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SHORT COMMUNICATION KISA MAKALE

Confirmation of the presence of *Helicolenus dactylopterus* (Delaroche, 1809), in the Sea of Marmara with morphometrical and bioecological notes

Helicolenus dactylopterus (Delaroche, 1809) türünün Marmara Denizi'nde güncel varlığının doğrulanması, morfometrisi ve biyoekolojisi üzerine notlar

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Abstract: On 9 August 2024 two specimens of *Helicolenus dactylopterus* (Delaroche, 1809) were caught by means of a scientific bottom-trawl hauling towed at a depth range between 143 and 188 m, at the central sector of the Sea of Marmara. After more than 30 years since the last occurrence of *H. dactylopterus* in the region, the capture of only two specimens does not represent more than confirmation of the current presence of the species in the Sea of Marmara. However, this record is also a significant finding revealing that life still exists in the deep regions of the Sea of Marmara and therefore action must be taken to prevent habitat and biodiversity loss.

Keywords: Sebastidae, *Helicolenus*, bathyal, Sea of Marmara, biodiversity

Öz: *Helicolenus dactylopterus* (Delaroche, 1809) türü derin deniz balığının iki örneği 9 Ağustos 2024 tarihinde Marmara Denizi'nin orta kesiminde 143 ila 188 m derinlik aralığında bilimsel amaçlı dip trolü çekimi sırasında yakalanmıştır. *H. dactylopterus* Marmara Denizi'nde en son 30 yıldan uzun süre önce kaydedilmiştir. Yakın zamanda yakalanmış olan bu iki bireyle türün bölgede halen yaşadığı doğrulanmaktadır. Marmara Denizi'nin derin bölgelerinde yaşamın hâlâ devam etmekte olduğunu ortaya koyan bu kayıt, habitat ve biyolojik çeşitlilik kaybını önlemek için harekete geçilmesi gerektiğine vurgu yapan önemli bir bulgudur.

Anahtar Kelimeler: Sebastidae, *Helicolenus*, batiyal, Marmara Denizi, biyoçeşitlilik

INTRODUCTION

The blackbelly rosefish *Helicolenus dactylopterus* (Delaroche, 1809) (Perciformes: Scorpaenoidei) is a member of the family Sebastidae (Froese and Pauly, 2024). *H. dactylopterus* is a bathydemersal deep-sea teleost fish found at depths between 50 and 1,100 m, but the common depth range of the species is known to vary from 150 to 600 m (Froese and Pauly, 2024). The range of the blackbelly rosefish extends from Nova Scotia (Canada) to Venezuela in the western Atlantic, and in the eastern Atlantic it's distribution covers a wide area from Iceland to Norway in the north, and the Mediterranean Sea and the Gulf of Guinea in the south (Froese and Pauly, 2024).

Chronologically the first literature reporting on the presence of *H. dactylopterus* in the Aegean and Mediterranean waters of Türkiye is the ichthyological inventory by Geldiay (1969). In this report Geldiay (1969) considers *H. dactylopterus* as a teleostean found in the Aegean and Mediterranean waters of Türkiye, especially in the waters of Bay of İzmir. The contemporary presence of *H. dactylopterus* in Turkish waters was further confirmed by Altuğ et al. (2011) and Koca (2023). During an extensive survey of the demersal fishery resources of the Turkish seas, *H. dactylopterus* was recorded from the Sea of Marmara for the first time (JICA, 1993), and followed by the second record of the species in the region a few years later (Meriç, 1995). Although the species is being reported as a member of the fish fauna of the Sea of Marmara in several ichthyological checklists published in recent decades (Eryılmaz and Meriç, 2005; Gönülal and Topaloğlu, 2016; Artüz and Fricke, 2019); however, the information on the presence of *H. dactylopterus* in the mentioned region provided in this literature is either based on JICA (1993) or Meriç (1995). Furthermore, *H. dactylopterus* was not been sampled in two recent surveys of demersal fishes of the Sea of Marmara (Torcu Koç et al., 2012; Daban et al., 2021). The absence of *H. dactylopterus* in the ichthyological field surveys conducted in the last two decades (Torcu Koç et al., 2012; Daban et al., 2021) suggests that the species may have been extirpated from the Sea of Marmara, and despite the occurrence information provided in the most recent ichthyological review (Artüz and Fricke, 2019), it's presence in the region requires confirmation. In the present article, the authors report on a recent capture of *H. dactylopterus* in the Sea of Marmara, and provide morphometric data and bioecological notes.

MATERIAL AND METHODS

Study area

The study area of the present study is located in the central sector of the Sea of Marmara (Figure 1), and according to the GFCM's definition of geographical subareas (GSAs) of the Mediterranean Sea, the Sea of Marmara is defined as GSA28 (GFCM, 2018).

Examined specimens

The present study is part of an ongoing governmental large-scale monitoring program of Turkish seas, which is titled as "Denizlerde Bütünleşik Kirlilik İzleme Programı - Integrated Program for Marine Pollution Monitoring" and implemented by Republic of Türkiye, Ministry of Environment, Urbanization and Climate Change. The demersal sampling was carried out onboard of *RV Yunus-S*, a 510 hp stern trawler operated by İstanbul University, Faculty of Aquatic Sciences. According to the MEDITS protocol, a bottom trawl with a codend mesh size of 14 mm and a maximum mesh size of 22 mm was used for the hauls (Anonymous, 2017). The tow duration for the hauls was 30 min at depths ≤200 m and 60 min >200 m depth (Anonymous, 2017). Oceanographic parameters (salinity, temperature and dissolved oxygen) were recorded using the SeaBird CTD probe.

Species identification followed Hureau and Litvinenko (1986), and taxonomic nomenclature followed Kovacić et al. (2021) and Froese and Pauly (2024). After fresh specimens were photographed, morphometric distances, expressed as percentages of standard length (SL) (Table 1), were measured on fresh specimens using either an ichthyometer (for distances >10 cm) or a digital vernier caliper (for distances ≤10 cm) to avoid influence of shape variations or changes in distances due to fixation (Martinez et al., 2013). Morphometric measurements and meristic counts were performed according to the procedure adopted from Kai and Nakabo (2002) and Koca (2023). The definitions of body depths 1 and 2 were adopted from Kai and Nakabo (2002), which are the distance between the anterior origin of the 12th dorsal spine and that of the 1st anal spine, and the distance between the anterior origin of the 1st dorsal spine and that of the pelvic spine, respectively. The total weight (TW) of the examined specimens was weighed to the nearest 0.05 g on a precision balance.The definitions of the maturity stages of the examined reproductive organs follow Follesa and Carbonara (2019). The examined blackbelly rosefishes were fixed and preserved in borax-buffered, 5% seawater formalin solution. According to the evidence-based approach for the confirmed presence of fish species (Kovacić et al., 2021), formalin-preserved specimens are stored at the Department of Fisheries Technologies and Management Laboratory, Faculty of Aquatic Sciences, İstanbul University with barcode numbers PSC20230114-121 and PSC20230114-122.

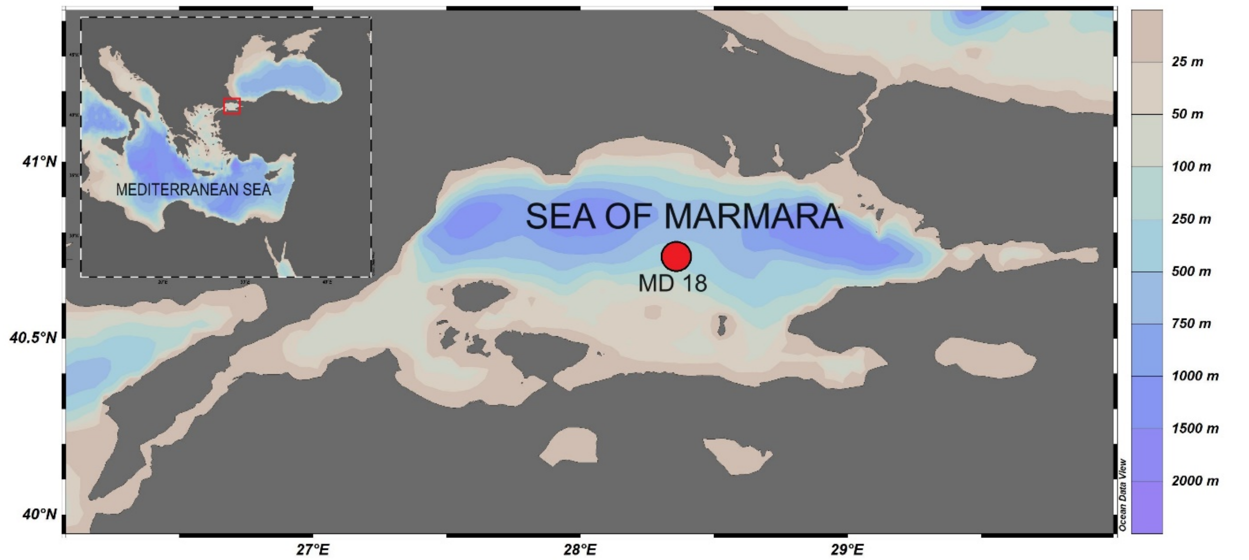

Figure 1. Map shows the approximate locality (red dot) of capture of the examined specimens of *Helicolenus dactylopterus* in the Sea of Marmara

RESULTS

On 9 August 2024, two specimens of *H. dactylopterus* were caught at the station MD18 (haul started at 40º 42.155' N 28º 19.985' E; haul ended at 40º 42.727' N 28º 18.192' E) on a mixed bottom of mud and sand at a depth range of 143-188 m (Figure 1). The following description of *H. dactylopterus* is based on the examined specimens (Figure 2). The morphometric measurements of the examined specimens are given in Table 1.

A large-headed teleostean fish with first suborbital bone without spines, second with 1 spine; nasal spine is present; preocular, supraocular and postocular spines are not highly elevated. The profile of the nape is relatively steep. The mouth is large and dark coloured inside. In both specimens: dorsal fin with 12 spines and 13 rays; anal fin with 3 spines and 5 rays; pectoral fin with 18 rays, of which the lowermost 8 are free for about a third of their length (Figure 2); and pelvic fin with 1 spine and 5 rays. Lateral line with tubular scales. Back and sides are reddish pink, and belly is pink coloured; 5 dark coloured bands are present below anterior, middle and posterior dorsal spines, below soft dorsal rays and at the base of caudal fin; faint dark spot is present on the posterior part of spinous dorsal fin; dark spot is present on the operculum. The abdominal cavity is black. These morphological characters are consistent with those described by Hureau and Litvinenko (1986).

The stomachs of both specimens were empty. Examination of the reproductive organs revealed that both specimens were females and the maturity stage of the ovaries was 2b (recovering) (Follesa and Carbonara, 2019). In terms of total length (TL), both specimens (173 and 201 mm) were well above the 50% mature size (L_{50}; TL 142 mm) reported for females of *H. dactylopterus* (Follesa and Carbonara, 2019). *In situ* dissolved oxygen concentration was 1.99 mg/L at a depth of 140 m, indicating that the seawater at the station MD18 is at the threshold of hypoxia (Howell and Simpson, 1994). Salinity was 38.82‰ and temperature was 15.41ºC at the same depth.

Table 1. Morphometric measurements of the examined specimens of *H. dactylopterus* caught in the Sea of Marmara

Measurements (mm)	SP1	SP2	Mean	±SD	% of SL of mean
TL	201	173	187	14	126.35
SL	158	138	148	10	100
Body depth 1	58.55	48.16	53.36	5.20	36.05
Body depth 2	47.57	39.68	43.63	3.95	29.48
Caudal peduncle depth	15.65	13.44	14.55	1.11	9.83
Predorsal length	50.14	42.26	46.20	3.94	31.22
Postdorsal length	11.70	11.03	11.37	0.34	7.68
Prepelvic length	72.63	55.58	64.11	8.53	43.31
Preanal length	111 .26	97.21	104.24	7.03	70.43
Prepectoral length	61.11	50.39	55.75	5.36	37.67
Between pelvic and pectoral fins	9.74	7.31	8.53	1.21	5.76
Between pelvic and anal fins	27.84	33.15	30.50	2.66	20.60
Dorsal base length	98.60	84.67	91.64	6.97	61.92
Anal base length	23.42	20.28	21.85	1.57	14.76
Pectoral fin length	49.59	44.66	47.13	2.47	31.84
Pelvic fin length	36.97	31.17	34.07	2.90	23.02
Pelvic spine length	17.74	18.15	17.95	0.21	12.13
Caudal fin length	42.95	39.25	41.10	1.85	27.77
1st dorsal spine length	12.73	13.27	13	0.27	8.78
2nd dorsal spine length	21.94	18.27	20.11	1.84	13.58
3rd dorsal spine length	25.32	21.95	23.64	1.69	15.97
4th dorsal spine length	25.04	19.63	22.34	2.70	15.09
5th dorsal spine length	22.55	19.31	20.93	1.62	14.14
12th dorsal spine length	18.91	15.92	17.42	1.50	11.77
11th dorsal spine length	15.91	11.91	13.91	2	9.40
1st anal spine length	11.70	7.67	9.69	2.02	6.54
2nd anal spine length	19.71	17.08	18.40	1.32	12.43
3rd anal spine length	21.33	16.46	18.90	2.43	12.77
Pelvic fin spine length	22.37	17.65	20.01	2.36	13.52
Head length	60.60	50.78	55.69	4.91	37.63
Snout length	12.27	10.66	11.47	0.81	7.75
Orbit length	20.69	17.36	19.03	1.67	12.85
Postorbital length	29.03	26.26	27.65	1.39	18.68
Interorbital length	7.61	7.63	7.62	0.01	5.15
Upper jaw length	34.24	30.10	32.17	2.07	21.74
Weight (g)	136.17	88.68	112.43	23.75	N/A
Gonad weight (g)	4.97	0.41	2.69	2.28	N/A

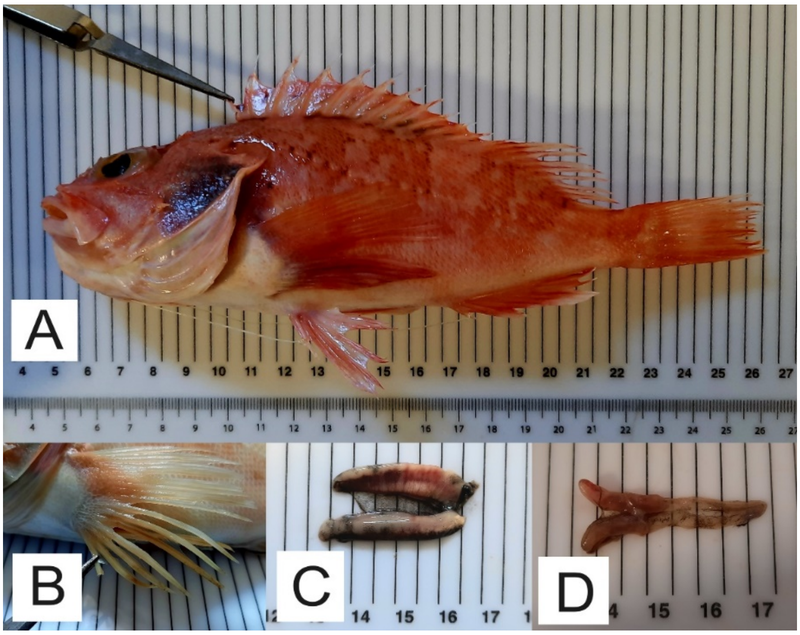

Figure 2. (A) one of the examined specimens of *H. dactylopterus* (specimen 1, TL 201 mm); (B) close-up image depicting lowermost free rays of the pectoral fin (specimen 1); (C) and (D) ovaries of specimen 1 and specimen 2 (TL 173 mm), respectively

DISCUSSION

The contemporary presence of *H. dactylopterus* in the Sea of Marmara is confirmed by the present study. Before further discussing the earlier records of *H. dactylopterus* from the mentioned region, it is necessary to clarify one point that the date of the first record of the species from the Sea of Marmara is contradictory. Although Eryılmaz and Meriç (2005) and Gönülal and Topaloğlu (2016) refer to Meriç (1995) as the first record of *H. dactylopterus* from the Sea of Marmara, contrary to them, Artüz and Fricke (2019) refer to JICA (1993). Presumably based on the sampling dates, the material examined by Meriç (1995) was considered the first record of *H. dactylopterus* from the Sea of Marmara, although this article was published two years after the JICA (1993) report. On the other hand, the demersal fishery resources survey was initiated in May 1991 (JICA, 1993); however, Meriç's (1995) material contains 36 specimens of *H. dactylopterus*, the majority (n=34) of which were caught in 1988. Although this brief anecdote does not change the fact that the first record of the species in the Sea of Marmara was in the early 1990s, it is clear that this discrepancy in the literature should be clarified. In addition, Altun (1997) found postlarvae and juveniles of *H. dactylopterus* in ichthyoplankton samples collected during surveys in the Sea of Marmara in the 1950s and 1960s and preserved at the Department of Hydrobiology, İstanbul University. Therefore, the results of Altun (1997) suggest that *H. dactylopterus* may have been present in the region since earlier years. According to Munoz et al. (2010), *H. dactylopterus* is a zygoparous species, which means that it gives birth in multiple batches by enclosing the embryos in a gelatin sheath. Although the embryos in the gelatin sheath are released to the seafloor, the larvae and juveniles are thought to be planktonic after the gelatin sheath dissolves (Froese and Pauly, 2024). Therefore, *H. dactylopterus* postlarvae found in the previous ichthyoplankton samples from the Sea of Marmara may have been transported from the Aegean Sea by the current. However, in a very recent study, underwater observations conducted by means of a remotly operated underwater vehicle (ROV) showed that both juveniles and adults were mostly standing on their fins on the substratum (93% of the adults and 94% of the juveniles) and in most cases completely inactive (El Vadhel et al., 2024).

Despite the possibility of transport from the Aegean Sea, the sampling period of ichthyoplankton samples from the Sea of Marmara is spread over a long period of time, suggesting that a population of *H. dactylopterus* may have lived in this region in the past. Furthermore, if this assumption is accepted as correct, it is known from the existing literature that *H. dactylopterus* lived under very favourable conditions, especially in terms of dissolved oxygen, in the bathyal zone of the Sea of Marmara in the 1950s and 1960s (Kocataş et al., 1993). According to Kocataş et al. (1993), who emphasized that the oxygen-rich water layer in the Sea of Marmara (mean DO 7.6 mg/L) could reach down to 80 m depth in the past, anaerobic conditions did not occur even if the oxygen level decreased below this layer. Moreover, the abundance of *H. dactylopterus* per unit area (kg/km^2) varied between 3.1 and 15.8 kg/km^2 between 201-500 m depth during the JICA (1993) survey, which supports the assumption that suitable environmental conditions for this species existed in the bathyal zone of the Sea of Marmara in those years.

Considering that *H. dactylopterus* is a member of the family Sebastidae, and sebastids are known to have distributions such as reduced home ranges, suggesting less tolerance to low oxygen than most other taxa (Parnell et al., 2020). Mainly due to anthropogenic impacts, DO levels in the deep regions of the Sea of Marmara have decreased significantly below the hypoxia threshold (DO < 2 mg/L) over the past 40 years, and even anoxia appears to be becoming more widespread (Mantıkçı et al., 2022), suggesting that the living conditions of *H. dactylopterus* have deteriorated in it's natural deep habitat. Contrary to the statement in the JICA (1993) report that the abundance of *H. dactylopterus* in the Sea of Marmara peaked in winter at 20-100 m depth (23.4 kg/km^2) and at 201-500 m depth (15.8 kg/km^2), the absence of the species in the deep zones is presumably due to the environmental degradation of it's habitat. The in situ DO measurements (≤2 mg/L) at station MD18, where only 2 specimens of *H. dactylopterus* were caught, and nearby deeper stations support the link between the absence of the species and deoxygenation.

The morphometric measurements presented in Table 1 provide the first detailed morphometry of *H. dactylopterus* from the Sea of Marmara. According to Koca (2023), who studied the morphometry of *H. dactylopterus* based on 156 samples (97 males and 59 females) caught in Antalya Bay, most of the morphometric characteristics of male fishes differed from female fishes, while such differences were found to be statistically insignificant. Due to the small number of samples (n=2) and the fact that only females were included in the sample, it is currently not possible to make a similar morphometric comparison within the Sea of Marmara population or an interregional comparison with the Antalya Bay population. If environmental conditions do not continue to deteriorate in the future and the species continues to exist in the Sea of Marmara, it may be possible to make such morphometric comparisons in the future when more samples are available.

CONCLUSION

The results of the present study showed that *H. dactylopterus*, a deep-sea teleost of the family Sebastidae, is still present in the Sea of Marmara. After more than 30 years since it's last occurrence in the region following the report of Meriç (1995), the capture of the present specimens raised hopes for life in the bathyal zones of the Sea of Marmara, where environmental degradation is a major challenge for deep-sea life. With regard to the previously reported abundance of *H. dactylopterus* from the Sea of Marmara (JICA, 1993), the capture of only two specimens does not represent more than a confirmation of the current presence. However, this record is also an important finding because it shows that life still exists in the deep regions of the Sea of Marmara, and therefore action must be taken to prevent severe habitat and biodiversity loss.

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AUTORSHIP CONTRIBUTIONS

Material preparation and data collection were performed by all authors. Study conception and drafting of the manuscript were performed by Hakan Kabasakal. All authors commented on previous versions of the manuscript and approved the final version.

CONFLICT OF INTEREST

The authors of this work declare that they have no conflicts of interest.

ETHICS APPROVAL

The present study does not raise any ethical issues and no special permissions were required to conduct the study.

DATA AVAILABILITY

For questions regarding datasets, the corresponding author should be contacted.

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