

# ANNALES



UDK 5

*Analí za istrske in mediteranske študije  
Annali di Studi istriani e mediterranei  
Annals for Istrian and Mediterranean Studies  
Series Historia Naturalis, 31, 2021, 1*



UDK 5

ISSN 1408-533X  
e-ISSN 2591-1783



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**Annali di Studi istriani e mediterranei**  
**Annals for Istrian and Mediterranean Studies**

**Series Historia Naturalis, 31, 2021, 1**

KOPER 2021

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**Izdajatelja/Editori/Published by:**Zgodovinsko društvo za južno Primorsko - Koper / Società storica del Litorale - Capodistria<sup>®</sup>Inštitut IRRIS za raziskave, razvoj in strategije družbe, kulture in okolja / Institute IRRIS for Research, Development and Strategies of Society, Culture and Environment / Istituto IRRIS di ricerca, sviluppo e strategie della società, cultura e ambiente<sup>®</sup>**Sedež uredništva/Sede della redazione/  
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**e-mail:** annales@mbss.org, **internet:** [www.zdjp.si](http://www.zdjp.si)

Redakcija te številke je bila zaključena 30. 06. 2021.

**Sofinancirajo/Supporto finanziario/  
Financially supported by:**

Javna agencija za raziskovalno dejavnost Republike Slovenije (ARRS), Luka Koper in Mestna občina Koper

Annales - Series Historia Naturalis izhaja dvakrat letno.

**Naklada/Tiratura/Circulation:** 300 izvodov/copie/copies

Revija Annales, Series Historia Naturalis je vključena v naslednje podatkovne baze / La rivista Annales, series Historia Naturalis è inserita nei seguenti data base / Articles appearing in this journal are abstracted and indexed in: BIOSIS-Zoological Record (UK); Aquatic Sciences and Fisheries Abstracts (ASFA); Elsevier B.V.: SCOPUS (NL); Directory of Open Access Journals (DOAJ).

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received: 2021-02-06

DOI 10.19233/ASHN.2021.12

## UNCOMMON THERMOPHILIC FISHES FROM THE MARMARA AND BLACK SEAS

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### ABSTRACT

The paper discusses the occurrences of three fish species in previously unrecorded localities in Turkey. *Centrolophus niger* (Gmelin, 1789) is a new addition to the fauna of the Sea of Marmara, while *Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817) and *Coryphaena hippurus* Linnaeus, 1758 are recorded for the first time in the Black Sea ecosystem. The range expansion of these taxa is most likely facilitated by increased seawater temperatures in the region.

**Key words:** *Centrolophus niger*, *Alectis alexandrina*, *Coryphaena hippurus*, Sea of Marmara, Black Sea

## PESCI TERMOFILI NON COMUNI DEL MAR DI MARMARA E DEL MAR NERO

### SINTESI

Nell'articolo vengono presentate nuove segnalazioni di tre specie di pesci in località della Turchia dove precedentemente non erano state ritrovate. *Centrolophus niger* (Gmelin, 1789) è una nuova aggiunta alla fauna del Mar di Marmara, mentre *Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817) e *Coryphaena hippurus* Linnaeus, 1758 vengono ritrovati per la prima volta nell'ecosistema del Mar Nero. L'espansione dell'areale di questi taxa è molto probabilmente facilitata dall'innalzamento della temperatura dell'acqua marina nella regione.

**Parole chiave:** *Centrolophus niger*, *Alectis alexandrina*, *Coryphaena hippurus*, Mar di Marmara, Mar Nero

## INTRODUCTION

Several thermophilic fish species native to subtropical or tropical environments are extending their biogeographical ranges to northern sectors of the Mediterranean Sea, primarily as a result of seawater warming (Francour *et al.*, 1994; Azzurro, 2008; Azzurro *et al.*, 2011; Bianchi *et al.*, 2017). This phenomenon has also been observed along the Turkish coastline, especially in the Marmara and Black Seas, where rapid change in fish fauna has been observed during the past decade. The mean surface water temperature of both seas, which was 15.1 °C during the 1970–1979 period, experienced a significant increase to 16.3 °C and 16.6 °C in the Black Sea and the Sea of Marmara, respectively, during the 2010–2019 period (TSMS, 2021). The change of hydrographical conditions of these two unique semi-enclosed seas is manifest in the influx to the region of an increasing number of non-native fish with warm water affinities. For example, *Trachinotus ovatus* (Linnaeus, 1758) has recently penetrated as far as the Strait of Istanbul, the entrance to the Black Sea, with possible indications of population establishment (Bilecenoglu & Öztürk, 2019). Likewise, occurrences of typical Mediterranean taxa, such as *Mustelus asterias* Cloquet, 1819 and *Serranus hepatus* (Linnaeus, 1758) in the Black Sea (Eryılmaz *et al.*, 2011; Dalgiç *et al.*, 2013), and *Dasyatis tortonesei* Capapé, 1975 and *Aetomylaeus bovinus* (Geoffroy Saint-Hilaire, 1817) in the Sea of Marmara (Yıldız *et al.*, 2016; Bilecenoglu, 2019) can be interpreted as a consequence of global warming.

In this paper, we are presenting new information on the distribution range expansion of three thermophilic fish species: *Centrolophus niger* (Gmelin, 1789), which was recorded for the first time in the Sea of Marmara, and *Alectis alexandrina* (Geoffroy Saint-Hilaire, 1817) and *Coryphaena hippurus* Linnaeus, 1758, which are new to Black Sea fauna.

## MATERIAL AND METHODS

On 15 November 2020, a single specimen of *C. niger* measuring 79 cm in total length and weighing 6880 g was captured by trammel net off Hamzaköy (Çanakkale, Sea of Marmara, Fig. 1), at a depth of 2 m. Owing to the uncommon occurrence of this species, the fishermen immediately informed the local fisheries authorities (second author) and provided several photographs of the captured individual.

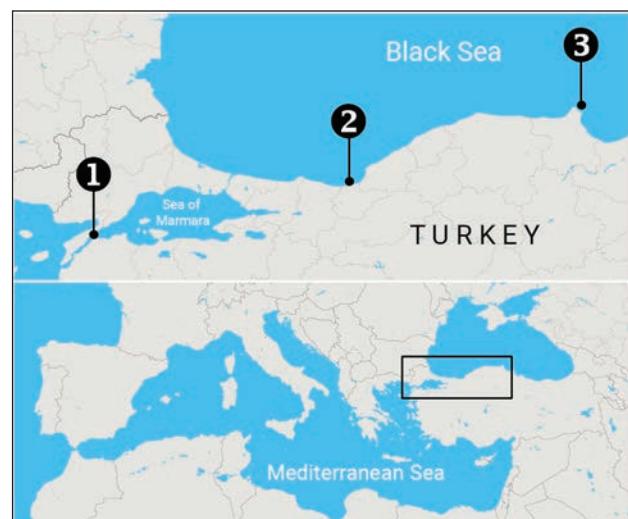
During regular screening of online Turkish newspapers for any uncommon marine fish reports, an occurrence of a large-sized *A. alexandrina* (8400 g in weight) captured from Sinop coasts (central Black Sea, Fig. 1) was unexpectedly encountered.

The news appeared on 17 November 2020 in several local and national newspapers, and is worth including herein due to its taxonomical importance. The length of the fish was not mentioned, but the associated photograph indicated a total length of at least 80 cm.

On 3 January 2021, a skin diver captured a single individual of *C. hippurus* of an approximate total length of 50 cm, using a speargun at a depth of 10 m, in the Akçakoca coast of Zonguldak (western Black Sea, Fig. 1). The diver shared the photographs of the fish on the social media (Facebook) and later forwarded them to the first author for taxonomic identification.

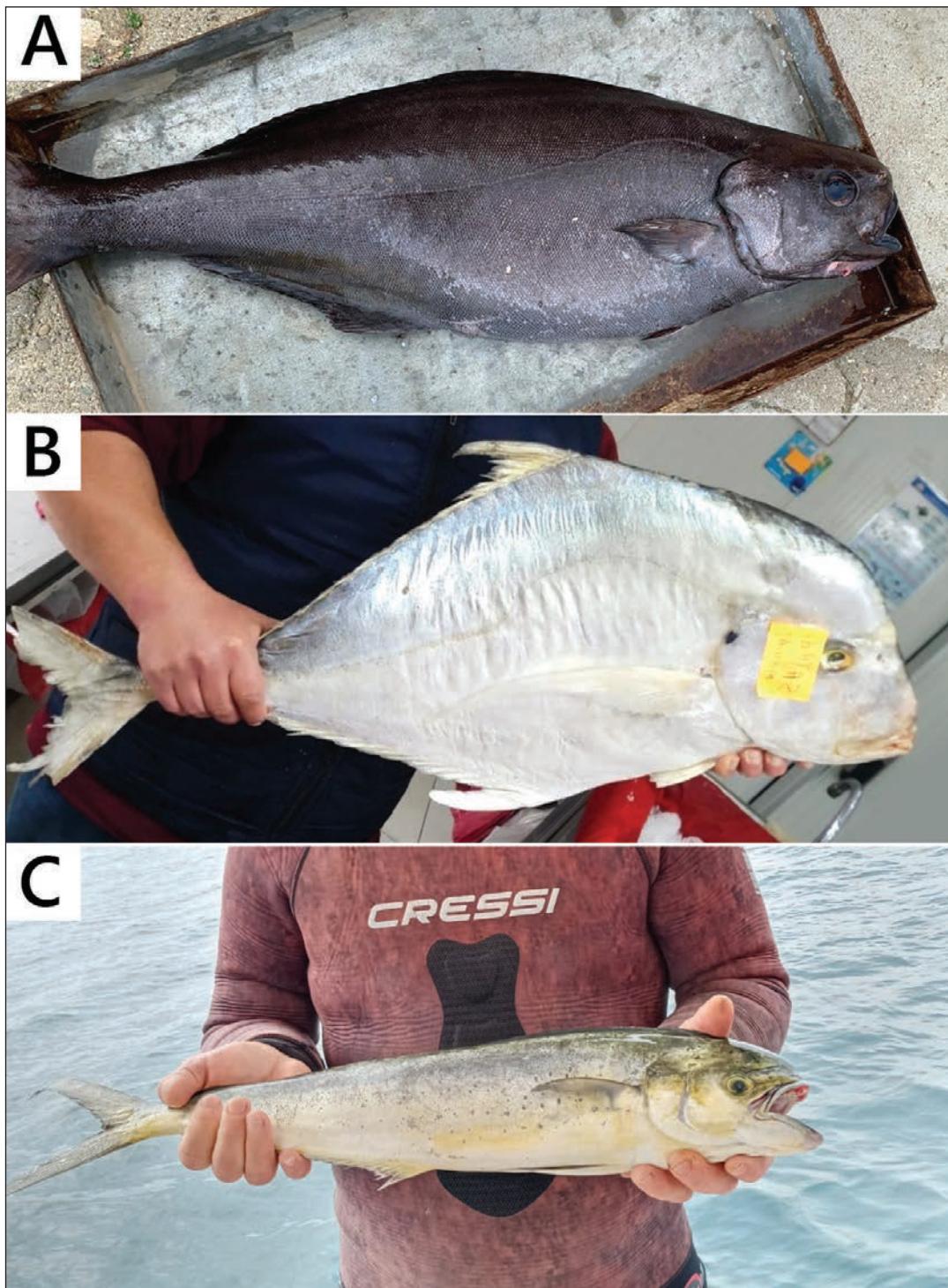
## RESULTS AND DISCUSSION

Based on the combination of characters including elongate body, large mouth, single dorsal fin (originating slightly behind the end of pectoral fin), very small scales, anteriorly arched lateral line, and uniformly dark brown body color, the Marmara specimen of *C. niger* was positively identified from the photograph (Fig. 2A), matching the description by Haedrich (1986). Previously regarded as rare in the Mediterranean Sea, based on several records from distant localities in recent years, *C. niger* has proved to be more common and widespread, and the increasing number of observations of the species is likely related to climate change (Capapé *et al.*, 2017). Adults of the species tend



**Fig. 1:** Capture and observation localities of *Centrolophus niger* (1), *Coryphaena hippurus* (2) and *Alectis alexandrina* (3) along the Turkish coast.

**Sl. 1:** Lokalitete, kjer so bile ujete ali opažene vrste *Centrolophus niger* (1), *Coryphaena hippurus* (2) in *Alectis alexandrina* (3) vzdolž turških obal.



*Fig. 2: A) The *Centrolophus niger* individual captured from Gelibolu coast, Sea of Marmara (photograph courtesy of C. Konur); B) *Alectis alexandrina* from Sinop, central Black Sea (source: <https://www.haberler.com/sinop-ta-yakalanan-dev-iskender-baligi-gorenleri-13741950-haberi/>), C) *Coryphaena hippurus* spearfished from the Akçakoca shore in the western Black Sea (photograph courtesy of V. Erdogan).*

*Sl. 2: A) Primerek črnuha, *Centrolophus niger*, iz obale pri Gelibili, Marmarsko morje (Foto: C. Konur); B) primerek vrste *Alectis alexandrina* iz Sinop, osrednje Črno morje (vir: <https://www.haberler.com/sinop-ta-yakalanan-dev-iskender-baligi-gorenleri-13741950-haberi/>), C) primerek delfinke, *Coryphaena hippurus*, ulovljen s podvodno puško na obali Akçakoca v zahodnem Črnem morju (Foto: V. Erdogan).*

to inhabit deep waters (Haedrich, 1986), however, our recent finding is from a very shallow shore (2 m) in the Gelibolu coast, where maximum depths do not exceed 70 m. The hydrography of the Strait of Çanakkale is governed by a two-layered flow system, i.e., a surface layer flowing from the Black Sea towards the Aegean Sea, and a bottom layer comprising Mediterranean waters flowing towards the Black Sea (Beşiktepe *et al.*, 1994). The most plausible explanation would thus be that the species has penetrated the Strait of Çanakkale from the Aegean Sea through the bottom flow layer and was incidentally captured at the southwestern margin of the Sea of Marmara.

Monitoring the distribution of marine taxa through data obtained from online newspapers is a quite new low-cost and non-destructive approach, which has proved to be efficient in providing valuable information, including existence of previously unknown species and/or significant range expansions (Kabasakal & Bilecenoglu, 2020). The occurrence data of an adult individual of *A. alexandrina* in the central Black Sea coast (Fig. 2B) are also provided accordingly. This thermophilic carangid is prevalent along the entire northern Levant shores extending as far as Gökova Bay in the southern Aegean coast of Turkey, but prior to this occurrence there were no observations in relation to the species from the northern Aegean or Marmara or Black Seas (Bilecenoglu *et al.*, 2014). This recent occurrence in the Sinop coast, at least 900 nautical miles away from Gökova Bay, is therefore surprisingly interesting.

The unique coloration and, even more so, the body shape of *C. hippurus* captured from the western Black Sea were instrumental in the identification of the species based on the photograph (Fig. 2C), and its distinction from the congeneric *C. equiselis*, as the body depth equaled less than 25% of standard length in adults, and the pectoral fin represented

over a half of the length of the head (Collette, 1986; Froese & Pauly, 2019). The epipelagic *C. hippurus* is distributed worldwide in tropical and subtropical seas, including the Mediterranean Sea (Collette, 1986). Naturally occurring in the Levant and Aegean Sea shores of Turkey (Bilecenoglu *et al.*, 2014), the species has penetrated into the western part of the Sea of Marmara over the past decade (Artüz & Kubanç, 2015). Since the species displays a highly migratory behavior (Froese & Pauly, 2019), its influx into the Black Sea via the Strait of Istanbul is a reasonable explanation.

The Marmara and Black Seas have quite similar ichthyofaunas (56% similarity based on presence vs. absence of species, Bilecenoglu *et al.*, 2002), which is to be expected considering that they evolved together during the same geological eras. The increasing number of thermophilic fish recorded from the region should be considered a serious threat that might lead to an undeterred biological homogenization, commonly known as “Mediterraneization” (Boltachev & Karpova, 2014). Fish species near the limits of their thermal distribution are obvious candidates for range shifts given the rising temperatures (Campana *et al.*, 2020), so we may assume that several other species have the potential to advance towards the colder sectors of the Mediterranean Basin. The monitoring of the distribution patterns of native fish taxa can therefore provide valuable bioecological information, which should be collected using all novel methodological means (i.e., citizen science, social media, print/online media, etc.) in addition to traditional methods.

#### ACKNOWLEDGEMENTS

The authors would like to thank to the local fishermen Cengiz Konur and Veli Erdogan for providing data and photographs of *Centrolophus niger* and *Coryphaena hippurus*, respectively.

## NENAVADNE TOPLOLJUBNE RIBE IZ MARMARSKEGA IN ČRNEGA MORJA

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### *POVZETEK*

*Avtorji poročajo o novih pojavih treh vrst rib iz lokalitet, na katerih doslej še niso bile potrjene v Turčiji. Centrolophus niger (Gmelin, 1789) je nova vrsta v favni Marmarskega morja, medtem, ko sta bili vrsti Alectis alexandrina (Geoffroy Saint-Hilaire, 1817) in Coryphaena hippurus Linnaeus, 1758 prvič potrjeni v ekosistemu Črnega morja. Širjenje areala teh vrst je najverjetneje povezano z višjimi temperaturami vode v regiji.*

**Ključne besede:** *Centrolophus niger, Alectis alexandrina, Coryphaena hippurus, Marmarsko morje, Črno morje*

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