Doğanın Sesi, Haziran 2023 Cilt: 6 Sayı: 11, 24-34

AN ADDITIONAL OCCURRENCE OF GREY TRIGGERFISH *(BALISTES CAPRISCUS* GMELIN, 1789) WITH SOME NOTES ON MORPHOLOGICAL PARAMETERS IN SAROS BAY, (NORTHERN AEGEAN SEA, TÜRKİYE)

Saroz Körfezi'nden (Kuzey Ege Denizi, Türkiye) Morfolojik Parametreler Üzerine Bazı Notlarla, Gri Çütre Balığı (*Balistes capriscus* Gmelin, 1789)'nin İlave Bulunuşu

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Research Article
Received: 24.03.2023
Accepted: 26.06.2023

Anahtar Kelimeler
Balistes capriscus, Saroz Körfezi, çütre

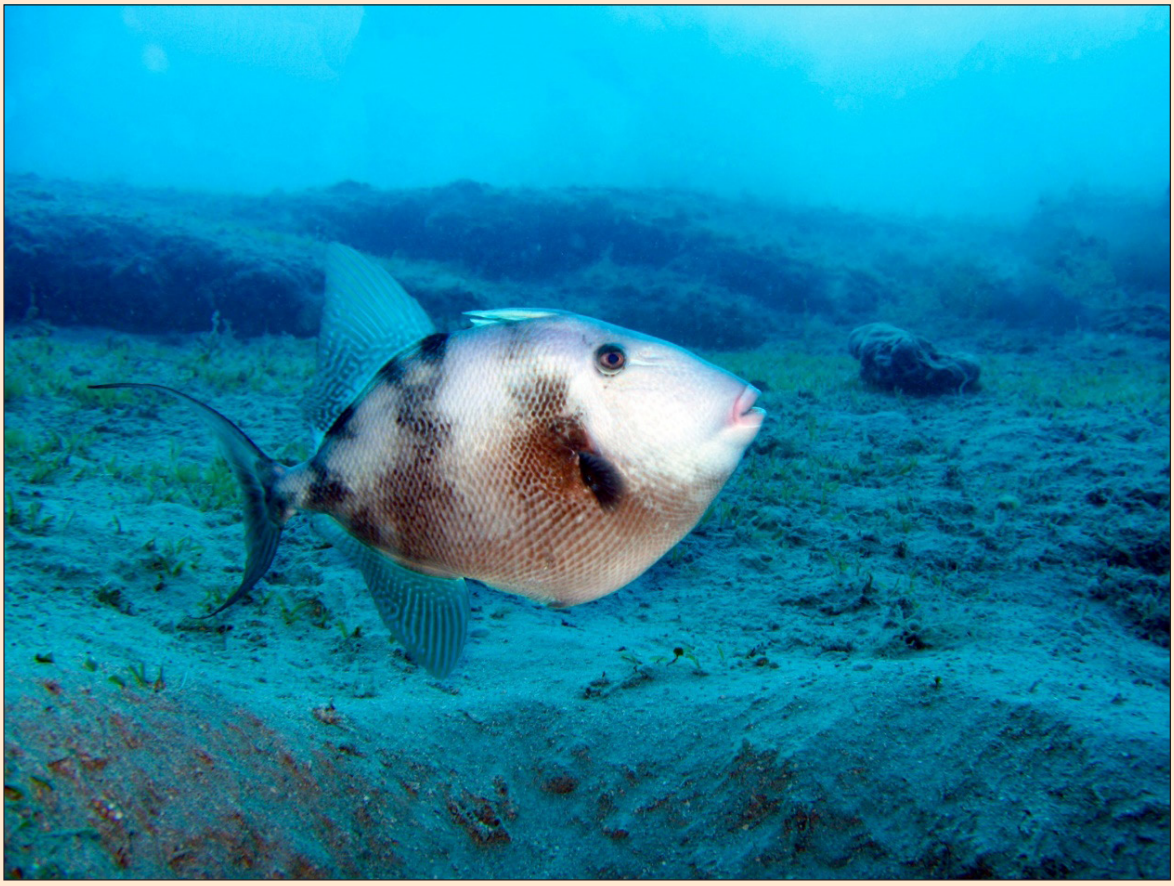
Keywords
Balistes capriscus, Saroz Bay, triggerfish

One female specimen of *Balistes capriscus* (SL: 46.24 mm, TL: 59.23 cm, TW: 2600 g.) was captured at the depth of 30 m. by longlining in Saros Bay (Türkiye) on 14th March, 2020. Description of the species were based on morphometric characteristics. Morphometric measurements were carried out, using a digital calliperof 0.05 mm accuracy and digital balance of 0.01 g., respectively. This paper declares the northernmost extension range of *B. capriscus* in Turkish Aegean Sea, related to global heating. Here, the major morphometric and meristic characters of this rare species which was secondly found in Saros Bay were given. This knowledge is important in terms of tracking biological diversity changing during global heating.

ÖZET

14 Mart 2020 tarihinde bir dişi *Balistes capriscus* (çütre balığı) bireyi (SB: 46.24 mm, TB: 59.23 cm, ağırlık:2600 gr.) Saroz Körfezi'nden paraketa ile 30 m. derinlikten yakalandı. Türün tanımlanması morfometrik özelliklerine göre yapılmıştır. Morfometrik ölçümler sırasıyla 0.05 mm and 0.01 gr. hassasiyetli bir dijital kumpas ve terazi kullanılarak gerçekleşti. Bu makale *B. capriscus*'un küresel ısınmayla ilişkili olarak, Ege Denizi'ndeki kuzeye doğru yayılışını genişlettiğini bildirmektedir. Burada, Saroz Körfezi'nde ikinci kez bulunan bu nadir türün başlıca morfometrik ve meristik özellikleri verilmiştir. Bu bilgi küresel ısınma süresincedeğişen biyoçeşitliliğin izlenmesi bakımından önemlidir.

Torcu Koç H., Tunçer S., Zilifli A. (2023). "An additional occurrence of grey triggerfish (*Balistes capriscus* Gmelin, 1789) with some notes on morphological parameters in Saros Bay, Northern Eegean Sea, Türkiye". Nature and Sustainability Association, Voice of Nature, 6 (11): 24-34



Balistes capriscus © B. Gözcelioğlu

GENİŞLETİLMİŞ ÖZET

Araştırmanın amacı ve literatür:

Bu araştırmada, Türkiye sularında nadir olarak bulunan gri çütre balığının önemli morfomeristik karakterleri verilmiştir. *Balistes capriscus* Doğu Atlantik'te Akdeniz dahil Batı Atlantik sularına kadar 12-100 m derinliklerinde yayılış gösterir (Harmelin-Vivien ve Quero, 1990; Smith-Vaniz vd.1999). Başta yumuşakça ve kabuklular olmak üzere bentik bölgede yaşayan omurgasızlarla beslenmektedirler.. Son yıllarda küresel ısınma nedeniyle dağılım alanında farklılıklar olmasıyla birlikte türün coğrafik yayılımı sınırlarını aşarak Kuzey bölgelerine kadar genişlemiştir (Keskin ve ark., 2011; Meo ve ark., 2018). (Kacem ve ark. 2014; 2015). Bazı çalışmalarda *B. capriscus*'un Saros Körfezi'nde ve tüm Türkiye denizlerinde ilk kez görüldüğünden bahsedilmiş ancak türün detaylı morfometrik ve meristik karakteristlik özellikleri ortaya konulmamıştır.

Gri çütre balığının varlığı, Türkiye'nin kuzey Ege kıyılarında yerleşik bir popülasyon olduğunu açıkça göstermese de, gelecekte kuzey Ege Denizi'nin farklı kesimlerinde gözlemlenebilme ihtimalini oldukça fazladır. Bu nedenle, gri çütre balığı gibi termofilik indikatör türlerin dağılımının izlenmesi, Akdeniz deniz ekosistemleri üzerindeki olası değişiklikleri göstermek ve kendi bölgesi dışında istikrarlı popülasyonlar oluşturmak için bazı bilgiler verebilmektedir. Ayrıca, türün biyolojisi ve ekolojisi hakkında da çok az bilgi bulunması ve bu nedenle kuzeye doğru genişleyen gri çütre balığının populasyon dinamiklerini Akdeniz havzasının kuzey kesimleri boyunca izlemek için daha fazla çalışmaya ihtiyaç duyulmaktadır.

Materyal ve yöntem:

14.03.2020 tarihinde Saroz Körfezi'nde (40°22'11"K 26°19'16"D) paragat takımı ile bir dişi gri çütre balığı Saroz Körfezi'nden örneklenmiştir. Saroz Körfezi'nde dip trolü avcılığı 2000 yılından beri yasak olduğu için körfez antropolojik etkilerden etkilenmemiş ve bozulmaya uğramamış bir bölge olarak değerlendirilebilmektedir (Cengiz vd., 2013). Yakalanan birey, tür düzeyine göre FishBase veri tabanından tanımlanmıştır (Harmelin-Vivien ve Quero,1990). Morfometrik ölçümleri 0.05 mm hassasiyetli bir kumpas yardımıyla yapılmıştır. Eşey tayini belirlendikten sonra meristik özellikleri 20x büyütmeli stereo mikroskopta sayıldıktan sonra fotoğraflanmıştır. Daha sonra örnek birey %75 etanol içerisinde muhafaza edilerek, Çanakkale Onsekiz Mart Üniversitesi Piri Reis Deniz Müzesi Koleksiyonu bölümüne transfer edilmiştir (PRM-PIS 2020-0084).

Bulgular:

Bireyin standart boyu 46,54 cm, toplam boyu ise 59,23 cm olarak belirlenmiştir. Yakalanan bireyin morfolojik spesifik özellikleri olarak küçük ağız yapısı, plate pul tipi, vücudun üst kısmında ve medyan yüzgeçlerde küçük ve mavi noktaların bulunması, bununla birlikte bu noktalara eşlik eden karındaki düzensiz kısa çizgilerin bulunması yakalanan bireyin *B.capriscus* olduğunu desteklemektedir (Randal;1996; Muus ve Nielsen, 1999). *B.capriscus*'un Saroz Körfezi'nde gözlemlenmesi, Atlantik Okyanusu ve Akdeniz'den Kuzey Ege Denizi'ne doğru olan yayılımının mümkün olduğu varsayımını doğurmaktadır. Morfolojik ölçümler ve meristik sayımlar büyük oranda Muus ve Nielsen (1999) çalışmasıyla uyum içinde olduğunu göstermiştir. Ancak bulunan küçük farklılıklar balıkların büyüklük ve yaş gibi parametrelerine göre değişim gösterebilmekle beraber, Deniz suyu sıcaklığı, tuzluluk gibi dış etkenlerden de kaynaklanabilmektedir. Saroz Körfezi'nden elde edilen B. capriscus'ta dikromatizm gözlemlenmiştir. Türün alt- solungaç kapağı bölgesinde erkek ve dişi bireylerde renk farklılığı gösterdiği belirtilmiştir (Mackichan ve Szedlmayer, 2007). Ancak yapılan bu çalışmada örnek sınırlılığından dolayı erkek ve dişi birey karşılaştırılması yapılabilme fırsatı olmamıştır.

Tartışma ve sonuç:

Küresel iklim değişikliği, denizel ortamı veya denizdeki populasyonların coğrafi dağılımını kontrol eder. İklim değişikliği ve insan faaliyetlerinden kaynaklanan habitat bozulması, ekosistemlerdeki tür dağılımını ve kaynak dinamiklerini etkileyebilmektedir (Raitsos vd., 2010). Akdeniz bölgesindeki mevsim normalleri üzerindeki sıcaklıktan dolayı bazı endemik türlerin optimal ortam koşullarının bozulmasıyla orijinal güney coğrafik dağılımından kuzeye doğru göç etmelerine sebebiyet vermektedir (Walther ve ark., 2002; Azzurro ve ark., 2011). Azzurro'ya (2008) göre, bilinen aralığın kuzeyinde görünen yerli termofilik türler, deniz suyu sıcaklığındaki ve küresel ısınmadaki değişiklikleri göstermek için iyi bir göstergedir. Balık türlerinin göç yolları, avcılığı ve dağılımı, küresel ısınma, su sıcaklığındaki değişikliklerle ilişkilendirilebilmektedir (Dulčić ve Grbec, 2000; Cengiz ve Paruğ, 2020). Denizlerin küresel ısınması, Akdeniz biyoçeşitlilik dengelerinin değişimine ve balık populasyonlarının yıllara bağlı olarak değişimine yol açan önemli bir faktördür

(Lejeusne vd., 2010). *B.capriscus* gibi Akdeniz balıklarının dağılımı, genellikle türlerin bilinen coğrafi aralığının dışında dağılmış bireylerin rastgele gözlemlenmesiyle ortaya çıkar. Bu çalışmada Atlanto-Akdeniz türü olarak bilinen *B.capriscus*'un Karadeniz'den gelen soğuk, az tuzlu ve besin değeri yüksek suların çıkışından etkilenen Kuzey Ege Denizi'ne doğru yayılması küresel ısınmayla ilişkilendirilebilmektedir. Gri çütre balığı, Kuzey Ege Denizi'ndeki balık biyoçeşitliliği için önem arz etmektedir. Ekonomik değeri olan ve çoğunlukla taze, tütsülenmiş ve kurutulmuş tuzlu olarak tüketilen *B.capriscus* aynı zamanda ciguatera zehirlenmesine neden olduğu da kaydedilmiştir (Bravo ved., 2015). *B.capriscus* türünün korunması, yaşam bölgelerinin genişlemesi ve varlığını sürdürmesi büyük önem arz etmektedir (IUCN, 2019; Liu et al. 2015).

INTRODUCTION

Balistes capriscus Gmelin, 1789 is a grey triggerfish widely found in the eastern Atlantic from the British Isles to Angola, including the Mediterranean Sea (Harmelin-Vivien and Quero, 1990; Smith-Vaniz et al., 1999) and in the western Atlantic from the Gulf of Mexico to Argentina (Robins and Ray, 1986). It is a planktonic species that is associated with Sargassum sp. at 12-100 m depth of the subtropical waters (Harmelin-Vivien and Quero, 1990; Gül et al., 2011). It feeds on benthic invertebrates like molluscs and crustaceans according to Fishbase (Tortonese, 1986; Gül et al., 2011).

The species commonly measures 44 cm in total length (Figueiredo et al., 2002) but might grow as big as 60 cm (total length) (Harmelin-Vivien and Quéro, 1990; Jardas, 1996; Dulcic and Soldo, 2005).In last years, its distribution range has been extended towards the northern regions, perhaps because of global warming (Francour et al., 1994; Astraldi et al., 1995; Garrabou et al., 2003; Frota et al., 2004; Keskin et al., 2011; de Meo et al., 2018). Burton et al. (2015) mentioned the growth parameters of triggerfish from Brazilian coasts and southeastern United States. While Kacem et al. (2011) determined a digenean parasite, *Hypocreadium caputvadum* from the intestine of *B*. *capriscus* collected from the Gulf of Gabès (Tunisia), Hamza et al. (2015). Made a description of a parasitic species including Lernaeopodidae family on the grey triggerfish in Algerian coasts. Kacem et al. (2014, 2015) also mentioned the growth and reproductive biology parameters of the species from thesame area. *B*. *capriscus* has been reported as a rare species from Mediterranean Sea so far in north- east Atlantic Ocean: Gordo and Cabral, (2001) and Veiga et al. (2010), Adriatic Sea: Dulcic and Soldo, (2005), the Sea of Marmara: Eryılmaz and Meriç, (2005), Turkish Mediterranean Sea: Torcu and Aka (2000), Torcu-Koç et al. (2004), Çoker and Akyol, (2014), Gül et al. (2011), Keskin et al. (2011), and Yemişken et al. (2014). Torcu-Koç et al. (2004) gave some morphometric features of 30 species from Saros Bay, except for the finding of *B*. *capriscus*. Bilecenoğlu et al. (2014), Çoker and Akyol, (2018), and Cengiz and Paruğ (2020) mentioned the first occurrence of *B*. *capriscus* in SarosBay, and all Turkish Seas but, they did not give any detailed morphometric and meristic characters of the species**.**

Although the presence of grey triggerfish does not clearly indicate that there is an established population in the northern Aegean coast of Turkey, its distribution into the area is not a single eventand ongoing process and might be observed in different sections of the northern Aegean Sea in the future. Thus, monitoring of distribution of thermophilic indicator species, such as the gray triggerfish, may give some information to show possible changes on the Mediterranean marine ecosystems and to form stable populations outside its own region. Besides, there is also a little knowledge about the species biology and ecology, thus, further studies are required to track the population dynamics of this northward expanding species through the northern parts of the Mediterranean basin. Here, we present new data on the morphological measurements for grey triggerfish from the Saros Bay, northern Aegean Sea.

MATERIALS AND METHODS

One female specimen was caught by paraket at the depth of 30 m. from Saros Bay (40°22'11"N 26°19'16"E) on 14th March, 2020 **(Figure 1, 2)**. Saros Bay is an inlet of the northern Aegean Sea located in north of the Gallipoli Peninsula in northwestern Türkiye. The bay is mentioned for the first time by Lacombe et al. (1958) in Pazi (2008) as an area where deep waters can be formedand ventilates the deeper layers of the north Aegean and especially the Lemnos Basin. It is roughly "V" shaped; its length is about 61 km, reaching a depth of 700 m. In most of the year, the bay is under the influence of northerly winds which cause upwelling over the area (Tokat and Sayın, 2007).As bottom trawl fishing Saroz Bay had been banned in Saros Bay since 2000, the bay can be considered as an unspoilt environment (Cengiz et al., 2013).

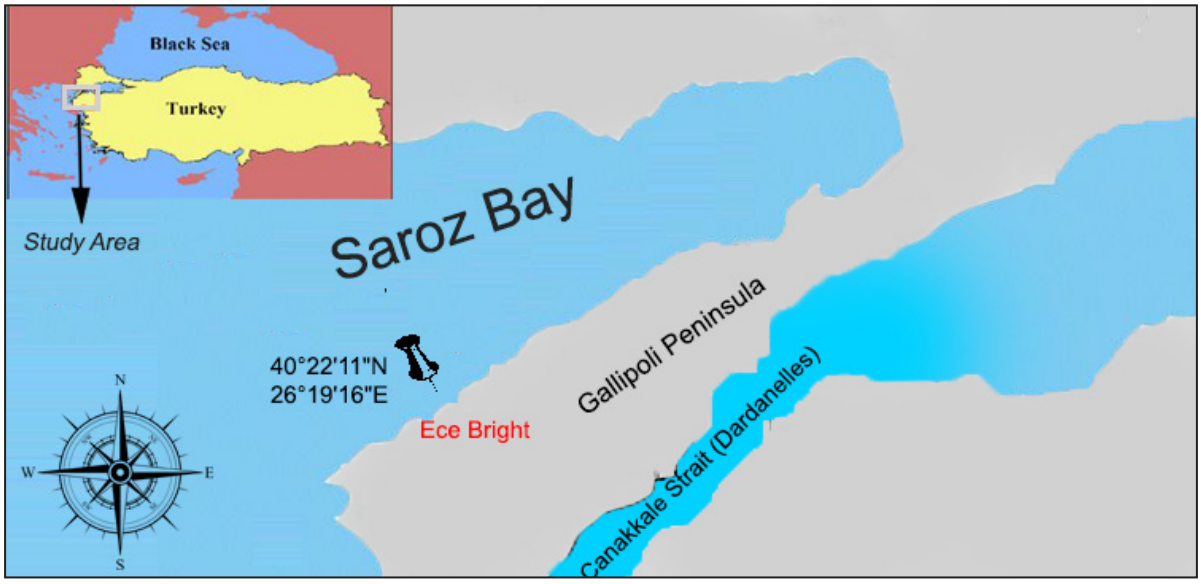


Figure 1. Map of Saros Bay (Zilifli, 2023)

Figure 2. A female *Balistes capriscus* in Saros Bay, March 14, 2020 © S. Tuncer

The sample was identified at species level according to FishBase (Harmelin-Vivien and Quéro, 1990).Measurements of the standard and total lengths (TL and SL), and total weight were carried out with a dial calliper of 0.05 mm accuracy and to the nearest 0.01 g. Sex was determined. After the meristicfeatures were counted as under a stereomicroscope having × 20 magnification, the material was photographed, dissected, fixed in 10% buffered formaldehyde, and then, subsequently preserved in 75% ethanol and stored in the collections of the Piri Reis Marine Museum, University of Çanakkale (PRM-PIS 2020-0084).

RESULTS AND DISCUSSION

Standard and total lengths of the specimen were measured as 46.54 cm and 59.23 cm **(Table 1)**.It is identified as *B. capriscus* on the following basis: with a small mouth and plate like scales, threefaint irregular broad dark bars on body; a narrow pale transverse band on chin; small light blue spotson upper half of body and median fins, and irregular short lines ventrally (Randall, 1996; Muus and ielsen, 1999) with a sexual dichromatism concerning the color of the upper side. This dichromatism is more pronounced during the reproduction period (Kacem et al., 2014).

Table 1. Morphometric (mm) and meristic data of *Balistes capriscus* specimen captured from Saros Bay on14th March, 2020. Morphometric measurements also given as proportions of total and head lengths.

Morphometric and meristic characters	Muus and Nielsen (1999)	Dulcic and Soldo (2005)*	Kacem et al. (2015)	Cengiz and Paruğ (2020)	Present study
Total length (LT)	-	525.0	-	36.4	59.23
Standard length (LS)	14 (72.9%LT)	400.0	-	-	46.54(78.57%LT)
Fork length (LF)		451.0	139-427	-	-
Preanal distance, (%LT)	45.5%LT	211.4	-	-	26(43.89%LT)
Predorsal distance (%LT)	24.0%LT	115.8	-	-	8.5(14.35% LT)
Prepectoral distance ((%LT)	26.9%LT	160	-	-	13(21.94% LT)
Prepelvic distance (%LT)	39.8%LT	151.6	-	-	19(32.07% LT)
Dorsal fin length		87.6-133.0	-	-	-
Anal fin length		110.5	-	-	-
Pectoral fin length		51.9	-	-	-
Body depth (%LT)	36.7%LT	41.2	-	-	22.00(37.14% LT)
Head length, (%L T)	26.6%LT	103.9	-	-	13.54(22.86% LT)
Snouth length (%LH)			-	-	7.61(56.20% LH)
Eye diameter (%LH)	21.9%LH	15.9	-	-	2.54 (18.75% LH)
Preorbital distance (%LH)	62.6%LH	90.4	-	-	8.46(62.48% LH)
Interorbital distance (%L H)		18	-	-	(% LH)
Dorsal fin rays	III+26-29	III+27	-	-	III+27
Anal fin rays	23-26	25	-	-	24
Pectoral fin rays	-	14	-	-	14
Weight (g.)	-	-	-	800	2600

*gives measurements in mm.

The additional finding of *B. capriscus* in Saros Bay represents northward expansions from the Atlantic Ocean and Mediterranean Sea towards northern Aegean Sea. The morphometric measurements and meristic counts **(Table 1)** were generally in harmony with the previous literature except for some findings by Muus and Nielsen (1999). The differences can be attributed to the

combination of one or more factors such as differences in the numbers of specimens examined and the size range of fish caught (Moutopoulos and Stergiou, 2002). Besides, these variations can be related the specific environmental conditions, such as temperature, salinity of seawater (Kacem et al.,2015).

Sexual dichromatism concerning the color of the upper side was already observed in *B. capriscus*, obtained from Saros Bay. According to Garnaud (1960), the male has more pronounced colour during the period of reproduction. Gerlotto and Stequert (1981) and Mackichan and Szedlmayer, (2007) reported that *B. capriscus* has a sexual dichromatism in which males and femaleswere different in skin colour at the sub-opercular

region. Furthermore, sexual dimorphism in the length and weight has also been observed for this species in the base of males significantly larger than females from Gulf of Gabes (Kacem et al., 2014). Neverthless, there is no an opportunity to compare female and male in this study.

Global climate change controls the geographical distribution of marine species or populations in the sea. Climate change and habitat disturbance by human activities can affect species distribution and resource dynamics in ecosystems (Vitousek et al., 1997; Dukes and Mooney 1999; Raitsos et al.,2010). In the Mediterranean Sea, climate warming leads species to drive their ranges north in the Northern Hemisphere (Parmesan et al., 1999; Walther et al., 2002). A lot of Mediterranean warm- water native fish species have now been pointed out the north of their original south geographical distribution and colder sectors of the basin has been reported (Azzurro et al., 2011). According to Azzurro (2008), the native thermophilic species appearing northern than the known range could serveas a good indicator to show the changes in seawater temperature and global heating. Changes in seawater temperature, salinity, and marine currents may also affect the reproductive physiology anddistribution ranges of fish and lead to drifting of larvae and juveniles, as well as the distribution andabundance of phytoplankton and zooplankton. Thus, the migration routes of fish species are related to changes in prey abundance and distribution (Papaconstantinou, 2014). These changes may affect to rise the occurrence of *B*. *capriscus* in the northern Aegean Sea

CONCLUSIONS AND RECOMMENDATIONS

Global heating of seas is an important factor that leads the reconstruction of the Mediterranean marinebiodiversity and a settlements of fish populations (Bianchi and Morri, 2004; Lejeusne et al., 2010). The distribution of Mediterranean fishes such as *B.capriscus* is generally revealed by casual observation of scattered individuals outside the species known geographical range. The spreading of *B.capriscus* known as Atlanto-Mediterranean species towards the north Aegean Sea which is mainlyaffected by the outflow of cold, less saline and highly nutrient- rich waters from coming the Black Sea can be attributed to global heating.

Gray triggerfish is important for fish biodiversity in the northern Aegean Sea. Even if *B. capriscus* has a commercial importance, consuming mostly fresh, smoked, and dried salted, nevertheless, it has been also recorded to cause ciguatera poisoning (Bravo et al., 2015). As *B*. *capriscus* is placed in the category of vulnerable species according to Liu et al. (2015) and IUCN Red List (2019), the decreasing population structure of the species should be managed and protected.

ACKNOWLEDGEMENTS

We would like to thank fisherman Zulfo Reis for providing the specimen from Saros Bay.

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