NEW RECORD OF *BEMBRADIUM MAGNOCULUM* (ACTINOPTERYGII: SCORPAENIFORMES: PLECTROGENIIDAE) FROM THE NORTH-EASTERN INDIAN OCEAN

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Abstract. The presence of the deep-water flathead, *Bembradium magnoculum* Kishimoto, Kawai, Tashiro et Aungtonya, 2019, from the north-eastern Indian Ocean is reported for the first time. The species was previously known only from a single specimen collected off Phuket, Thailand, eastern Andaman Sea. One specimen measuring 101 mm SL was collected by the Fishery Oceanographic Research Vessel (FORV) *Sagar Sampada* with a demersal trawl (HSDT crustacean version) on the insular shelf north of Car Nicobar Island, Nicobar Islands, at 362 m depth. The specimen is described, and the new distributional record from the north-eastern Indian Ocean is confirmed.

Keywords: deepwater flatheads, Bembradium magnoculum, Plectrogeniidae, Scorpaeniformes, Nicobar Islands, India

INTRODUCTION

The family Plectrogeniidae Fowler, 1928 comprises two genera (Bembradium Gilbert, 1905 and Plectrogenium Gilbert, 1905) and was treated as a subfamily in the order Scorpaeniformes by Nelson et al. (2016). This classification follows Imamura (1996, 2004) and Smith et al. (2018) who aligned Bembradium with Plectrogenium and placed both genera in the family Plectrogeniidae. The above-mentioned two valid genera in this family include four valid species (Fricke et al. 2018a). Members of the family Plectrogeniidae, commonly known as slender deep-water flatheads, are characterised by their elongated and cylindrical body covered with ctenoid scales, moderately to strongly depressed head, and large mouth with fine teeth on jaws. The body is devoid of large scute-like spines (Poss 1999), and this family shares the following synapomorphies skinny sensory canal between pterotic and preopercle absent; dorsal-fin stay and analfin stay present cartilaginous; anterior portion of musculus transversus dorsalis anterior unbranched (Imamura 2004). The eye is large and the upper jaw is superior to slightly

sub-terminal (Nelson et al. 2016). These species are bathydemersal and distributed at a depth range of 138–800 m (Nakaya et al. 1982, Masuda et al. 1984, Okamura 1985, Parin 1991, Chave and Mundy 1994). *Bembradium* is a small genus consisting of only three species *Bembradium furici* Fourmanoir et Rivaton, 1979, *Bembradium roseum* Gilbert, 1905, and *Bembradium magnoculum* Kishimoto, Kawai, Tashiro et Aungtonya, 2019. *Bembradium furici* is endemic to New Caledonia, distributed at a depth range of 360–400 m (Froese and Pauly 2019); *B. magnoculum* is known only from Phuket, Thailand, eastern Andaman Sea at 284-300 m, while *B. roseum* is widespread in the Indo-Pacific, at 138–800 m depth (Fricke et al. 2011).

MATERIALS AND METHODS

The presently reported specimen of *Bembradium magnoculum* was collected during the exploratory deep-sea trawling operations carried out in the continental margins north of Car Nicobar Island, Nicobar Islands, by Fishery Oceanographic Research Vessel (FORV) *Sagar Sampada* (Cruise No. 349) of the Centre for Marine Living Resources

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and Ecology (CMLRE), Ministry of Earth Sciences, India during April 2016 (Fig 1). The fishing operations were carried out using a High-Speed Demersal Trawl (HSDT II, Crustacean version). The trawl catches were counted, sorted, and identified up to the lowest possible taxon, basic morphometric measurements were taken on board and samples were preserved in 10% formalin and brought to the shore laboratory for the further analysis. The morphometric measurements were taken to the nearest 0.1 mm using a digital dial calliper. The specimen was deposited in the Centre for Marine Living Resources and Ecology Referral Centre (Ref. No. IO/SS/FIS/00523). Other museum acronyms follow Fricke and Eschmeyer (2018); the collection of the Institut de recherche pour le développement, Nouméa, New Caledonia is abbreviated IRDNC.

Species are classified according to Fricke et al. (2018a), unless otherwise noted. References are cited according to Fricke (2018). Descriptive methods follow Imamura et al. (2018). The proportions of the morphometric measurements are expressed as the percentage of the standard length (SL). The morphometric and meristic measurements used for the species identification were taken from the preserved specimen.

Comparative material. *Bembradium furici*: MNHN 1978-0470 (holotype), Île des Pins, New Caledonia. IRDNC uncat. (1), Île des Pins, New Caledonia; MNHN 1978-0471 (1 paratype), Île des Pins, New Caledonia. *Bembradium roseum*: USNM 51617 (holotype), Pailolo Channel, Hawaiian Islands; IRDNC uncat. (1), Île des Pins, New Caledonia; MNHN 2002-0126 (3), off north-western

Madagascar, 563–570 m depth; MNHN 2002-0127 (1), off north-western Madagascar, 600–605 m depth; USNM 366399 (1), off north-western Madagascar, 600–605 m depth.

RESULTS AND DISCUSSION

Family Plectrogeniidae Fowler, 1938

Bembradium Gilbert, 1905

Bembradium magnoculum Kishimoto, Kawai, Tashiro et Aungtonya, 2019

(Fig. 1, Table 1)

English common name: bigeye deep-sea flathead *Bembradium magnoculum* Kishimoto, Kawai, Tashiro et Aungtonya, 2019; Kishimoto et al. 2019:10, figs. 1 A-B, 2, 3A (off Phuket, Thailand, eastern Andaman Sea).

Material. IO/SS/FIS/00523, 101 mm SL, Andaman-Nicobar Ridge, 38.5 km north of Car Nicobar Island, 09°36.219'N, 092°43.739'E, FORV *Sagar Sampada*, Cruise 349, Station 4, 362 m depth, bottom trawl, 6 Apr. 2016.

Diagnosis. Morphometrics expressed as percentages of standard length are shown in Table 1. First dorsal fin with IX spines and second dorsal fin with 12 rays, pectoral fin with 25 rays, pelvic fin with 1 spine and 5 rays, anal fin with 11 rays without spines, scale rows between first dorsal fin and lateral line 3.5, scale rows between anal fin and lateral line 7. Lateral line scales 27. Body moderately compressed along dorsal region; head narrow, depressed, with long snout; mouth horizontal, and lower jaw slightly shorter than upper jaw, covered by upper jaw when mouth is closed. Mouth large, upper



Fig. 1. Lateral view of *Bembradium magnoculum* Kishimoto, Kawai, Tashiro et Aungtonya, 2019 (CMLRE/349/04) from Car Nicobar Island north (362 m) (**A** is the fresh colouration, **B** is colouration after preservation in formalin)

jaw reaching below middle of orbit. Teeth uniformly minute as bands in jaws, on vomer and palatine; narrow groove in interorbital space, margins raised with minute backwardly-directed serrations. Infraorbital ridge bearing 4 spines. First dorsal short, spines sharp and moderately strong third spine longest; first two anal rays simple, others branched near tips; pectoral rays in middle are branched, upper rays long, lower rays shorter. Large ctenoid scales on lateral and dorsal body surfaces, cycloid scales on belly.

Live colour (Fig. 1). Body dorsally reddish, belly whitish. Red colour intensified on cheeks and opercles. Soft dorsal and caudal with red bands, anal fin translucent, spinous dorsal fin uniform red; pectorals with irregular red blotches, pelvic fins silvery tinged with red.

<u>Colour in preservative</u> (Fig. 1). In the preserved specimen, the colouration fades to pale yellowish, with slightly darker fins, preopercle darkish. Belly and lower parts of body whitish. Margins of the opercle tinged red, preopercle slightly darker than body.

Table 1

Morphometric measurements and meristic counts of *Bembradium magnoculum* Kishimoto, Kawai, Tashiro et Aungtonya, 2019

Character	Presently reported specimen			Kishimoto et al. 2019		
	Absolute value [mm]	Relative value [%SL]	Meristic count	Absolute value [mm]	Relative value [%SL]	Meristic count
Total length	125.0					
Standard length (SL)	101.0			115.9		
Head length		46.5			46.8	
Body depth		20.2			20.8	
Eye diameter		14.1			13.2	
Postorbital length		19.2			19.4	
Preorbital length		15.2			10.5	
Interorbital space		2.0			2.0	
Upper-jaw length		19.2			20.1	
Lower-jaw length		16.2				
Caudal-peduncle depth		7.1			7.5	
Caudal-peduncle length (upper)		14.1			13.8	
Caudal-peduncle length (lower)		11.6			12.1	
Predorsal length		43.4			41.9	
Preanal length		65.7			67.7	
Prepectoral length		42.4				
Prepelvic length		36.4				
Dorsal-base length		48.5				
Anal-base length		25.5			23.9	
Pectoral-fin length		23.2			21.5	
Pelvic-fin length		15.1			16.7	
1st dorsal-spine length		4.3				
2nd dorsal-spine length		8.1				
3rd dorsal-spine length		11.1				
4th dorsal-spine length		13.1				
5th dorsal-spine length		12.1				
Dorsal-fin elements			IX + 12			XI + 12
Anal-fin rays			11			11
Pelvic-fin elements			I + 5			I + 5
Pectoral-fin rays			23			25
Lateral-line scales			27			28
Horizontal scale rows above LL			4			2
Backward teeth in suborbital ridge			25			20
Nasal spines			5			5
Preopercular spines			2			2
Parietal spines			1			1
Opercular spines			2			2
Branchiostegal rays			7			
Gill rakers	6A			6B		

SL = standard length, LL = lateral line; 6A = 6 gill rakers on the horizontal limb of outer arch and 2 on vertical limb (one is immovable), 6B = 11-12 gill rakers on the horizontal limb of outer arch and 3 on vertical limb (one is immovable).

Remarks. The presently reported specimen from the Nicobar Islands represents the first record of Bembradium magnoculum from the Andaman and Nicobar Islands, and extends the known distribution range ca. 560 km westward to include the eastern and central parts of the Andaman Sea (Fig. 2). The genus Bembradium was previously mainly known from the Pacific Ocean (Masuda et al. 1984, Poss 1999), including southern Japan, the Ryukyu Islands, Taiwan, the Okinawa Trough, the Kyushu-Palau Ridge, the Emperor Seamounts, the Hawaiian Islands, New Caledonia, and the Sala-y-Goméz and the Nazca Ridges in the south-eastern Pacific. However, a few records documented the distribution in the Indian Ocean, including Lombok Island, southern Indonesia (Gloerfelt-Tarp and Kailola 1984), the Ninety East Ridge in the southern central Indian Ocean (Timohin et al. 2017), and very recently a new distributional extension to off northwestern Madagascar (Fricke et al. 2018b).

The presently reported specimen was collected off Car Nicobar Island, which indicates a distribution of the species in the north-eastern Indian Ocean. The collecting depth of 362 m is slightly shallower than the known depth range of the holotype at 285-300 m.

Bembradium roseum and B. *magnoculum* have 12 dorsal-fin rays and 11 anal-fin rays while *B. furici* has 11 dorsal-fin rays and 10 anal-fin rays (Fourmanoir and Rivaton 1979). B. *magnoculum* differs from *B. roseum* by its larger eye diameter (12.4%—13.4% of SL versus 9.8%–11.8% of SL), and the width of the dermal flap of the anterior nostril (broad versus narrow) (Kishimoto et al. 2019). *Bembradium roseum* is distributed widely in both the Indian Ocean and Pacific Oceans, whereas *B. furici* is restricted to the southwestern Pacific Ocean (New Caledonia).

The presence of *B. magnoculum* at the Nicobar Islands is considered as very important as this genus only includes three species, its distribution is poorly known, and it is globally very rare. The Andaman and Nicobar waters of the north-eastern Indian Ocean are quite known to harbour rich deep-sea fishery resources, but their unique biodiversity is in need of conservation measures (Rajeeshkumar et al. 2016, Nikki et al. 2018). It is suggested that other bathydemersal species may be found in the eastern Indian Ocean when more exploratory surveys of deep-sea waters are conducted there.

Ethical approval. The work was carried out based on a specimen collected during exploratory fishing operations on board of FORV *Sagar Sampada*; no ethical permission was needed for this study.

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Fig. 2. Map showing the collection locations of *Bembradium magnoculum* (star symbol indicates the location of presently reported study; diamond symbol represents reports of Bembradium roseum; triangle marks a previous report of *Bembradium furici*). Sources for reports of B. roseum include: Gilbert (1905), Jordan and Richardson (1908), Jordan and Jordan (1922), Fowler (1928), Tinker (1944), Böhlke (1953), Gosline & Brock (1960), Clarke (1972), Novikov et al. (1981), Kanayama in Okamura et al. (1982), Gloerfelt-Tarp and Kailola (1984), Humphreys et al. (1984), Ochiai in Masuda et al. (1984), Yatou in Okamura (1985), Borets (1986), Pequeno (1989), Rivaton et al. (1990), Parin (1991), Chave and Mundy (1994), Parin et al. (1997), Rivaton and Bourret (1999), Ho et al. (2009), Nakabo (2000), Shinohara et al. (2001), Nakabo (2002), Mundy (2005), Shinohara et al. (2005), Fricke et al. (2011), Timohin et al. (2017), Fricke et al. (2018b).

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