

New distributional record of oblique-banded grouper, *Epinephelus radiatus* (Day, 1868) from the St. Martin Island, Bangladesh

Md. Abu HANIF¹, Md. Rajib SHARKER^{1,2}, Shaharior HOSSEN², Moniruzzaman BIPU³

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¹ Patuakhali Science and Technology University, Department of Fisheries Biology and Genetics, Patuakhali-8602, Bangladesh

² Chonnam National University, College of Fisheries and Ocean Sciences, Department of Fisheries Science, 50 Daehakro, Yeosu, Jeonnam, 59626, Republic of Korea

³ Riverine Station, Bangladesh Fisheries Research Institute (BFRI), Chandpur-3600, Bangladesh

ABSTRACT

Groupers are mostly found in the reef-associated marine habitat, of which some are pelagic and others are demersal. Recently, a grouper species called Oblique-banded grouper, *Epinephelus radiatus* (Day, 1868) was newly reported while conducting research work on the availability of reef-associated fishes in St. Martin Island. This species had never been reported to occur not only from this coral reef area but also from the water area of Bangladesh. *E. radiatus* was easily identified following morphological traits, especially color pattern. The findings of the present study added new distributional range for this grouper species from Bangladeshi water.

Keywords: First record, Grouper, Coral reef, St. Martin Island, *Epinephelus radiatus*

ORCID IDs of the author(s):

M.A.H 0000-0002-9198-3879

M.R.S. 0000-0002-2423-5459

S.H. 0000-0003-3581-2271

M.B. 0000-0002-6154-8278

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Correspondence:

Md. Abu HANIF

E-mail: mahanif.pstu@gmail.com



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Introduction

A coral reef is one of the most important biodiversity hotspots on earth, which contain some species-rich communities of marine fishes (Stuart-Smith et al. 2013, Rabosky et al. 2018, Atta et al. 2019). St. Martin's is the only coral belonging Island of Bangladesh endowed with vast marine and land resources having a global biodiversity significance. Molony et al. (2006) recorded a total of 225 fish species from this island of which most abundant fishes are Parrot, Snappers, Damsel, Surgeon, Butterfly, Emperors and Grouper. Thompson and Islam (2010) documented a list of 98 coral-associated fish species from this Island, including five species of grouper.

Groupers of the family Epinephelidae, earlier placed as a subfamily in Serranidae are of considerable economic value in tropical and subtropical countries (Rimmer and Glamuzina, 2017). The family comprises more than 160 species in 16 genera in the world (Tucker et al. 2016, Zhuang et al. 2013). Initially, Hossain (1969) listed eight species of epinephelids from the marine water of Bangladesh; however, nine more species had been added in the recent decade (Rahman et al. 2009; Thompson and Islam, 2010, Habib et al. 2017). By now, 17 species in 4 genera are available in this reef. *Epinephelus radiatus* of this family is distributed widely in the Indo-Pacific from East Africa to Tonga, including Zanzibar, Chagos, Lacadives, St. Brandon's Shoals, Maldives, Sri Lanka, India, Nazareth Bank, Sumatra, Fiji (Randall et al. 2003). It is a coral reef-associated species and inhabits relatively deep waters of rocky and coral reefs associated area in tropical region. It may also occur in marine protected areas in some parts of its range. However, juvenile *E. radiatus* mainly occur shallow rocky area while adults comparatively deeper water. This species is explicitly rare but abundantly found when it forms large schools. Although, the species is considered as a protogynous hermaphrodite; however, further research is needed to confirm this. The present paper reports a new record of *E. radiatus* for the first time from Bangladeshi water.

Material and Methods

In March 2018, three individuals of a species of grouper fish were sampled from a fisherman catch captured from the Saint Martin's Island (coordinate 20.611° N and

92.327° E) of Bangladesh (Figure 1) at a depth approximately 22m during coral-associated fish diversity survey. Collected specimens were preserved in ice box and transported to the laboratory for identification. In the laboratory, fourteen morphometric measurements and seven meristic counts were taken from the collected species (Table 1) by using measuring board nearest to 0.1cm. A digital electric balance were used to measure the weight of sampled specimens up to 0.1g. The specimens were identified as *E. radiatus* according to traditional morphology-based taxonomic keys (Randall and Heemstra, 1991; Heemstra and Randall, 1993; Baldwin et al. 1994) and color pattern. The examined specimens (F1807SM-48) were deposited in the Fisheries Lab., Department of Fisheries Biology and Genetics, Patuakhali Science and Technology University, Patuakhali, Bangladesh.

Results and Discussion

Morphometric and meristic traits of *E. radiatus* are given in Table 1. *E. radiatus* is a fusiform fish. Both body and head are compressed; maxilla reaching to hind margin orbit; mid-lateral part of the lower jaw with two rows of palatine teeth (Figure 2); posterior margin of preopercle serrated and five enlarged serrae at the coner; three spines on opercle and one spine hided membrane; dorsal spines easily distinguished from rays; third dorsal spine longest; second and third anal spines subequal; pelvic fins not reaching anus; caudal fin convex to moderately rounded.

Colour Pattern

Immediately after capture, *E. radiatus* had greyish brown with five irregular oblique dark-edged brown bands (Figure 2); the first band curvilinearly extending from upper half of orbit to nape; second band branching from the first band just behind the eye, crossing anterior dorsal margin of the operculum, broadening on back and extending fourth dorsal spine; the third band began basally to the second band at opercular flap, expanding into posterior spinous of dorsal fin; fourth band runs from a rear end of dorsal fin, branching at medial side, with one branch going towards the origin of the anal fin, the other to a rear end of the base of the anal fin, the fifth band on the caudal peduncle, also branching ventrally. But after preservation, greyish brown with five irregular oblique dark-edged brown bands paler than alive; expressly, a margin of body paled.

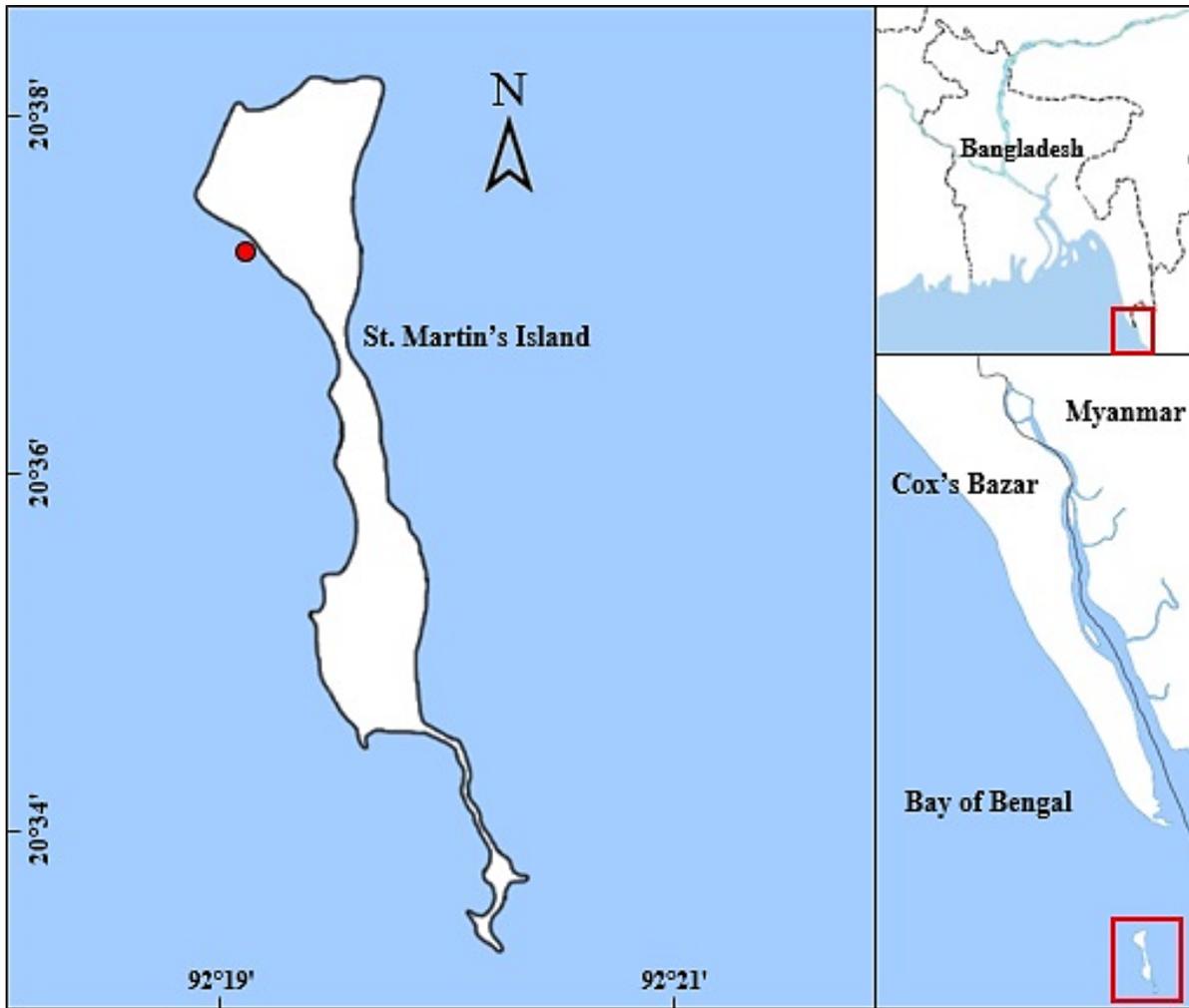


Figure 1. Sampled area of *E. radiatus*, St. Martin Island, Bangladesh

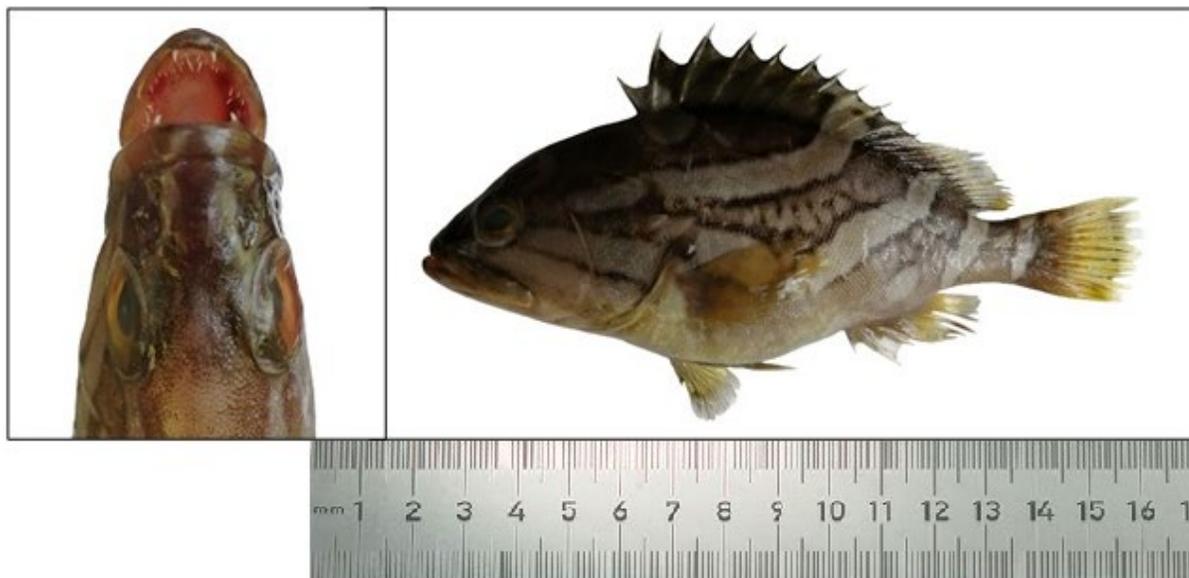


Figure 2. Lateral view with palatine teeth of *E. radiatus* collected from Saint Martin's Island

Table 1. Comparison of morphometric measurements and meristic counts with the present study and published previous studies

Parameter	Present study, n=3			Han et al. (2014), n=1
	1 st specimen	2 nd specimen	3 rd specimen	
Morphometric characters				
Total length (TL)	13.7	14.2	14.1	-
Standard length (SL)	11.5	11.7	11.7	371
Body depth (BD)	5.1	5.2	5.0	35.1
Body width (BW)	1.9	2	2.1	18.7
Head length (HL)	4.3	4.4	4.4	40.7
Inter-orbital length (IOL)	0.9	0.9	0.9	7.9
Eye diameter (ED)	0.7	0.8	0.8	-
Snout length (SL)	1.0	1.1	1.1	10.7
Pre-dorsal length	4.1	4.3	4.2	33.1
Pre-pectoral length	4.4	4.5	4.5	38.7
Pre-anal length	7.6	7.8	7.9	71.7
Upper jaw length	1.7	1.8	1.8	19.0
Caudal peduncle depth (CPD)	1.0	1.1	1.0	-
Meristic counts				
Dorsal fin spines	11	11	11	11
Dorsal fin soft rays	14	14	14	14
Pectoral fin soft rays	16	17	17	17
Pelvic fin spine	1	1	1	-
Pelvic fin soft rays	5	5	5	-
Anal fin spines	3	3	3	3
Anal fin soft rays	8	8	8	-

Generic identification of these Epinephelid was made following the diagnostic morphological characteristics described by Heemstra and Randall (1993). The members under the family Epinephelidae are typically identified by their color pattern, morphological characters and size of the fins, the shape and relative size of the head and various parts of the head and body (Elamin et al. 2011). Sometimes they exhibit different colours and morphological counts in the juvenile stage. However, a morphological feature, especially meristic counts, were in line with previous studies by Heemstra and Randall (1993), and Han et al., (2014). Previously, 15 species of Epinephelids under four genera, namely *Cephalopholis* (3 spp.), *Cromileptes* (1 sp.), *Epinephelus* (10 spp.), *Plectropomus* (1 spp.) which compare to very low found in Indian waters. Ranjan et al. (2017) estimated that, a total of 54 numbers of Epinephelids had been recorded from Indian waters.

Pisces are primarily mobile, and they may shift their location more quickly than species on land because they face fewer physical barriers (Pinsky et al. 2013). Also, many marine species, for instance; fish, do not have fixed nesting places or dwellings that might otherwise compel them to stay in one

place. Species distribution is affected by a simple ‘suitability’ measure, established by the combination of unimodal responses to environmental variables (Meynard and Quinn, 2007; De-Marco et al. 2008). Climate changes are predicted to potentially affect population size, survival and distribution of organisms (Walther et al. 2002; Preuss et al. 2014; Su et al. 2015; Lu et al. 2015; Hanif et al. 2017; Siddik and Hanif, 2020). The highly discrete geographical distribution of species points towards a strong preference for a particular type of habitat (Hanif et al. 2019). Reef fish diversity of St. Martin Island of Bangladesh including other marine species, remains, to date, relatively unexplored (Hanif 2019). Currently, 12% of groupers worldwide are considered under threat of extinction (i.e. Critically Endangered, Endangered, or Vulnerable), with another 13% considered as Near Threatened (Castellanos-Galindo et al. 2018). The discovery of grouper species presented in this paper demonstrates the need for Bangladesh’s reef fish and other understudied marine fauna available in Bangladesh, to be surveyed and documented, to produce an updated inventory of local marine species. There-

fore, this present article has confirmed the presence of *E. radiatus* in the Saint Martin's Island, Bay of Bengal and indicates the possibility of the existence of more species in the family *Epinephelus* in Bangladesh waters that have been overlooked in past surveys.

Conclusion

The present study confirms the occurrence of oblique-banded grouper, *E. radiatus* in the water area of Bangladesh. The findings of the study contribute to better understanding on biology, taxonomy, morphology, genetic and phylogenetic diversity as well as distribution of this species which would be helpful for sustainable management of this grouper species in Bangladesh.

Compliance with Ethical Standard

Conflict of interests: The authors declare that for this article they have no actual, potential or perceived conflict of interests.

Ethics committee approval: All authors declare that this study does not include any experiments with human or animal subjects.

Funding disclosure: -

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Disclosure: -

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