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Review of the spiny eels of northeast India with description of *Macrogathus dhanzei* sp. nov. (Teleostei: Synbranchiformes: Mastacembelidae)

L. Arunkumar

Abstract

Northeast India is one of important ichthyobiodiversity hot-spot area, mainly drained by four river drainages or basins viz., Brahmaputra, Barak-Meghna-Surma, Chindwin and Kaladan. Eight species viz., five species of spiny eels of *Macrogathus* and three species of *Mastacembelus* are reported from this region and shared 9.19% in the world. *Macrogathus aculeatus* of Dhanze *et al.* (2018) is erected as a new species, *M. dhanzei* due to lack of ocelli, 28-34 vertical transverse bars, XXIV-XXVII dorsal spines, 31-38 soft dorsal fin rays, i 15-18 pectoral fin rays, 30-41 soft anal fin rays, 10-12 caudal fin rays, dorsal spine fin base length 72.6-79.9%SL, preorbital or snout length 34.3-44.0% HL, head width 15.2-29.1%HL, upper jaw length 24.3-30.0% HL, absence of rostral plates and presence of 72 vertebrae respectively. Easiest key for the spiny eel of the genus *Macrogathus* in the northeast India is provided.

Keywords: Mastacembelid fishes, *Macrogathus dhanzei* sp. nov.

1. Introduction

Northeast region of India is one of the important biodiversity hot spot areas and belongs to the Indo-Burma or Indochina bioregion (Kottelat & Whitten, 1996) ^[20]. It lies between 21⁰57' and 29⁰23'N and between 87⁰58' and 97⁰09'E. It comprises of the eight states namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. These areas were covered the Middle Brahmaputra and parts of the upper Brahmaputra, the Himalayan foot hills, the Gangetic delta and plain, the Chin-Arakan Coast and the Sittaung- Irrawaddy regions (Abell *et al.*, 2008) ^[1]. It is drained by the four major river drainages viz., the Brahmaputra, the Barak- Surma-Meghna, the Chindwin and the Kaladan. The mastacembelid spiny eels are formed by two genera viz., *Macrogathus* Lacepede, 1800 and *Mastacembelus* Scopoli, 1777; and are distributed in the major parts of Tropical and Subtropical Africa, the Middle-East and South-East Asia, North to China and Iran Berra, 2001^[4]. They have a long series of well separated dorsal spines and hence their name spiny eels, have a wriggling behaviour when handled and some are known to move backwards to impale the hand with their dorsal spines. They are found at high altitudes as well as in lowlands, in both hill streams, rivers, lakes and reservoirs. They also have very short series of anal spines mainly two or three. Pelvic fins and pelvic girdle are absent. They have huge numbers of small cycloid scales. Hora (1921) ^[15] was the first ichthyologist to the taxonomic views of mastacembelid fishes of North-east region of India, described *Rhynchobdella dhanashorii* from Dhanashori stream, about a mile from Dimapur, Assam and *Mastacembelus manipurensis* from Khurda (now, Khordak) stream, near Thanga Id (i.e., Thanga island) of Manipur. The present study attempted for the first time to prepare a detailed review and systematic checklist of the mastacembelid or spiny eels occurring in the four major river drainages or basin systems of North-East region of India. The key to *Macrogathus* species of the inland water bodies of India given by Arunkumar (2016) ^[2] is not a good dichotomous key due to printing mistake and again recasted as it is here with *M. dhanzei* sp.nov.

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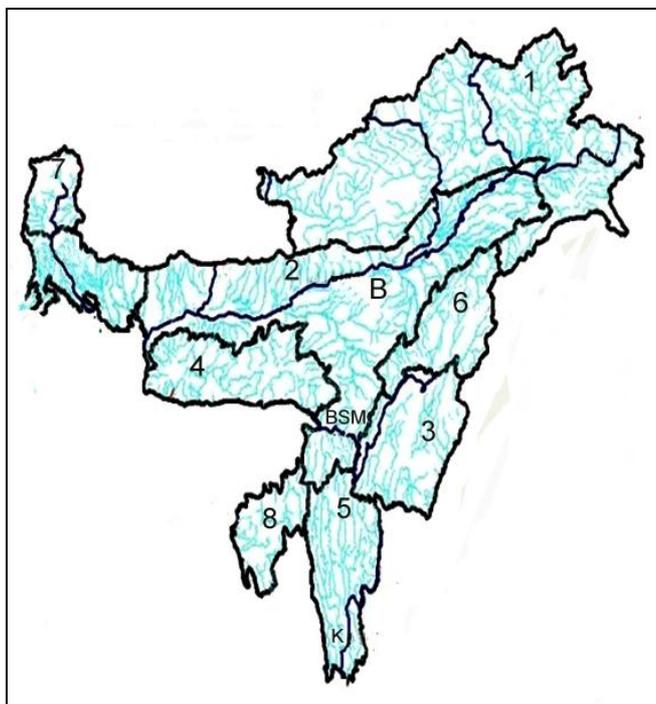


Fig 1: Northeast States of India showing four river drainages: 1= Arunachal Pradesh; 2= Assam; 3= Manipur; 4= Meghalaya; 5= Mizoram; 6= Nagaland; 7= Sikkim and 8= Tripura. B=Brahmaputra; BSM= Barak-Surma-Meghana; K= Kaladan and C=Chindwin.

Table 1: The distribution pattern of mastacembelid spiny eels in the four major river drainages of north-east India. Presence and absence of each species is indicated by + and – sign respectively. B= the Brahmaputra River drainage, BMS= the Barak-Meghna-Surma River drainage. C= the Chindwin River drainage and K= the Kaladan River drainage

Sl. No.	Scientific Name	B	BMS	C	K
1	<i>Macrognathus aral</i> (Schneider, 1801)	+	+	-	+
2	<i>Macrognathus dhanzei</i> sp.nov.	+	-	-	-
3	<i>Macrognathus morehensis</i> Arunkumar & Tombi Singh 2000	-	-	+	-
4	<i>Macrognathus pancalus</i> Hamilton –Buchanan, 1822	+	+	-	+
5	<i>Macrognathus siangensis</i> Arunkumar, 2016	+	-	-	-

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

1	Rostral tooth-plates present	2
	Rostral tooth-plates present	11
2	Presence of a pair series of rostral tooth-plates	3
	Presence of 14-28 pairs of rostral tooth-plates	4
	Presence of 15-17 pairs of rostral tooth-plates	5
	Presence of 8-11 pair pairs of rostral tooth-plates	6
3	26-30 dorsal spines	7
4	14-16 dorsal spines	8
5	19-22 dorsal spines	9
6	11-16 dorsal spines	10
7	29 irregular blotches present on mid-dorsal line form the top of opercular to base of caudal	<i>M. albus</i>
8	3-6 perfect ocelli at the branched dorsal fin rays	<i>M. aral</i>
9	Eye size black blotches along dorsal fin	<i>M. lineatamaculatus</i>
10	12-14 imperfect ocelli at the base of dorsal fin rays	<i>M. morehensis</i>
11	Preorbital spine present	12
12	Preorbital spine absent	15
	Lateral side of body with 26-27 distinct yellow vertical bars originating form 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 rays caudal fin	14
13	28-30 dorsal spines	<i>M. fasciatus</i>
14	24-26 dorsal spines, vertebrae 65	<i>M. pancalus</i>
15	27-30 dorsal spines	<i>M. guentheri</i>
16	15-19 dorsal spines	<i>M. siangensis</i>
17	24-27 dorsal spines, vertebrae 72	<i>M.dhanzei</i> sp.nov.

2. Materials and Methods

Fishes were collected from different localities. Colour in fresh was noted before fixation and preserved in 10% formalin. Measurements were made point to point with dial calliper to the nearest 0.1mm and expressed as percentages of standard length (SL). Subunits of head are expressed as proportions of head length (HL). Spines and fin rays were counted from the preserved specimens under transmitted light with the help of binocular microscope. Standard practices of Britz (2009, 2010) [5, 6] Britz & Kottelat (2020) [7], Day (1889) [10], Dhanze *et al.* (2018) [11], Hamilton –Buchanan (1822) [15], Jayaram (1999) [16], Ng and Tan (2020) [22], Roberts (1980, 1986) [26, 27], Sufi (1956) [31], Talwar & Jhingran (1991) [32] and Yazdani (1990) [38] were followed. A systematic review and check list of mastacembelid spiny eel fishes of northeast India has been prepared based on present collection and by consulting available literatures. The updated scientific names of valid taxa available in this list have followed that of catalogue of fishes, California Academy of Sciences and WORMS World Register of Marine Species (WWW. Marine species.org/aphi, down loaded on the 8th July 2020).

3. Results and Discussions

The study reveals 5 *Macrogathus* species from the north-east India. The systematic accounts of mastacembelid spiny eel fishes are given below:

3.1. *Macrogathus aral* (Schneider, 1801)

Rhynchobdella aral Bloch & Schneider, 1801; *Syst. Ichth.*; 479, Pl. 89 (type locality: “Fluvios Tranquabareses”).



Fig 2: *Macrogathus aral*

3.2. Materials: 6exs. Standard length (SL): 185-190mm.

3.3. Remarks

Macrogathus aral is previously referred to as either *M. aculeatus* (Day, 1878, 1889, Vinciguerra, 1889-1890, Sufi, 1956) [9, 10, 34, 31] or *M. aral* (Roberts, 1980 and 1986) [26, 27]; Talwar & Jhingran, 1991; Vidthayanon *et al.*, 2005) [31, 33] were belongs to *M. dorsiocellatus* (Britz, 2009) [5]. It is distributed strictly in the western side of Manipur and distinctive fish fauna of the Barak drainage in the northeastern India (Arunkumar & Tombi Singh, 2000) [3]. Bungdon & Waikhom (2015) [8] reported it from the Chindwin river basin of Manipur which have 16-23 rostral tooth plates, smooth preorbital and preopercular, and rounded caudal-fin without any meristic and morphometric characters. It differs from *M. dorsiocellatus* in having lesser ocelli along the base of soft dorsal-fin rays (perfect 3-7 ocelli vs. incomplete white rim 7-11 ocelli), lesser soft dorsal-fin rays (44-45 vs. 51-61), lesser soft anal-fin rays (44-52 vs. 51-60), lesser caudal-fin rays (14-15 vs. 16-20) according to Britz (2009) [5]. It is widely distributed in the northeast region of India viz., Barak and

Brahmaputra river drainages and *M. dorsiocellatus* is known from the Ayeyarwaddy (or Irrawaddy), lower Sittang and lower Salween river drainages or basins in Myanmar. Britz (2009) [5] stated that *M. lineatamaculatus* had been figured as *M. aral* by Roberts (1980 [26]; fig. 2b). *M. aral* differs from *M. lineatamaculatus* in having lesser soft dorsal fin rays (44-45 vs. 50-57), lesser caudal-fin rays (14-15 vs. 16-17), presence of perfect 3-7 ocelli vs. 10 circular black blotches along the base of soft dorsal-fin rays and more rostral tooth plates 20-24 vs. 15-17 (Britz, 2009) [5] and differs from *M. pentophthalmos* in having more dorsal-fin spines (18-22 vs. 14-16), shorter predorsal 35.5-40.8% SL vs. 43.3-46.8), shorter preanal (53.7-58.4%SL vs. 60.0-64.6), lesser soft dorsal-fin rays (44-45 vs. 50-52), lesser number of ocelli at the base of soft dorsal-fin rays (3-7 vs. 4-9) and absence vs. presence of a smaller ocellus at the posterior base of anal fin respectively (Pethiyagoda *et al.*, 2008) [24]. Preanal length of *M. aral* given by Dhanze *et al.* (2018) [11] is more longer than given by Pethiyagoda *et al.* (2008) [24] viz., 59.79-68.23%SL vs. 53.7-58.4. The numbers of soft dorsal-fin rays shown in Table 2 and Diagnosis 5.2 of this species, *Macrogathus aral* given by Dhanze *et al.* (2018) [11] are full of doubt viz., 45-53 and 45-43 respectively. 71 and 60 numbers of total vertebrae were also reported for this species of spiny eel by Vreven (2005) [35] and Dhanze *et al.* (2018) [11] respectively. IUCN Red List Category: Least Concern.

3.4. *Macrogathus dhanzei* sp. nov.

Macrogathus aculeatus Dhanze, Debbarma, Debbarma & Dhanze, 2018; *J. Entomol. Zool. Stud.*; 6: 373, fig. 1, a; 1. b; fig. 2.a (type locality: India: Assam and Tripura, North-eastern region of India).



A



B

Fig 3: *Macrogathus dhanzei* sp. nov. [from fig. 1a. *M. aculeatus* from Assam and b. *M. aculeatus* from Tripura].

3.5. Materials: 28 exs. Standard length (SL) 53.4-126.2 mm. [Data of Dhanze *et al.* (2018) for *M. aculeatus*].

3.6. Diagnosis

D. XXIV-XXVII 31-38, A III 30-41, P. i15-18; C. 10-12. Vertebrae 34+38= 72. Body contour cylindrical, tapering gently from occipital region to the pointed tip of snout anteriorly and from the origin of soft dorsal-fin to caudal

peduncle posteriorly. Rostrum with tubular nostril guarded by fimbriae. Opercular and pre-orbital spines absent. Overall colour yellowish grey with light brown vertically straight or oblique bands on dorsum and lateral aspect of entire body from opercular region to caudal peduncle giving zebra like striations; dorsal and anal fin hyaline with oblique black dotted streaks and on caudal fin vertical black dotted streaks. Dorsal and anal fins are not confluent with caudal fin.

3.7. Body proportions [mean, (ranges)] of the specimen:

Dorsal fin base length 75.9, (72.6-79.9), pre-spinous dorsal-fin length 24.5, (22.1-27.5)%SL; post-orbital length 52.0, (46.9-56.2), upper jaw length 28.8, (24.3-33.0), lower jaw length 12.1, (8.5-15.3), head depth 34.2, (28.5-43.6)%HL; eye diameter 29.0, (21.6-37.4), ineterorbital width 28.9 (20.5-36.8), upper jaw length 73.7, (56.7-83.8), lower jaw length 31.1, (21.0-42.6)% of preorbital length or snout length; eye diameter 21.8, (15.3-27.3), preorbital length 75.4, (62.1-85.9)% of post orbital length, pre-spinous dorsal length or predorsal length at the origin of spine 40.1, (24.2-46.2) and pre-soft dorsal fin rays 107.3, (102.8-111.0)% of pre-soft anal fin ray respectively.

3.8. Colouration

Imperfect and perfect ocelli are totally absent at the bases and rays of the dorsal, anal and caudal fins. 28-34 vertical transverse bars are present.

3.9. Etymology

The specific name is named in the honour of R Dhanze, Professor and Head, Department of Fisheries Resource Management, Central Agricultural University (1), Lembucherra, Tripura (W), India.

3.10. Remarks

Ophidium aculeatum Bloch, 1786 is the synonym of *Macrogathus aculeatus* (Bloch, 1786) and its type locality was "Sussen Wasser von Ostidien". Roberts (1986) [27] reported that *M. aculeatus* had not been found in Burma (now, Myanmar) or in the Indian Subcontinent. All or almost reports of this species, *M. aculeatus* from India and Sri Lanka are referred to *M. aral*. *Macrogathus aculeatus* of Day, 1878 [9], 1889 [10]; Vinciguerra, 1889-90 [24]; Sufi, 1956 [31] or *M. aral* of Roberts, 1980 [26], 1986 [27]; Talwar & Jhingran, 1991 [32] and Vidthayanon *et al.*, 2005 [33] are referred to *M. dorsiocellatus* (Britz, 2009) [5]. The important distinctive meristic characters of *M. aculeatus* are XIII-XXII dorsal-fin spines, 48-56 soft dorsal-fin rays and 50-54 soft anal-fin rays (Günther, 1861 [13]; Weber & Beaufort, 1962 [36]; Khachonpisitsak, 2007) [17] and Froese & Pauly, 2013 [12]. *M. dhanzei* sp. nov. is easily distinguished from *M. aculeatus* by having more dorsal-fin spines XXIV-XXVII vs. XIII-XXII, lesser soft dorsal-fin rays 31-38 vs. 48-56 and lesser soft anal fin rays iii 30-iii41 vs. 50-54. *Macrogathus aculeatus* of Dhanze *et al.* (2018) [11] from Assam and Tripura of the northeastern region of India is quite different from the *M. aculeatus* of Thailand (based on Khachonpisitsak, 2007 [17]; Rainboth, 1996 [25] and Roberts, 1989) [28], viz., (1) D. XXIV-XXVII 31-38 vs. D. XV-XIX 48-54; (2) Pi 15-18 vs. 24-27 (Khachonpisitsak, 2007) [17] & 22-29 (Roberts, 1989) [28]; (3) A. III 30-41 vs. A. III 44-51; (4) C. 10-12 vs. 13-16.; (5) Dorsal spine fin base length 72.6-79.9%SL vs. 23.7-30.9; (6) Snout length or preorbital length 34.3-44.0% HL vs. 50.9-54.9; (7) Head width 15.2-29.1%HL vs. 10.5-16.8; (8) Upper

jaw length 24.3-33.0%HL vs. 12.1-16.8; (9) Body with a series of 28 vertical bars (Fig. 1.a, from Assam) and 33-34 vertical transverse bars (Fig. 1.b, from Tripura vs. 13-17 obliquely oriented dark bars and (10) No number of rostral tooth plates i.e., absence of rostral tooth plates vs. 30-50, 29-55 & 21-55 pairs of rostral tooth plates (Khachonpisitsak, 2007, Rainboth, 1996 and Roberts, 1980 and 1989) [17, 25, 26, 28] respectively. It has more number of vertebrae 72 vs. 70 (Vreven, 2005) [35]. *M. aculeatus* have XIV-XX dorsal spines, 52-56 soft dorsal fin rays and 50-54 branched anal soft rays [(AqGRISI), ICAR National Bureau of Fish Genetic Resources; <https://tasteoifhome.in/detail>, dated 07.06.2020]. This meristic data is also totally distinct from *M. aculeatus* of Dhanze *et al.* (2018) [11]. *M. dhanzei* sp.nov. differs from *M. aral* in having more dorsal-fin spines (XXIV-XXVII vs. XVI-XXII), lesser soft dorsal-fin rays (31-38 vs. 44-45), lesser soft branched anal fin rays (30-41 vs. 44-52), and absence vs. presence of distinct ocelli at the base of soft dorsal-fin rays respectively. It also differs from *M. dorsiocellatus* in having more dorsal-fin spines XXIV-XXVII vs. XIV-XXII, lesser soft dorsal-fin rays (31-38 vs. 51-61), lesser soft anal-fin rays (iii30-iii41 vs. 51-60), lesser caudal-fin rays (10-12 vs. 16-20), absence vs. presence of 7-11 ocelli along the base of soft dorsal-fin rays, shorter predorsal at the origin of spinous dorsal-fin (22.1-27.5%SL vs. 35.3-42.8) and longer predorsal at the origin of soft dorsal fin-ray (68.7-76.3%SL vs. 63.5-70.2) respectively. *M. dhanzei* sp. nov. is most closed to *M. pancalus* in meristic and morphometric characters but distinctly different in the total number of vertebrae 72 vs. 65 respectively (Dhanze *et al.*, 2018) [11]. They did not mentioned about the numbers of rostral tooth-plates for *M. aculeatus* of them. The new species, *M. dhanzei* differs from *M. kris* in having lesser branched dorsal fin rays (31-38 vs. 46-55), anal fin rays (30-41 vs. 51-59), caudal-fin rays (10-12 vs. 20-23), vertebrae (72 vs. 76-78) and absence vs. presence of 11-14 irregular pentagonal dark blotches on sides of body. Data of Ng and Tan (2020) [22] for *M. kris* were used for comparison. It differs from *M. morehensis* in lacking imperfect ocelli at the base of branched dorsal-fin rays and differs from *M. siangensis* in having more dorsal spines (XXIV-XXVII vs. XV-XIX) and lesser dorsal soft fin rays (31-38vs. 42-53) respectively. *M. dhanzei* sp. nov. differs from *M. zebrinus* in having lesser dorsal spine fin (XXIV-XXVII vs. XXVIII-XXXI), lesser soft dorsal fin rays (31-38 vs. 48-55), lesser anal soft fin rays (30-41 vs. 48-59), lesser caudal fin rays (10-12 vs. 18-19), more vertical bars of body (28-34 vs. 17-22), absence vs. presence of 1 preorbital spine, longer upper jaw 24.3-33.0%HL vs. 15.2-20.5 and shorter pectoral-fin 25.1-37.6%HL vs. 43.4-34.3 respectively. *M. aculeatus* is widely distributed in Borneo, Sumatra, Java and the Malay Peninsula northwards to the Tapi River basin, Thailand, an endemic species to the Southern basins from Kra isthmus to the Southern-most country. Only specimens encountered in Java are to be identified as *M. aculeatus* according to Britz (2010) [6] and www.gbif.org, downloaded on 27.7.2020. Due to the above remarks, *Macrogathus aculeatus* of Dhanze (2018) [11] is considered as a new species, *Macrogathus dhanzei*. IUCN Red list category: Not evaluated.

3.11. *Macrogathus morehensis* Arunkumar & Tombi Singh, 2000

Macrogathus morehensis Arunkumar & Tombi Singh, 2000; *J. Bomaby nat. Hist. Soc.*; 97:119, fig. 3 (type locality: Manipur: Maklang river near Moreh Bazar, Chandel District).



Fig 4: *Macrogathus morehensis*

3.12. Materials: 10exs. Standard length (SL): 73-144mm.

3.13. Remarks

Macrogathus morehensis differs *M. aureus* in having lesser dorsal spines (XI-XVI vs. 21-22), longer head (18.6-24.3%SL vs. 16.9-18.3), longer predorsal of spinous dorsal fin (43.3-46.7% SL vs. 33.1-33.8), lesser caudal fin rays (11-14 vs. 16-19), absence vs. presence of a series of around 20 irregular-shaped black blotches along dorsum from nape to caudal-fin base extending anteriorly as a black stripe to vertical through eye (Britz, 2010) [6]. It is further distinguished from *M. dorsiocellatus* in having lesser rostral tooth plates (8-11 vs. 19-24), lesser dorsal-fin spines (11-16 vs.17-22) and presence of 9-14 imperfect ocelli vs. 7-11 perfect ocelli along the base of soft dorsal-fin rays respectively (Britz, 2009) [5]. *M. morehensis* differs from *M. kris* in having lesser number of rostral tooth-plates (8-11 vs. 43-45), lesser dorsal spines (XI-XVI vs. XXIV-XXV), lesser caudal-fin rays (11-14 vs. 20-23), and absence vs. presence of 11-14 irregular pentagonal dark brown blotches on sides of body. Data of Ng & Tan (2020) [22] for *M. kris* were used for comparison. Soram *et al.* (2012) [30] reported *M. morehensis* from the Sidzii hill stream of Manipur or also called Cheherii by local Mao community, belonging to the mighty Brahmaputra river of Assam. Their specimens of *M. morehensis* shall be belongs to the genus *Mastacembelus* due to the confluence of dorsal, caudal and anal fins. *M. morehensis* is an endemic mastacembelid fish species of the Chindwin basin of Manipur and Myanmar (Arunkumar & Tombi Singh, 2000; Britz, 2009 & 2010 and Khaing *et al.* 2019) [3, 5, 6, 18]. IUCN Red list category: Least concern.

3.14. *Macrogathus pancalus* Hamilton-Buchanan, 1822

Macrogathus pancalus Hamilton-Buchanan, 1822; *Fish Ganges*; 30, 364, pl. XXII; fig. 7 (type locality: India: Ganges River drainage).



Fig 5: *Macrogathus pancalus*

3.15. Materials: 6 exs. Standard length (SL): 63-144mm.

3.16. Remarks

Day (1888-1889) [10] once noted that he thought *M. pancalus*

and *M. zebrinus* were one species. *Macrogathus pancalus* is not mentioned in the fishes of inland waters of Southeast Asia (Kottelat, 2013) [19]. Preopercular with 2-5 spines and 1 strong preorbital spine are present and piercing in the skin (Yazdani, 1990 and Talwar & Jhingran, 1991) [38, 32]. Dhanze *et al.* (2018) [11] reported that such type of spines are absent in this fish. Singh *et al.* (2018) [29] reported different ranges of dorsal spines in the key and in the description of this species viz., 24-26 and 35-36 respectively. Perfect and imperfect ocelli are totally absent at the base of soft dorsal and anal fin rays. 64, 60±2 and 65 number of total vertebrae are reported for *M. pancalus* by Vreven, 2005b [35]; Patra & Datta, 2013 [23] and Dhanze *et al.* 2018 [11] respectively. It is distributed in the Barak and Yu river basin belonging to the Chindwin drainages of Manipur. IUCN Red lists category: Least concern.

3.17. *Macrogathus siangensis* Arunkumar, 2016

Macrogathus siangensis Arunkumar, 2016; *J. Research Biol*; 2003, fig. 1. (type locality: India. Arunachal Pradesh, Siang river at Pasighat, East Siang district, Brahmaputra river drainage).



Fig 6: *Macrogathus siangensis*

3.18. Materials: 5 exs. Standard length (SL):97-121mm.

3.19. Remarks

Macrogathus siangensis differs from *M. aral* in having absence vs. presence of rostral tooth plates, presence of 7-11 dark spots like imperfect ocelli at the base of soft dorsal fin vs. 3-7 distinct perfect ocelli and 22-27 oblique transverse bars on the lateral sides of body vs. 2 broad pale longitudinal width bands extending entire length. It differs from *M. aculeatus* of Dhanze *et al.* (2018) [11] or *M. dhanzei* sp. nov. in having lesser dorsal fin spines (15-19 vs. XXIV-XXVII), more soft dorsal-fin rays (42-53 vs. 31-38), more pectoral fin rays (22 vs. 15-18), more anal fin rays (32-51 vs. 30-41), more caudal fin rays (13-14 vs. 10-12), shorter dorsal spine fin base (27.2-31.8% SL vs. 26.4-31.8), longer predorsal at soft branched dorsal fin ray (62.3-66.8% SL vs. 68.7-76.3) longer predorsal at dorsal fin spine origin (34.3-39.0%SL vs. 22.1-27.5) slender body depth (10.3-11.0%SL vs. 10.3-14.0), 7-11 spots like imperfect ocelli at the base of soft dorsal fin rays present vs. absent, 22-27 dark blotches like very shorts transverse oblique bars above the lateral line to dorsal are present vs. 28-34 vertical bars, presence of two parallel longitudinal streak rows of greyish bands on dorsal and anal branched soft fin rays which are distinct at the posterior ends vs. presence of five to six parallel longitudinal streak rows on dorsal and anal branched soft fin rays respectively. It differs form *M. dorsiocellatus* in having absence vs. presence of 19-23 rostral tooth plates, lesser dorsal fin with 15-19 spines and 42-53 rays vs. 14-22 spines and 51-61 rays, lesser soft and fin

rays 32-51 vs. 51-60 and lesser caudal-fin rays 13-14 vs. 16-20, respectively. Data of Britz (2009) ^[5] for *M. dorsiocellatus* were used for comparison. *M. siangensis* differs from *M. kris* in having absence vs. presence of 43-45 rostral tooth-plates, lesser dorsal spines (XV-XIX vs. XXIV-XXV), lesser branched anal fin rays (32-51 vs. 51-59), caudal-fin rays (13-14 vs. 20-23), lesser body depth (10.3-11.0%SL vs. 11.8-15.9) and absence vs. presence of 11-14 irregular pentagonal dark brown blotches on the sides of body. Data of Ng & Tan (2020) ^[22] for *M. kris* were used for comparison. It differs from *M. lineatamaculatus* in having absence vs. presence of 15-17, lesser dorsal spines 15-19 vs. 19-22, lesser caudal fin (13-14 vs. 16-17) and narrower width of body 1.5 -17 in depth of body vs. 2.1-2.7 respectively. Data of Britz (2009) ^[5] for *M. lineatamaculatus* were used for comparison. It differs from *M. morehensis* in having more dorsal spines (15-19 vs. 11-16), lesser body depth (10.3-11.0%SL vs. 11.8-13.8), shorter predorsal length at the origin of dorsal spine (34.3-39.0%SL vs. 43.3-46.7), absence vs. presence of 8-11 rostral tooth-plates, lesser imperfect ocelli at the base of soft dorsal-fin rays (7-11 vs. 12-14), presence of 22-27 dark blotches like very short transverse oblique bars vs. 20-25 broad complete transverse oblique bars respectively. It differs from *M. orthosemos* in having absence vs. presence of rostral tooth plates, presence of 7-11 imperfect ocelli vs. 8-12 perfect ocelli, larger eye (11.8-18.9%HL vs. 9.0-11.0), lesser width of body in its depth (1.5-1.7 vs. 1.8-2.7), lesser caudal fin rays (13-14 vs. 15-17), more transverse oblique bars in front of soft dorsal fin (17-19 vs. 8-12) and absence vs. presence of 7-9 dark spots along the anal-fin base respectively. Data of Britz & Kottelat (2020) ^[7] for *M. orthosemos* were used for comparison. It differs from *M. pancalus* in having lesser dorsal fin spines (15-19 vs. 22-27), more soft dorsal fin rays (42-53 vs. 30-42), more pectoral fin rays (22 vs. 15-19), presence vs. absence of 7-11 imperfect ocelli at the base of soft dorsal branched fin rays, presence vs. absence of 22-27 oblique transverse bars on the lateral sides of body, shorter dorsal fin spine base (27.2-31.8%SL vs. 70.00-80.06) and longer predorsal at dorsal-fin spine origin (34.3-39.0% SL vs. 21.7-27.4) respectively. IUCN Red list category: Not evaluated.

4. Conclusion

Mastacemblid spiny eels of 87 species (25 species of *Macrogathus* in Asian region + 17 species of *Mastacembelus* in Asian region + 45 species of *Mastacembelus* in African region) are well known recorded. Only 5 that is 20.0% of *Macrogathus* species are still recorded and shared from the north-east India, in the South Asian Countries of the World. Further investigations, explorations and classification of spiny eels of mastacemblid fishes in the north east region of India are highly necessary.

5. Comparative materials

1. *Macrogathus aculeatus*: Data from Roberts (1980, 1986, 1989) ^[26], Rainboth (1996) ^[25], Khachonpisitsak (2007) ^[17]. 2. *Macrogathus aral*: Data from Roberts (1980, 1986) ^[26], Talwar & Jhingran (1991) ^[32], Arunkumar & Tombi Singh (2000) ^[3], Vidthayanon *et al.* (2005) ^[33], Britz (2009) ^[5], Dhanze *et al.* (2018c). 3. *Macrogathus aureus*: Data from Britz (2010) ^[6]. 4. *Macrogathus dhanzei* sp. nov.: Data of Britz (2010) ^[6]. 5. *Macrogathus aculeatus* from Dhanze *et al.* (2018) ^[11]. 6. *Macrogathus dorsiocellatus*: Data from Britz (2009) ^[5]. 7. *Macrogathus lineatamaculatus*: Data from Britz (2009) ^[5].

8. *Macrogathus orthosemos*: Data from Britz & Kottelat (2020) ^[7]. 9. *Macrogathus pancalus*: Data from Hamilton-Buchanan (1822) ^[14], Sufi (1956) ^[31], Yazdani (1990) ^[8], Talwar & Jhingran (1991) ^[32], Arunkumar & Tombi Singh (2000) ^[3], Arunkumar (2016) ^[2], Singh *et al.* (2018) ^[29], Dhanze *et al.* (2018) ^[11], Sarma (2019). 10. *Macrogathus pentophthalmos*: Data from Pethiyagoda *et al.* (2008) ^[24]. 11. *Macrogathus siangensis*: Data from Arunkumar (2016) ^[2].

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