid fishes of Asian and African continents respectively. Arunkumar and Singh (1998), Britz (2009 and 2010), Kottelat and Widjanarti (2005), Pethiyagoda *et al.* (2008), Roberts (1980 and 1986), and Plamoottil and Abraham (2013 and 2014, a,b) reported and described new mastacembelid fishes of the genus *Macrogathus*. As many as 24 species of *Macrogathus* were currently recorded ([www.fishbase.org/identification/species](http://www.fishbase.org/identification/species), downloaded on 05/11/2015). Britz, (2010) reported that 11 species of *Macrogathus* *M. aureus* from upper Ayeyarwaddy river drainage, Myanmar were distinguished and described. The systematic position of *Macrogathus caudicellatus* was reviewed and retransferred to *Mastacembelus* (Britz, 2009). Later *Macrogathus taeniagaster* was synonymised to *M. semicellatus* (Vidhayanon, 2012).

Northeast India is an important part of the Indo-Myanmar (Indo-Burma) biodiversity hot spot, one of the 34 global biodiversity hotspots. It is drained by the three river systems viz., the Brahmaputra, the Chindwin and the Kaladan.

Various worker viz., Arunkumar and Singh (1998, 2000), Bagra and Das (2010), Bagra *et al.* (2009), Hora (1921), Kar and Sen (2007), Nath and Dey (2000), Sen (1985), Tamang *et al.* (2007), Vishwanath (2002,

2007), Vishwanath *et al.* (2007), and Yazdani (1985, 1990) mainly reported about the ichthyofaunal distribution from northeast India. Presently, seven species of *Macrogathus* viz., *M. albus* (Plamoottil and Abraham, 2014b), *M. aral* (Bloch and Schneider, 1801), *M. fasciatus* (Plamoottil and Abraham, 2014a), *M. guentheri* (Day, 1889), *M. lineatamaculatus* (Britz, 2010); *M. morehensis* Arunkumar and Singh, 2000 and *M. pancalus* Hamilton-Buchanan, 1822, and three species of *Mastacembelus* viz., *M. alboguttatus* Boulenger, 1893 *M. armatus* (Lacepede, 1800) and *M. malabaricus* Jerdon, 1849 had been reported from Indian waters already (Arunkumar and Singh, 1998 and 2000; Britz, 2009; Jayaram, 1999; Plamoottil and Abraham, 2013 and 2014a, b).

During an ichthyological survey (the 15<sup>th</sup> December 2008) in East Siang district, Arunachal Pradesh the author collected five specimens of the genus *Macrogathus* from Siang River at Pasight. On detailed study, the specimens were found to be distinct from all known species. The species described here is *Macrogathus siangensis* sp nov.

## MATERIALS AND METHODS

Standard practices of Talwar and Jhingran (1991), Jayaram (1999), Arunkumar and Singh (2000), Britz (2009 and 2010), and Plamoottil and Abraham (2014a, b) were followed while taking meristic and morphometric measurements. Measurements of Head Length (HL) and body parts are expressed as proportions of Standard Length (SL) and the subunits of head as proportions of head length. The specimens were deposited in the Manipur University Central Museum (MUCM), Canchipur. Registration numbers are given below.

## RESULT

*Macrogathus siangensis* sp. nov. (Figure. 1.)

**Common name:** Arunachal's Spiny Eel.

**Local name:** Bami (by Adi people of Arunachal Pradesh, India).

**Manipuri name:** Nagril macha/Chinglak ngaril

**Holotype**

**43/NH/MUM** 115.2 mm SL; Siang river at Pasighat, East Siang district, Brahmaputra river drainage/ basin, Arunachal Pradesh, India, 28°05'17" N and 95°19'54" E; about 150m above mean sea level, 15.xii. 2008, Coll. G.S. Sharma.

**Paratypes**

4 specimens, 97-120.9mm SL; data same as for holotype.

**Diagnosis**

A *Macrogathus* with the absence of rostral tooth plates, dorsal fin spines 15-19, dark spots like imperfect ocelli at the base of dorsal soft branched fin rays 7-11, oblique transverse bars on the lateral sides of body 22-27, dark blotches on the lateral sides which increases their sizes from anterior to posterior ends 22-27, dorsal fin rays with two longitudinal streak rows, caudal fin rays with 4-6 fine striated streaks, body width 59.0-67.4% of its depth, head length at occiput and predorsal length at dorsal spine origin 10.0-15.1% and 34.3-39.0% of standard length respectively.

**Description**

Br. 3-5; D. 15-19/42-53; P. 22; A. 3/32-51; C. 13-14. General body shape and appearance is shown in the Figure. 1. Body-eel like, occiput to the origin of dorsal fin spine subcylindrical and then laterally compressed to the posterior end. Preorbital and preopercular spines are absent. Occipital region of head scaleless but otherwise head including operculum and cheeks are covered with minute scales. Head long with median fleshy rostral tentacles projecting from the upper jaw. Mouth is found to be inferior and narrow. Lip is fleshy. Gill membrane is connected to the isthmus. Operculum opening is large ventrally but extending dorsally only to the level of horizontal through upper third of pectoral fin base. Eyes not visible from the

ventral side, more or less same as the interorbital distance. Scales are minute. Lateral line distinct and lies one by third above the body depth. Spinous dorsal-fin is originating far behind the end of the pectoral fin. Anus is nearer to the base of caudal fin than to the snout. Anal fin spines are covered and concealed by thick skin, second spine longest. Caudal-fin rounded, distinctly separate from the dorsal and the anal fins. Proportional measurements are given in Table 1.

**Colour**

Dorsal dark grey, ventral yellowish pale white. A series of 7-11 dark spots like imperfect ocelli are present at the base of dorsal soft branched fin rays, 22-27 oblique transverse bars on the lateral sides of the body, a longitudinally light greyish or light yellowish band from the posterior end of the eye upto the origin of branched dorsal soft fin rays which lies above the lateral line and distinct at the posterior end, blotches along dorsal-fin and mid-lateral blotches are only separated from posterior eye upto the origin of dorsal soft branched fin rays and joined upto the origin of caudal fin, 4-6 fine transversely striated dark greyish streaks on caudal fin rays. Two parallel longitudinal streak rows of greyish bands on dorsal and anal branched soft fin rays which are at the distinct posterior end. Pectoral fin is clear.

**Etymology**

The species is named after the Siang River, Arunachal Pradesh, type locality of the species.

**Distribution and Habitat**

Presently known only from the Siang River at Pasighat, East Siang district, Arunachal Pradesh, Brahmaputra river drainage, India. The fish inhabits the pebbly bottom with sandy beds of swift, moderate and turbid running water.. The following is a list of ichthyofaunal species collected syntopically with this new species: Cyprinidae: *Raiamas bola*, *Cabdio morar*, *Amblypharyngodon mola*, Cobitidae: *Lepidocephalichthys guntea*, Siluridae: *Ompok pabo*, Schilbeidae: *Clupisoma garua*, *Eutropiichthys vacha*,

Key to *Macrognathus* species of the inland water bodies of India

Rostral tooth-plates present	2
Rostral tooth-plates absent	11
Presence of a pair series of rostral tooth-plate	3
Presence 14-28 pairs of rostral tooth-plate	4
Presence of 15-17 pairs of rostral tooth-plate	5
Presence of 8-11 pair pairs of rostral tooth-plate	6
26-30 dorsal spines	7
14-16 dorsal spines	8
19-22 dorsal spines	9
11-16 dorsal spines	10
29 irregular blotches present on mid-dorsal line form the top of opercular to base of caudal	<i>M. albus</i>
3-6 perfect ocelli at the branched dorsal fin rays	<i>M. aral</i>
Eye size black blotches along dorsal fin	<i>M. lineatamaculatus</i>
12-14 imperfect acelli at the base of dorsal fin rays	<i>M. morehensis</i>
Preorbital spine present	12
Preorbital spine absent	15
Lateral side of body with 26-27 distinct yellow vertical bars originating from mid-dorsal to ventral side	13
Lateral side of body sparkled with small white dots, a distinct streak of longitudinal spots runs along the lateral line from eye to the days caudal fin	14
28-30 dorsal spines	<i>M. fasciatus</i>
24-26 dorsal spines	<i>M. pancalus</i>
27-30 dorsal spines	<i>M. guentheri</i>
15-19 dorsal spines	<i>M. siangensis</i> sp. nov.

Mastacembelidae: *Mastacembelus armatus*.

## DISCUSSION

The main distinguishing characters of *Macrognathus* species of the inland waterbodies of India are given into the key of this paper. Spiny eels of the genus *Mastacembelus* and *Macrognathus* from the Northeast India are shown in Figure. 2 and Figure. 3. *Macrognathus siangensis* sp. nov. differs from *M. aculeatus*, *M. albus*, *M. aral*, *M. aureus*, *M. dorsiocellatus*, *M. lineatamaculatus*, *M. meklongensis*, *M. morehensis*, *M. obscurus*, *M. pavo*, *M. pentophthalmos* and *M. siamensis* by the absence of rostral tooth-plates, from *M. zebrinus* by having less number of dorsal fin spines (15-19 VS. 28-31), from *M. circumcinctus*, *M. keithi*, *M. maculatus* and *M. semiozellatus* by having distinctly separate caudal fin VS. confluent with dorsal and anal fins and less numbers of dorsal spines (15 – 19 Vs. 26-29, 26-27, 26-31 and 28-

32 respectively) and from *M. tapirus* by having 7-11 dark spots like imperfect ocelli at the base of dorsal soft branched fin rays VS. 6 distinct large perfect ocelli and more transverse oblique bars (22-27 VS. 13) respectively.

*Macrognathus siangensis* sp. nov. is distinguished from *M. fasciatus* in many significant taxonomic features. In *M. siangensis*, head is longer than *M. fasciatus* (18.4-21.0% SL Vs. 14.8-16.5), longer pectoral fin (6.3-7.2% SL Vs. 4.3-5.2), shorter base of dorsal fin rays (32.2-35.2% SL Vs. 36.1-39.2), longer predorsal length (34.3-39.0% SL Vs. 22.2-26.1), larger eye diameter (11.7-18.9% HL Vs. 3.7-4.8), more interorbital distance (12.2-18.5% HL Vs. 10.0-10.9) and shorter snout length (30.6-38.3% HL Vs. 38.6-43.6) and distribution (Arunachal Pradesh, Siang River Vs. Kerala, Manimala River) respectively. Data of Plamoottil and Abraham (2014a) for *M. fasciatus* were used for

Table 1. Morphological characters of *Macrognathus siangensis* sp. nov.m

	Holotype 43/ NH/MUM	Paratypes 43/NH/MUM (N=4)	
Standard length (SL) in mm.	115.2	97-121	
<b>In % of standard length (SL)</b>		Mean (Range) ±SD	
Predorsal length at soft branched fin ray origin	65.1	64.6(62.3-66.8)	±2.0
Predorsal length at dorsal fin spine origin	34.7	36.1(34.3-39.0)±1.5	
Head length at the end of lateral operculum	19.2	19.2(18.4-21.0)±1.1	
Body width at branched dorsal fin origin	6.6	6.7(6.4-7.0)	±0.6
Body width of branched anal fin origin	5.2	5.0(4.1-5.3)	±0.5
Height of dorsal fin	3.3	3.0(2.6-3.3)	±0.4
Pectoral fin base length	2.6	2.7(2.5-3.0)	±0.4
Head length at occiput	10.0	13.4(12.6-15.1)	±0.9
Head depth at occiput	5.4	6.4(6.0-7.0)	±0.6
Head depth at eye	4.3	4.7(4.4-5.1)	±0.5
Body depth	10.4	10.7(10.3-11.0)	±0.8
Preanus length	57.5	57.3(52.5-60.3)	±1.9
Preanal fin length	61.8	60.3(55.6-65.3)	±1.9
Pectoral fin length	6.5	6.8(6.3-7.2)	±0.6
Caudal fin length	6.3	6.6(5.2-7.6)	±0.6
Dorsal fin spine base length	28.6	29.3(27.2-31.8)	±1.3
Dorsal soft branched fin ray base length	32.5	34.1(32.2-35.2)	±1.5
Anal soft branched fin ray base length	32.4	34.0(32.0-38.6)	±1.5
<b>In % of head length at the end of lateral operculum</b>			
Depth of head at occiput	28.2	32.2(28.1-34.1)	±1.4
Width of head at occiput	20.5	20.7(18.5-22.2)	±1.1
Pectoral fin length	33.9	35.8(32.6-37.2)	±1.5
Eye diameter	13.6	14.8(11.8-18.9)	±1.0
Interorbital distance	14.5	14.8(11.8-18.9)	±1.0
Snout length	37.0	34.4(30.7-38.3)	±1.5
Rostral barbel length	16.7	15.2(13.2-18.9)	±1.0
Mouth width	7.9	8.0(7.9-8.1)	±0.7
<b>In % of body depth</b>			
Body width	63.7	62.9(59.0-67.4)	±1.9

Table 2. The distribution pattern of spiny eels or mastacembelid fishes in the three river basins of northeast India. Presence and absence of each species is indicated by + and – respectively. BRB=Brahmaputra River basin CRB= Chindwin River basin and KRB= Kaladan/Koladyne River basin.

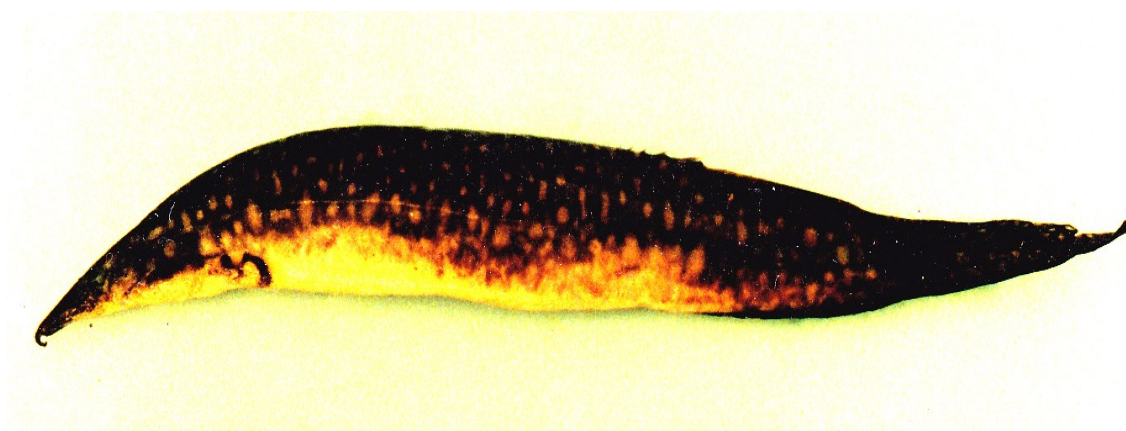
Sl. No.	Scientific name	BRB	CRB	KRB
1.	<i>Mastacembelus alboguttatus</i>	-	+	-
2.	<i>M. armatus</i>	+	+	+
3.	<i>Macrognathus aral</i>	+	-	-
4.	<i>M. morehensis</i>	-	+	-
5.	<i>M. pancalus</i>	+	+	+
6.	<i>M. siangensis</i> sp. nov.	+	-	-

comparision.

*Macrognathus siangensis* sp. nov. is also distinguished from *M. pancalus* by having more branched dorsal fin rays (42-53 Vs. 30-42), lesser body depth (10.3-11.0% SL Vs 10.7-15.6), shorter head length (18.4-21.0% SL Vs. 18.5-25.3), shorter snout length (30.7-38.3%HL Vs 39.6-43.8), larger eye diameter (11.8-18.9% HL Vs 7.9-13.0) and more interorbital distance (11.8-18.9% HL Vs 5.0-6.0) and distribution (Siang river of Arunachal Pradesh Vs. Widely distribution in north east India) respectively. Data of Arunkumar and Singh (2000) and Sufi (1956) for



Figure 1. *Macrognathus siangensis* sp. nov. 43/NH/MUM 115.2 mm SL; Siang river at Pasighat, East Siang district, Brahmaputra river drainage/basin, Arunachal Pradesh, India



(a)



(a)

Figure 2. Spiny eels of the genus *Mastacembelus* in the Northeast India:  
(a) *Mastacembelus alboguttatus*, (b) *M. armatus*



(a)



(b)



(c)

**Figure 3. Spiny eels of the genus *Macrognathus* in the Northeast India:  
(a) *M. aral*, (b) *M. morehensis*, (c) *M. pancalus***

*M. pancalus* were used for comparison.

*Macrogathus siangensis* sp. nov. is distinguished from *M. guentheri* by having less number of branched dorsal soft fin rays (42-53 Vs. 58-74), less number of anal soft branched fin rays (32-51 Vs. 59-75), longer head length (18.4-21.0% SL Vs 16.0-18.3), longer pectoral fin (6.3-7.2% SL Vs. 4.2-5.0), shorter snout length (30.7-38.3% HL Vs. 39.5-42), longer eye diameter (11.8-18%HL Vs. 8-9), more interorbital distance (11.8-18.9%HL Vs. 4-5), pectoral fin (clear Vs. oblique bars) and distribution (northeast India, Arunachal Pradesh Vs. an endemic to South India, Kerala) respectively.

*Macrogathus siangensis* sp. nov. is further distinguished from *M. guentheri* which reported by Plamoottil and Abraham (2014) by having longer head length (18.4-21.0% SL Vs. 14.1-16.3), longer pectoral fin length (6.3-7.2% SL Vs. 4.4-5.3), shorter dorsal soft branched fin ray base length (32.2-35.2% SL Vs. 37.0-38.0), shorter anal soft branched fin ray base length (32.0-38.6% SL Vs. 39.0-40.7), longer pectoral fin base length (2.5-3.0% SL Vs. 1.7-1.9), longer predorsal length (at spine origin 34.3-39.0 and at branched fin rays origin 62.3-66.8% HL Vs. 21.1-24.0), larger eye diameter (11.8-18.9% SL Vs. 7.3-10.0), longer depth of head (28.1-34.1% SL Vs. 39.5-42.2), smaller width of head (18.5-22.2% SL Vs. 29.3-35.0), more interorbital distance (11.8-18.9% SL Vs. 10.5-12.0), and smaller mouth width (7.9-8.1% SL Vs. 10.9-12.0) respectively.

Roberts (1986), Freyhof *et al.* (2000), Vreven (2005a), Khachonpisitsak *et al.* (2008) and Britz (2010) stated that 14 species of mastacemblid fishes (eight *Macrogathus* species and six *Mastacembelus* species) from Myanmar and Thailand, two species of *Macrogathus* from South Vietnam, 12 endemic species of mastacembelid fishes within the Lake Tanganyika, 12 species of spiny eels (six *Macrogathus* species and six *Mastacembelus* species) from Thailand and the highest number of 12 spiny eels of Myanmar from 82 species of

Asian country respectively. The spiny eel or mastacembelid fishes of northeast India (only 7.5% of the total geographical area of India) are *Mastacembelus alboguttatus*, *M. armatus*, *Macrogathus aral*, *M. morehensis*, *M. pancalus* and *M. siangensis* sp. nov. and their distributions in three river basins of this region are shown in Table 2.

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#### REFERENCES

- Arunkumar L and Tombi Singh H. (1998).** First records of the freshwater fishes *Chagunius nicholsi* and *Mastacembelus alboguttatus* in India. *Journal of Advanced Zoology*, 19(1):59-61.
- Arunkumar I and Tombi Singh H. (2000).** Spiny eels of the genus *Macrogathus* Lacepede from Manipur with description of a new species. *Journal of the Bombay Natural History Society*, 97(1):117-122.
- Bagra K and Das DN. (2010).** Fish diversity of River Siyom of Arunachal Pradesh India: A case study. *Our Nature*. 8:164-169.
- Bagra K, Kadu K, Sharma KN, Laskar BA and Das DN. (2009).** Ichthyological survey and review of the checklist of fish fauna of Arunachal Pradesh, India. *Check List*. 5(2):330-350.
- Britz R. (2009).** Species of the *Macrogathus aculeatus* group in Myanmar with remarks on *M. caudicellatus* (Teleostei: Synbranchiformes: Mastacembelidae). *Ichthyol. Explor. Freshwater*. 20(4):295-308.
- Britz R. (2010).** *Macrogathus aureus*, a new spiny eel of the *M. aculeatus* species group from the upper



- Ayeyarwaddy River drainage, Myanmar (Teleostei: Synbranchiformes: Mastacembelidae). *Zootaxa*. 2514:55-60.
- Day F. (1889).** The Fauna of British India, including Ceylon and Burma. Fishes, 2 Taylor and Francis, London. 509.
- Freyhof J, Serov DV and Nga NT. (2000).** A preliminary checklist of the freshwater fishes of the River Dong Nai, South Vietnam. *Bonner Zoologische Beiträge*, 49(1-4):93-99.
- Hamilton-Buchanan F. (1822).** An account of the fishes found in the river Ganges and its tributaries. Edinburgh and London. 405:39.
- Hora SL. (1921).** Fish and fisheries of Manipur with some observations on those of Naga Hills. *Records of the Indian Museum*, 22(3): 165-214.
- Jayaram KC. (1981).** The Freshwater Fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka, A Handbook. *Zoological Survey of India. Calcutta*, 475.
- Jayaram KC. (1999).** The Freshwater Fishes of the Indian region, Narendra Publishing House, Delhi. 551.
- Jerdon TC. (1849).** The fishes of Southern India. *Madras. J. Lit. Sc.* 15:147
- Khachonpisitsak S, Thirakhupt K and Wongratama T. (2008).** Taxonomy of Spiny eels (Synbranchiformes: Mastacembelidae) in Thailand. 12<sup>th</sup> BRT Annual Conference, Oct., 10-13<sup>th</sup>, 2008. Suraj Thani.
- Kar D and Sen N. (2007).** Systematic list and distribution of fishes in Mizoram, Tripura and Barak drainage of northeastern India. *Zoos' Print Journal*, 22 (3):2599-2607.
- Kottelat M and Widjanarti E. (2005).** The Fishes of Danau Sentarum National Park and the Kapuas Lake area, Kalimantan Barat, Indonesia. *Raffles Bulletin of Zoology Suppl.* 13:139-173.
- Menon AGK. (1974).** A checklist of fishes of the Himalayan and the Indo-Gangetic plains. Spl. Publ. No. 1. *Inland Fish. Soc. India*, Barrackpore. 136.
- Nath P and Dey SC. (2000).** Fish and fisheries of North Eastern India (Arunachal Pradesh). New Delhi, Narendra Publishing House. 217.
- Pethiyagoda R, Silva A, Maduwagek and Kariya WL. (2008).** The Sri Lankan Spiny eel, *Macrogathus pentopthalmos* (Teleostei: Mastacembelidae) and its enigmatic decline. *Zootaxa*, 1931:37-48.
- Plamoottil M and Abraham NP. (2013).** Rediscovery of *Mastacembelus malabaricus* after one and half century. *Research Journal of Animal, Veterinary and Fishery Sciences*, 1(8): 6-11.
- Plamoottil M and Abraham NP. (2014a).** *Macrogathus fasciatus* (Synbranchiformes: Mastacembelidae) a new fish species from Kerala, India. *Journal of Experimental Zoology, India*, 17(1):49-54.
- Plamoottil M and Abraham NP. (2014b).** *Macrogathus albus* (Order: Synbranchiformes; Family: Mastacembelidae), a new fish species from Kerala, India. *International Journal of Pure and Applied Zoology*, 2 (2):100-105.
- Roberts TR. (1980).** A Revision of the Asian Mastacembelid fish genus *Macrogathus*. *Copeia* 3:385-391.
- Roberts TR. (1986).** Systematic review of the Mastacembelidae or Spiny eels of Burma and Thailand, with description of two new species of *Macrogathus*. *Journal of Ichthyology*, 33(2):95-109.
- Sen TK. (1985).** The Fish Fauna of Assam and the neighbouring north-eastern States of India. *Records of the Zoological Survey of India, Calcutta, Miscs. Publ.*

*Occas. Pap.*, 64:1-216.

**Sufi SMK. (1956).** Revision of the Oriental fishes of the family Mastacembelidae. *Bull. Raffles Museum*, 27: 94-146.

**Taki, Y. (1975):** Geographic distribution of Primary freshwater fishes in four principal areas of Southeast Asia. *South East Asian Studies* 13(2):200-214.

**Talwar PK and Jhingran AG. (1991).** Inland Fishes of India and Adjacent Countries. Oxford and IBH publishing Co. Pvt. Ltd., New Delhi. II Vol. 158.

**Tamang L, Chaudhury S and Choudhury D. (2007).** Ichthyofauna contribution to the state and comparison of habitat contiguity on taxonomic diversity in Senkhi Stream, Arunachal Pradesh, India. *Journal of the Bombay Natural History Society*, 104(2):172-179.

**Travers RA. (1984a).** A revision of the Mastacembeloidei, a suborder of Synbranchiform teleost fishes. Part I. *Bull. British Mus. Nat. Hist. (Zoo)* 46(1):1-133.

**Travers RA (1984b).** A A revision of the Mastacembeloidei, a suborder of Synbranchiform teleost fishes. Part I. Phylogenetic analysis. *Bull. British Mus. Nat. Hist. (Zoo)* 47(2):83-150.

**Vishwanath W. (2002).** Fishes of North East India, a field guide to species identification. Manipur University NATP publication, P. 198.

**Vishwanath W. (2007).** Checklist of fishes of Manipur with systematic status of some fish. In: Endemic Bioresources of India-Conservation and Sustainable Development with special Reference to North-East India. Bisen Sing Mahendra Pal Singh, Dehra Dun, India. P. 375-395.

**Vishwanath W, Lakra WS and Sarkar UK. (2007).** Fishes of North East India. NBFGR, Lucknow, UP., India. 264.

**Vreven EJ. (2005a).** Redescription of *Mastacembelus ophidium*, 1893 (Synbranchiformes: Mastacembelidae) and description of a new spiny eel from Lake Tanganyika, *J. Nat. Hist.* 39: 1539-1560.

**Vreven EJ. (2005b).** Mastacembelidae (Teleostei: Synbranchiformes) Subfamily diversion and African generic division: an evaluation. *J. Nat. Hist.* 39(4): 351-370.

**Vreven EJ and Stiassny MLJ. (2009).** *Mastacembelus simbi*, a new dwarf spiny eel (Synbranchiformes: Mastacembelidae) from the lower Congo River. *Ichthyological Exploration of Freshwaters*, 20(3): 213-22.

**Vidhayanon C. (2012).** WWW.IUCN redlist org/details/180795/0 Published on 2012 Date of Assessed 2011.03.05.,

**Yang LP and Zhou W. (2001).** A review of the genus *Mastacembelus* (Perciformes: Mastacembelidae) in China with description of two new species and one new record. *Acta Zootaxon. Sinica* 36(2):325-331.

**Yazdani GM. (1985).** Fishes of Khasi Hills. *Rec. Zoo. Surv., India Misc. Publ. Oceas. Pap.* 70:1-43.

**Yazdani GM. (1990).** Contribution to the Fish Fauna of India Including countries, Order Mastacembeliformes. *Records of the Zoological Survey of India*, 124:1-36.

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