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New records of two parrotfish (Perciformes: Scaridae) from Saint Martin's Island of the Bay of Bengal, Bangladesh

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Abstract

The present article reports two new records of parrotfish *Scarus ghobban* Forsskal, 1775 and *Chlorurus rhakoura* Randall & Anderson, 1997 from Bangladesh. Specimens were collected from Saint Martin's Island located at the Bay of Bengal, Bangladesh during a survey on coral associated fishes of the country from July 2017 to September 2018. The examined specimens are described by morphomeristic characteristics in addition with DNA barcoding. The present study constitutes an extension of the known distributional range of *C. rhakoura* from the Gulf of Mannar of the southern Bay of Bengal to Northern Bay of Bengal, Bangladesh.

Keywords: First record, Range extension, DNA barcoding.
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Introduction

The fishes of the family Scaridae (Rafinesque, 1810), generally known as parrotfishes, inhabit tropical seas, including the Pacific, Indian, and Atlantic Oceans (Liao et al. 2004). Scaridae has two subfamilies of Scarinae (75) and Sparisomatinae (25) comprising a total of 100 valid species (Fricke et al. 2020). Generally, parrotfishes are found in inshore waters. They are reef-dwellers and mostly abundant on coral reefs. Some species are also found in lagoons, creeks, and sea grass beds associated with reef areas (Liao et al. 2004). Scarid fishes can be identified by the characteristic compressed and elongated body, rounded snout, unprotrusible mouth, continuous dorsal fin with 11 flexible spines and 10 soft rays, pelvic fin with I spine and 5 rays, anal fin with III spines and 9 soft rays, moderate to large cycloid scales in body, 1-4 rows scales in cheek, well-developed pharyngeal bones and teeth on both jaws typically fused to form a pair of beak-like plates, interrupted lateral line with 22~24 pored scales (Bellwood 2001). Many Parrotfish have been identified by their live colorations, but this may be lost on preservation, or color pattern varies in different growth stages and sexes (Bellwood 2001; Barman and Mishra 2005).

Parrotfish are one of the least studied groups in Bangladesh. There are reports of only 4 valid species in 3 different genera from the marine waters of the country (Hussain 1970; Rahman et al. 2009; Thompson and Islam 2010). The present paper reports occurrence of *Chlorurus rhakoura* (Randall & Anderson, 1997) and *Scarus ghobban* (Forsskål, 1775) for the first time from marine waters of Bangladesh. Morphological characters and meristic counts were analyzed for species identification. DNA barcoding based on mitochondrial cytochrome oxidase subunit I (COI) gene was also used for genetic identification of these species.

Material and Methods

Sample collection: Specimens were collected from local angler of the Saint Martin's Island, Bangladesh (Fig. 1) during July 2017 to March 2018. This is the only Island in Bangladesh where coral colonies are found. Saint Martin's Island forms the southernmost tip of Bangladesh situating in the northern Bay of Bengal (BoB). The

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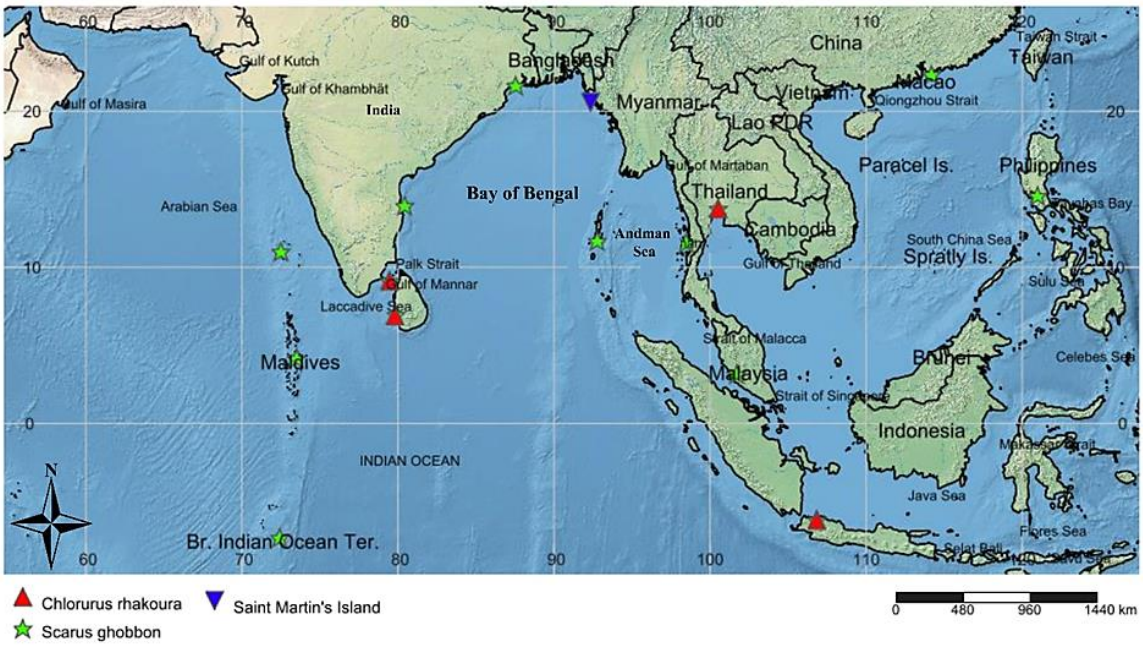

Figure 1. Saint Martin's Island of Bangladesh, the sampling location of *S. ghobban* and *C. rhakoura* in the northern Bay of Bengal (▼); and previously reported distribution of *S. ghobban* (★) and *C. rhakoura* (▲).

examined specimens were preserved in 90% alcohol and deposited in the Aquatic Bioresource Research Lab., Department of Fisheries Biology and Genetics, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh.

Morphological identification: The species were identified based on morphological characteristics and meristic counts. Morphological analysis was performed following the descriptions of Sommer et al. (1996), Randall and Anderson (1997), Carpenter et al. (1997) and Bellwood (2001).

DNA barcoding: DNA barcoding was used to identify the collected species as well. For this purpose, genomic DNA was extracted from preserved muscle tissues using TIANamp Marine Animals DNA Kit (TIANGEN) following manufacturer's protocol. The partial 5′ region of mitochondrial COI gene was amplified with the primer set FishF1-5′TCAACCAACCACAAAGACATTGGCAC3′ and FishF2-5′TCGACTAATCATAAA GA TATCGGCAC3′ (Ward et al. 2005). The amplification reaction was performed in a total volume of 25 µl, including 16.25 µl ultrapure water, 2.25 µl 10X PCR buffer, 1.25mM $MgCl_2$, each dNTP at 0.2 mM, each primer at 2 mM, 1.25 U Taq DNA polymerase and 1 µl DNA template. The thermal regime of PCR consisted of an initial step of 2 min at 95°C followed by 35 cycles of denaturing (94°C, 1 min), annealing (54°C, 40 sec) and extension (72°C, 1 min), with a final extension at 72°C for 10 min and the samples were then held at 4°C. Amplified PCR products were separated on 1% agarose gel (Invitrogen, USA) stained with ethidium bromide in a gel documentation system (Model: Syngene InGenius³). PCR products which showed a single and clear visible band were purified with the TIANGEN- Universal DNA Purification Kit for sequencing. DNA sequencing of the purified products was performed in a normal automatic sequencer (Model 3730xI DNA analyzer) at Macrogen Inc. (Korea).

The obtained COI Sequences were checked using BLAST search engine provided by National Center for Biotechnology Information (NCBI) and Bold database. Finally, the sequences were submitted to GenBank. Phylogenetic tree for COI barcode sequences was constructed by Neighbor Joining (NJ) method applying 10000 bootstrap replicates using MEGA-7 bioinformatics software (Kumar et al. 2016). Three sequences of conspecific species of *S. ghobban*, its 2 congeneric species (JQ840681, KJ658940) and four sequences of two congeneric species of *C. rhakoura* viz. *C. bleekeri* and *C. frontalis* retrieved from the GenBank (JN312293,

Table 1. Morphometric and meristic characters of the collected specimens of *Scarus ghobban* and *Chlorurus rhakoura* from Saint Martin's Island, Bangladesh.

Parameters	*S. ghobban*	*C. rhakoura*
Dorsal-fin spines	IX	IX
Dorsal-fin soft rays	10	10
Pectoral-fin soft rays	14	14
Pelvic-fin spines	I	I
Pelvic-fin soft rays	5	5
Anal-fin spines	III	III
Anal-fin soft rays	9	9
Caudal-fin rays	16	26
Branchiostegal rays	–	4
Median pre-dorsal scales	6	7
Scale rows on cheek	3	2
Total length	283.00	382.00
Standard length (SL)	230.00	314.00
In percentage of SL		
Body width	39.57	38.85
Body depth	21.30	22.61
Head length	33.91	35.35
Inter-orbital wide	10.43	11.15
Pre-orbital length	15.22	16.24
Post-orbital length	13.04	17.52
Eye diameter	5.22	4.46
Snout length	12.17	9.87
Caudal peduncle length	15.22	16.56
1st Dorsal-fin base length	56.52	53.18
1st dorsa-fin length	10.43	11.78
Pectoral-fin base length	6.96	7.01
Pectoral-fin length	22.61	27.07
Pelvic-fin base length	4.35	3.82
Pelvic-fin length	19.13	26.75
Anal-fin base length	10.43	22.93
Anal-fin length	23.48	10.51
Caudal-fin base length	13.48	16.56
Caudal-fin length	23.48	26.11
Pre-dorsal length	45.22	36.31
Pre-pectoral length	39.13	30.25
Pre-pelvic length	41.74	33.44
Pre-anal length	78.26	61.15

JN313070, MH049174, JQ431617, JQ431619) and BOLD (FADLI198-17, FADLI199-17) to use with for phylogenetic analysis. *Pomacentrus imitator* (MF828506 Coral Sea) was used as an outgroup. Genetic distances among sequences were calculated by MEGA-7.

Results

Two species of parrotfishes identified in the present study are *S. ghobban* Forsskal 1775 and *C. rhakoura* Randall & Anderson 1997.

Scarus ghobban Forsskål, 1775

Blue-barred parrotfish (Fig. 2, Table 1)

Material examined: F1707SM-46, 1, 230 mm SL, Bangladesh: Cox`s Bazar, Saint Martin's island (20°36'39.6"N, 92°19'37.2"E), Amit Kumer Neogi (GenBank accession number: MK340703).

Diagnostic characters: Morphomeristic measurements are given in Table 1. Body colour dull orange yellow, five diffuse dark bars present on body. Terminal phase bluish green dorsally, scale margins salmon-pink; a broad

Figure 2. Lateral view of *Scarus ghobban*, 230 mm SL (F1707SM-46).

Figure 3. Lateral view of *Chlorurus rhakoura*, 314 mm SL (F1803SM- 69).

irregular green band from corner of mouth across lower part of head linked with two transverse blue bands on chin and 3 narrow irregular green bands extending posteriorly from eye; edge of upper lips salmon pink with a broad green band above; dorsal fin salmon-pink with blue-green margin; edge of upper pectoral fin blue green. Median pre-dorsal scales 6; 3 rows of scales on cheek, the third row have only one scale. Teeth fused to form dental plates; dental plates comparatively smooth, white in colour; more than half of dental plates covered by lips (Fig. 2).

Habitat. *Scarus ghobban* occurs in shallow reefs, on flats and reef fronts (Psomadakis et al. 2019). In Bangladesh, we found it in the coral associated Island (Saint Martin's Island).

Distribution: *Scarus ghobban* is known to occur from Indo-Pacific: Persian Gulf, Red Sea and Algoa Bay, South Africa to Rapa and Ducie islands, north to southern Japan, south to Perth, new South Wales; Gulf of California to Ecuador; off the coast of Shiqmona, Myanmar (Myeik Archipelago), India (Andaman and Nicobar Islands, Lakshadweeps, Andhra Pradesh, Tamil Nadu, Gulf of Mannar, West Bengal) (Goren and Aronov 2002;

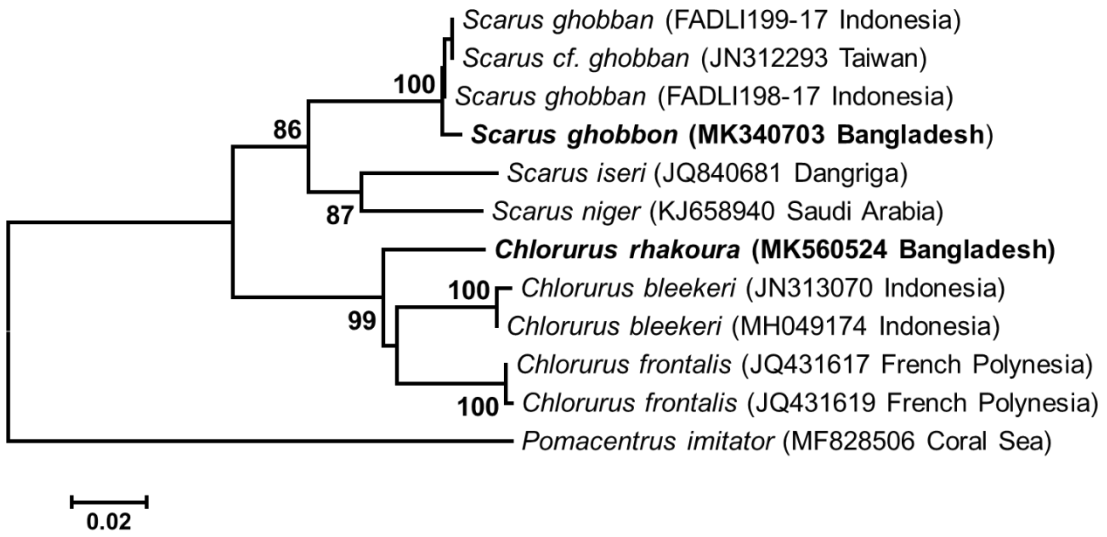

Figure 4. Neighbor-joining phylogenetic tree for COI gene sequences of *Scarus ghobban* and *Chlorurus rhakoura*. Bootstrap support of >85% are shown above branches. Scale represents substitution per site.

Yennawar et al. 2013; Rajan et al. 2013; Russell 2016; Psomadakis et al. 2019).

Chlorurus rhakoura Randall & Anderson, 1997

Raggedfin parrotfish (Fig. 3)

Material examined: F1803SM-69, 1, 314 mm SL, Bangladesh: Cox's Bazar, Saint Martin's island (20°36'39.6"N, 92°19'37.2"E), Amit Kumer Neogi (GenBank accession number: MK560524).

Diagnostic characters: Morphomeristic measurements are given in Table 1. Body moderately deep with three median pre-dorsal scales; two scale rows on cheek, seven scales on upper row with six scales on lower row; forehead with a prominent fleshy protuberance; two short, laterally-projecting teeth on pre-maxillary dental plate. Posterior margin of pectoral fins scalloped; caudal fin with strongly exerted rays, giving posterior margin a ragged appearance. Body color dark gray-brown, scales of body with a dull blue-green cast and very dark purplish edges; dorsal margins and anal fins bright blue; bluish white dental plates (Fig. 3).

Habitat: *Chlorurus rhakoura* generally found in marine habitats specially reef area with the depth range 1-30 m (Allen and Erdman 2012). In Bangladesh, we found it in the coral associated Island (Saint Martin's Island).

Distribution: *Chlorurus rhakoura* is known to occur from Eastern Indian Ocean: Sri Lanka, Andaman Sea (Thailand), India (Gulf of Mannar), Western Australia, Indonesia and Italy (Randall and Anderson 1997; Allen and Erdmann 2012; Saravanan et al. 2016; Insacco and Zava 2017; Froese and Pauly 2019).

Genetic results: We successfully barcoded two species of *S. ghobban* and *C. rhakoura*, and submitted their COI barcode sequences under the GenBank accession number MK340703 and MK560524, respectively. No sequence of *C. rhakoura* species submitted into the GenBank except for China that may be misidentified; so that we have excluded that sequence from our study. In the tree, *C. rhakoura* of Bangladesh formed a single clade showing heterogenetic relationship with other two congeneric species with over 95% bootstrap value. In addition, the sequence of *S. ghobban* of Bangladesh formed a single clade with the conspecific sequences from Indonesia and Taiwan with 100% bootstrap value. The genetic distances between Bangladeshi individuals with each of the individuals of Indonesia and Taiwan are 0.6% to 0.8% (Fig. 4).

Table 2. An updated checklist of Parrotfishes of Bangladesh

Scientific name	References
Bolbometopon muricatum Valenciennes, 1840	Thompson and Islam 2010
Chlorurus japanensis Bloch, 1789	Hussain 1970
Chlorurus rhakoura Randall & Anderson, 1997	Present study
Scarus ghobban Forsskal, 1775	Present study
Scarus psittacus Forsskål, 1775	Rahman et al. 2009
Scarus rivulatus Valenciennes, 1840	Hussain 1970

Discussion

Generally, parrotfishes found as reef-dwellers in inshore waters. In Bangladesh, parrotfish is one of the least studied groups and only found in the Saint Martin's Island, the only island that supports coral reef in the country. Only 4 valid species of 3 genera were previously reported from the marine waters of Bangladesh (Hussain 1970; Rahman et al. 2009; Thompson and Islam 2010), whereas approximately 32 species of parrotfish occur in Indian marine waters (Barman and Mishra 2005; Rajan et al. 2013; Saravanan et al. 2016; Nair and Kumar 2018;). In the present study, we identified two species of parrotfish namely *S. ghobban* and *C. rhakoura* from Saint Martin's Island of the Bay of Bengal, Bangladesh. Therefore, six valid species of parrotfish are been reported until now in Bangladesh, which have been presented in Table 2 as an updated checklist of parrotfishes.

Though *S. ghobban* was previously recorded from Digha coast (West Bengal, India) of the northern Bay of Bengal (Yennawar et al. 2013), other *C. rhakoura* is reported for the first time in this region. The results confirm an extension of the known distributional range of *C. rhakoura* from the Gulf of Mannar of the southern Bay of Bengal to Northern Bay of Bengal, Bangladesh.

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Literature cited

Allen G.R., Erdmann M.V. 2012. Reef fishes of the East Indies. Volumes I-III. Tropical Reef Research, Perth, Australia. 1292 p.

Barman R.P., Mishra S.S. 2005. Studies on the reef-dwelling fishes of India: Parrotfishes (Family SCARIDAE). Zoological Survey India 1-62.

Bellwood D.R. 2001. Scaridae. In: K.E. Carpenter, V.H. Niem (Eds.). FAO species identification guide for fishery purposes, the living marine resources of the Western Central Pacific. Volume 6. Bony fishes, part 4 (Labridae to Latimeriidae), estuarine crocodiles, sea turtles, sea snakes and marine mammals. Food and Agriculture Organization, Rome. pp: 3468-3494.

Carpenter K.E., Krupp F., Jones D.A., Zajonz U. 1997. FAO species identification field guide for fishery purposes, Living marine resources of Kuwait, Eastern Saudi Arabia, Bahrain, Qatar and UAE, Food and Agriculture Organization, Rome. 293 p.

Fricke R., Eschmeyer W.N., Van der Laan R. 2020. Eschmeyer's catalog of fishes: genera, species, references, (http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp). Retrieved 12/04/2020.

Froese R., Pauly D. 2019. FishBase. World Wide Web electronic publication.www.fishbase.org, (12/2019). Retrieved 12/04/2020.

Goren M., Aronov A. 2002. First record of the Indo-Pacific parrot fish *Scarus ghobban* in the Eastern Mediterranean, Cybium 26(3): 239-240.

Hussain M.M. 1970. The Marine and Estuarine Fishes of North East part of the Bay of Bengal. Scientific Researches, East Regional Laboratories, Dhaka (Pakistan) 7(1): 26-55.

Insacco G., Zava B. 2017. *Chlorurus rhakoura* Randall & Anderson, 1997, (Perciformes, Scaridae), an Indo-Pacific fish new for the Mediterranean Sea. Mediterranean Marine Science 18(2): 285-91.

Liao Y.C., Chen L.S., Shao K.T., Chen I.S. 2004. A review of parrotfishes (Perciformes: Scaridae) of Taiwan with descriptions of four new records and one doubtful species. Zoological Studies-Taipei 43(3): 519-36.

Nair R.J., Kumar D.S. 2018. Overview of the Fish Diversity of Indian Waters. In: DBT sponsored Three Months National Training in Molecular Biology and Biotechnology for Fisheries Professionals, 2nd February 2015 - 31st March 2018, Kochi. 66 p.

Psomadakis P.N., Thein H., Russell B.C., Tun M.T. 2020. Field identification guide to the living marine resources of Myanmar. FAO Species Identification Guide for Fishery Purposes, Food and Agriculture Organization, Rome. 694 p.

Rahman A.K.A., Kabir S.M.H., Ahmad M., Ahmed A.T.A., Ahmed Z.U., Begum Z.N.T., Hassan M.A., Khondoker M. 2009. Encyclopedia of Flora and Fauna of Bangladesh. Volume 24. Marine Fishes. Asiatic Society of Bangladesh, Dhaka. 485 p.

Rajan P.T., Sreeraj C.R., Immanuel T.I. 2013. Fishes of Andaman Andaman and Nicobar Islands: a checklist. Journal of Andaman Science Association 18(1): 47-87.

Randall J.E., Anderson R.C. 1997. *Chlorurus rhakoura*, a new species of parrotfish (Perciformes: Labroidei: Scaridae) from Sri Lanka. Journal of South Asian Natural History 2(2):155-64.

Kumar S., Stecher G., Tamura K. 2016. MEGA7: molecular evolutionary genetics analysis version 7.0 for bigger datasets. Molecular Biology and Evolution 33(7): 1870-1874.

Russell B.C. 2016. 2016 Survey of coral reef fishes of the Myeik Archipelago, Myanmar, Report No. 38 of the Tanintharyi Conservation Programme, a joint initiative of Fauna & Flora International (FFI) and the Myanmar Forest and Fisheries Departments. Flora and Fauna International, Yangon. 57 p

Saravanan R., Sadiq S., Nazar A.K.A. 2016. Rare Parrot fish *Chlorurus rhakoura* recorded from the Gulf of Mannar, Cadalmin, CMFRI Newsletter, n.150, July-September. SCA, Suez Canal Authority, 2015. available at: http://www.suezcanal.gov.eg. 10 p.

Sommer C., Schneider W., Poutiers J.M. 1996. FAO species identification field guide for fishery purposes, The living marine resources of Somalia, Food and Agriculture Organization, Rome. 383 p.

Thompson P.M., Islam M.A. 2010. Environmental Profile of St. Martin's Island, Eds, United Nations Development Programme (UNDP), Bangladesh. 151 p.

Yennawar P., Tudu P.C., Ray D., Mohapatra A. 2013. New records of two reef fishes *Gymnothorax reticularis*, Bloch, 1795 (Family: Muraenidae) and *Scarus ghobban*, Forsskal, 1775 (Family: Scaridae) from West Bengal coast, India, Records of the Zoological Survey of India 113(1): 129-35.