ANNALES

Anali za istrske in mediteranske študije
Annali di Studi istriani e mediterranei
Annals for Istrian and Mediterranean Studies
Series Historia Naturalis, 33, 2023, 1

UDK 5 Annales, Ser. hist. nat., 33, 2023, 1, pp. 1-142, Koper 2023 ISSN1408-533X

UDK 5

ISSN 1408-533X
e-ISSN 2591-1783

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KOPER 2023

ISSN 1408-533X
e-ISSN 2591-1783

UDK 5

Letnik 33, leto 2023, številka 1

Tisk/*Stampa/Print:* Založništvo PADRE d.o.o.

Izdajatelja/*Editori/Published by:* Zgodovinsko društvo za južno Primorsko - Koper / *Società storica del Litorale - Capodistria*©
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*©

Sedež uredništva/*Sede della redazione/*
Address of Editorial Board: Nacionalni inštitut za biologijo, Morska biološka postaja Piran / *Istituto nazionale di biologia, Stazione di biologia marina di Pirano / National Institute of Biology, Marine Biology Station Piran*
SI-6330 Piran /*Pirano*, Fornače/*Fornace* 41, tel.: +386 5 671 2900, fax +386 5 671 2901;
e-mail: annales@mbss.org, ***internet:*** www.zdjp.si

Redakcija te številke je bila zaključena 23. 06. 2023.

Sofinancirajo/*Supporto finanziario/*
Financially supported by: Javna agencija za raziskovalno dejavnost Republike Slovenije (ARRS) 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).

ANNALES · Ser. hist. nat. · 33 · 2023 · 1

Anali za istrske in mediteranske študije - Annali di Studi istriani e mediterranei - Annals for Istrian and Mediterranean Studies

UDK 5 Letnik 33, Koper 2023, številka 1 ISSN 1408-53 3X
e-ISSN 2591-1783

VSEBINA / *INDICE GENERALE / CONTENTS 2023(1)*

received: 2023-03-18 DOI 10.19233/ASHN.2023.09

FIRST RECORD OF *CARANX CRYSOS* (MITCHILL, 1815) IN THE LIGURIAN SEA (NORTHWESTERN MEDITERRANEAN SEA) SUGGESTS NORTHWARD EXPANSION OF THE SPECIES

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ABSTRACT

Four specimens of Caranx crysos *(blue runner) were spotted on 15th October 2022 in the waters of Ospedaletti (province of Imperia, Italy). This record is the first documented sighting of the species in the Ligurian Sea, and the northernmost in the western Mediterranean. Therefore, it could indicate a further expansion northwards of the species, with subsequent possible impacts on ecosystems, fishing and related commercial activities.*

Key words: *Caranx crysos*, Mediterranean, thermophilic species, Ligurian Sea, global warming

LA PRIMA SEGNALAZIONE DI *CARANX CRYSOS* (MITCHILL, 1815) NEL MAR LIGURE (MEDITERRANEO NORD-OCCIDENTALE) SUGGERISCE UN'ESPANSIONE VERSO NORD DELLA SPECIE

SINTESI

Quattro esemplari di Caranx crysos *(carango mediterraneo) sono stati avvistati il 15 ottobre 2022 nelle acque di Ospedaletti (provincia di Imperia, Italia). Questo ritrovamento è il primo avvistamento documentato della specie nel mar Ligure e il più settentrionale nel Mediterraneo occidentale. Potrebbe quindi indicare un'ulteriore espansione della specie verso nord, con conseguenti possibili impatti sugli ecosistemi, sulla pesca e sulle relative attività commerciali.*

Parole chiave: *Caranx crysos*, Mediterraneo, specie termofila, mar Ligure, riscaldamento globale

INTRODUCTION

Caranx crysos (Mitchill 1815), commonly called blue runner, is an Atlanto-Mediterranean fish belonging to the Carangidae family, which includes nearly 150 recognized species (Froese & Pauly 2022). In the western Atlantic, this species is reported from Argentine to Canada (Delpiani *et al.*, 2011; Devine & Fisher 2014), while in the eastern Atlantic, it is distributed from Angolan to British waters (Swaby *et al.*, 1996). However, in the last decades, this species has expanded its distribution along both the western and eastern Atlantic coasts (MacKay & Gethin 1969; Swaby *et al.*, 1996; Delpiani *et al.*, 2011; Devine & Fisher 2014). Similarly, this expansion process has been reported in Mediterranean waters (Psomadakis *et al.*, 2011; Raya & Sabatés, 2015; Tiralongo *et al.*, 2020). In particular, like other carangid species (*e.g.* Coco *et al.*, 2022), the blue runner is a perfect indicator of the so-called "meridionalization" of the Mediterranean Sea. This process involves the expansion, specifically a northward migration, of thermophilic native species whose original ranges were once confined to Atlantic waters or to the southern parts of the Mediterranean basin (Templado, 2014).

Caranx crysos has been reported almost all over the Mediterranean: the species is well established in the southeastern sector of the basin; it is also reported in Aegean and Peloponnese waters, at least in some areas (Psomadakis *et al.*, 2011). In the northern and western basin, *C. crysos* reached the Catalan coast (Raya & Sabatés, 2015), and the coasts of most southern Italian regions (Tiralongo *et al.*, 2020). Finally, even in the Adriatic Sea its distribution has been expanding in the last years (Pavičić *et al.*, 2014; Nerlović *et al.*, 2015; Iveša *et al.*, 2021).

The blue runner is an opportunistic predator which primarily feeds on pelagic preys; its diet mainly includes other teleosts and crustaceans (Sley *et al.*, 2009). Besides the ecological impacts that the expansion of this species may imply, the remarkable size it can reach (up to 70 cm, Froese & Pauly 2022) makes *C. crysos* a targeted species by both professional fishermen and amateurs (Tiralongo *et al.*, 2020; Escamilla-Pérez *et al.*, 2021). Moreover, this fish has a good growth performance which makes him even a considerable resource for aquaculture activities (Rombenso *et al.*, 2014). Therefore, predicting how its distribution may change in the next future may allow us to understand how fishing habits and trade of fish products will change as well.

Here we report the first documented record of the species in the Ligurian Sea, in Ospedaletti (Imperia). In fact, previous records of the species from Nice and Genoa were considered unreliable, as based only on questionable museological material that lacked information (Psomadakis *et al.*, 2011). Our record is thus the northernmost in the western Mediterranean, as reports further north in the basin only come from the high Adriatic (Dulčić *et al.*, 2009).

MATERIAL AND METHODS

This observation was collected during the Alien-Fish project campaign (Tiralongo *et al.*, 2019). On 15th October 2022, four specimens of *C. crysos* were spotted swimming together at a depth of 4 m (fish were 1 meter below the surface) by an Alien-Fish collaborator (PC) in the waters of Ospedaletti (43.79732 N, 7.72672 E; province of Imperia, Ligurian Sea, Fig. 1), during a spearfishing hunt. The spearfisherman didn't immediately recognize the species, as he had never encountered it before; in fact, he initially misidentified them as 4 specimens of the common dolphinfish (*Coryphaena hippurus*). After shooting one of them, he recognized the exact species; in fact, he stated that he had previously watched online spearfishing videos with this fish being caught.

RESULTS

The specimen caught (Fig. 2) was weighed once eviscerated, and had a weight of 800 g. The fisher reported that the four specimens observed appeared to be the same size. After showing the specimen to all his local spearfishermen acquaintances, he reports that none of them had ever encountered the species before.

Fig. 1: The red spot indicates the location of the record of** Caranx crysos **in the Ligurian Sea.
Sl. 1: Rdeča pika kaže lokaliteto, kjer so bili opaženi primerki vrste** Caranx crysos **v Ligurskem morju.

Fig. 2: The captured specimen of** C. crysos **indicated by a red arrow.
Sl. 2: Ujeti primerek vrste** C. crysos**, označen z rdečo puščico.

DISCUSSION

The recent expansion of *C. crysos* and other thermophilic Carangidae species along the Mediterranean coasts is well documented (Psomadakis *et al.*, 2011; Raya & Sabatés, 2015; Tiralongo *et al.*, 2018, 2020). The blue runner presence has now been reported in almost all the basin's waters (Psomadakis *et al.*, 2011; Pavičić *et al.*, 2014; Nerlović *et al.*, 2015; Raya & Sabatés, 2015; Iveša *et al.*, 2021), and a further range expansion and population increase in the near future are very likely. In fact, Mediterranean seawater temperatures are constantly rising, and the Ligurian Sea is one of the most sensitive areas to the increase in sea surface temperature (Pastor *et al.*, 2020). In this context, *C. crysos* spawns in the warmer months of the year, and its distribution is strictly related to water temperature (Raya & Sabatés, 2015). Therefore, future climatic conditions will be in favour of *C. crysos*, and the 4 specimens we are hereby reporting could be the first of a long list for this species, even in Ligurian waters.

Unfortunately, it was not possible to obtain the captured specimen, and it was therefore impossible to conduct morphological or genetic analyses to trace its geographical provenance. It is thus difficult to venture whether the origin of these 4 specimens should be Tyrrhenian (*i.e.* coming from central/southern Italy) or western (coming from France). In fact, the northernmost Tyrrhenian record of the species is from Civitavecchia and dates back to 2007 (Psomadakis *et al.*, 2011); on the other side, this fish's larvae were recorded along the Catalan coast

Fig. 3: Specimens of** C. crysos **and** C. rhonchus **sold in Sicily (Avola, Ionian Sea) on 4th March 2019. Photo credit: Francesco Tiralongo.
Sl. 3: Primerki modrega** C. crysos **in rumenega trnoboka** C. rhonchus**, ki so bili 4. marca 2019 naprodaj v Siciliji (Avola, Jonsko morje). Foto: Francesco Tiralongo.

in 2003 and 2004 (Raya & Sabatés, 2015). The recent expansion of the blue runner in Mediterranean and Atlantic waters suggests that the species may have already colonized both the north Tyrrhenian and French Mediterranean coasts in the last years. However, a general dearth of data may have prevented us from tracing its progressive expansion in these areas.

However, it must be underlined that nearly all the data on this species we collected in the AlienFish campaign are referred to the southern Italian regions, and our other northernmost record comes from San Felice Circeo, in Latina province.

The expansion of alien and thermophilic species in the Mediterranean Sea has often been considered an opportunity to increase the provision of food for human consumption (Tsirintanis *et al*., 2022; Coco *et al*., 2022). For example, Coco *et al*. (2022) proposed that the recent expansion of the congener *C. rhonchus* in the Mediterranean Sea could represent a commercially valuable resource, with subsequent benefits for humans and the environment, as it could both increase food provision and reduce fishing pressures on other species. Similarly, in Mediterranean, *C. crysos* will probably achieve further fishing and economic attention as well, even in areas where the species is currently still considered absent or rare. In fact, in Sicily, both species (*C. crysos* and C. rhonchus) now appear frequently in fish markets (Fig. 3). On the other hand, competition for food resources with some ecologically similar species (*e.g. Seriola* spp., *Caranx* spp.) could reshape the structure of fish community and ecosystems in general.

Finally, we also underline the importance of citizen science-based monitoring for the early detection of species of interest in new areas. The project AlienFish was launched in 2012 by Ente Fauna Marina Mediterranea, with the aim to monitor rare, thermophilic, and non-indigenous fish species along Italian coasts. Today, this initiative involves more than thirty researchers from all over Italy. The approach adopted to collect data is mainly citizen-science based, as it implies the involvement of both Social Networks and direct surveys in strategic areas such as fishing ports and landing points. The new record provided here was obtained thanks to a survey conducted within this project by one of the authors (AN).

ACKNOWLEDGEMENTS

We would like to thank our collaborator, Pino C., for his time and help. We would also like to thank Antonio Oscar Lillo for his help with the map design.

PRVI ZAPIS O POJAVLJANJU MODREGA TRNOBOKA *CARANX CRYSOS* (MITCHILL, 1815) V LIGURSKEM MORJU (SEVEROZAHODNO SREDOZEMSKO MORJE) DOKAZUJE ŠIRJENJE VRSTE PROTI SEVERU

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POVZETEK

Petnajstega oktobra 2022 so v vodah blizu lokalitete Ospedaletti (provinca Imperia, Italija) opazili štiri primerke modrega trnoboka Caranx crysos. *Ta zapis je prvo dokumentirano opazovanje vrste v Ligurskem morju in v najsevernejšem delu zahodnega Sredozemskega morja. Obenem nakazuje, da gre za nadaljnje širjenje areala te vrste proti severu, ki bi lahko imelo možen vpliv na ekosistem, ribištvo in sorodne gospodarske aktivnosti.*

Ključne besede: *Caranx crysos*, Sredozemsko morje, termofilne vrste, Ligursko morje, globalno segrevanje

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