

# Occurrences of juvenile *Fistularia commersonii* along the Montenegrin coast (southeastern Adriatic Sea)

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## ABSTRACT

Invasive species represent one of the greatest threats to marine ecosystems and organized management and monitoring of records are needed to effectively address their impacts. This research presents new records of the juvenile bluespotted cornetfish (*Fistularia commersonii*) from the Adriatic Sea, which are also the first from the waters of Montenegro. Three of such individuals were recorded during the monitoring of commercial trawling in the country, during two separated fishing activities. Although this species remains rare in local catches, these occurrences are further supporting the hypothesis that an established population of this species is present in the southern Adriatic Sea.

**Keywords:** invasive species, bluespotted cornetfish, Lessepsian migration, Montenegro, Adriatic Sea

## INTRODUCTION

Marine biological invasions pose one of the greatest challenges in marine conservation science nowadays. Facilitated both by human activities and climate change, many non-native species (NNS) have found their way to the Mediterranean Sea, with over 700 of them being established in this region (Zenetos *et al.*, 2022). The highest numbers of NNS are observed in the waters of Eastern Mediterranean countries, while their numbers generally decrease by moving towards the Western Mediterranean and the Adriatic Sea (Galanidi *et al.*, 2023). Although NNS are introduced in the Mediterranean Sea by various human activities (e.g., aquaculture or

marine traffic), the highest impact of this kind comes from so-called Lessepsian migration through the Suez Canal (Galil, 2023).

The Adriatic Sea represents a semi-enclosed basin and the northernmost part of the Mediterranean Sea. A recent comprehensive study for the Eastern Adriatic region suggests a higher risk of invasiveness of NNS in this area in the future, compared to the current climate conditions (Glamuzina *et al.*, 2023). Montenegro is occupying the southeastern part of the Adriatic coastline, where several non-native fish species are known (Pešić *et al.*, 2021; Tomanić *et al.*, 2022), with some recently observed (Fortič *et al.*, 2023).

The bluespotted cornetfish (*Fistularia commersonii*) is native to the Indo-Pacific region, as well as the Red Sea. It expresses predatory behaviour, feeds mainly on fish and spend its life either as a solitary individual or in small groups (Castriota *et al.*, 2014). The first Mediterranean record of this species came from Israel in 2000 (Golani, 2000), while the first Adriatic records date from 2006, from Italy and Croatia (Dulčić *et al.*, 2007; Dulčić & Dragičević, 2023). In Montenegro, it has been observed in December 2007 for the first time (Joksimović *et al.*, 2009), and only a few more records have been documented in the country since then. This Lessepsian migrant has spread along the coastlines of many Mediterranean countries since its first observation in this basin. In the Adriatic Sea, the first juveniles were observed in Molunat Bay (Croatia) which suggested an existence of self-sustaining population in the southern Adriatic Sea (Dulčić *et al.*, 2012). Three new records of juvenile individuals of this species are reported in this study, recently observed in catches of Montenegrin trawlers.

## MATERIALS AND METHODS

Three juvenile individuals of *F. commersonii* were found in the two trawling hauls, firstly on 20.12.2023 (two individuals) and then again, a single individual on 04.04.2024. Both trawlers were operating in front of the port of Bar (Montenegro), at a depth range of 70-100 meters, and on a muddy to sandy bottom. All three individuals were brought to the Laboratory of ichthyology and marine fisheries in the Institute of Marine Biology in Kotor (Montenegro). Some morphometric measurements, including total length (TL) and standard length (SL) were taken, as well as the total weight (TW). As the best practice suggests preserving of such

records (Bello *et al.*, 2014), these specimens were deposited in 96% ethanol and are kept secure in the Institute of Marine Biology collection.

## RESULTS AND DISCUSSION

The three recorded individuals (Fig. 1) were described as juveniles as their total length was below the length at first maturity for this species in the Mediterranean (Bariche & Kajajian, 2012), and no developed gonads were found. All taken morphometric measures are given below (Tab. 1). The individuals mostly expressed greenish-brown coloration, while some parts of their bodies had orange shades. They also had blunt spines along the posterior lateral line ossifications, and therefore the species was distinguished from its congeneric *F. petimba* (Stern *et al.*, 2017; Dragičević *et al.*, 2019), which was recently observed in the Adriatic for the first time (Langeneck *et al.*, 2023).

As noted before, individuals were checked for the shape of the spines along the posterior lateral line ossifications in order to eliminate possibility that they belong to *F. petimba*, which has not been recorded in Montenegro yet (Fig. 2). *F. commersonii* has managed to spread across the entire Mediterranean within a single decade and therefore earned a nickname Lessepsian sprinter (Karachle *et al.*, 2004; Stern *et al.*, 2017). Earlier records of juveniles of this species from the nearby Croatian waters suggested an existence of a self-sustaining population in the area (Dulčić *et al.*, 2012; Dulčić *et al.*, 2014).

Although its first recorded occurrence in the waters of Montenegro was almost two decades ago (Joksimović *et al.*, 2009), it is still rarely observed in local catches and it remains unknown whether it has an established population in the country's waters or not.

However, the records presented here are going in favour of its existence as suggested by Dulčić *et al.* (2012). On the other hand, if a continuous self-sustaining population exists, it would be expected that the species has a more regular appearance. The Adriatic Sea is a part of a wider sea system and there is peculiar circulation regimes which influence it (Civitarese *et al.*, 2023), so this might also be a reason why this species is present in some years and disappears in others.

Low temperature of seawater during winter is considered a significant obstacle for thermophilic species to establish their population in the Adriatic Sea (Dulčić *et al.*, 2014), and this possibly contributes to the fact that *F. commersonii* is still relatively rare in Montenegro. On the other hand, current climate change models predict changes in

precipitation regime and rising of the sea surface temperature in the upcoming decades, which could lead to higher abundance of this species in the area. *F. commersonii* is a predatory species known to feed on a variety of small bony fish species, including some commercially very important in the Adriatic Sea, such as bogue (*Boops boops*), red mullets (*Mullus* sp.), and anchovy (*Engraulis encrasicolus*), so it can have negative consequences on the local populations of these fish (Kalogirou *et al.*, 2007; Castriota *et al.*, 2014). In the recent study conducted in the Eastern Adriatic area in order to determine the risk of invasiveness of several marine species, *F. commersonii* was ranked as a high-risk species, based on the results obtained from the used risk-screening tools (Glamuzina *et al.*, 2023).



Figure 1. The three juvenile individuals of *F. commersonii* recorded in Montenegro (numbers correspond to those in the Table 1).

Table 1. Some morphometric measurements and total weight of the three juvenile individuals of *F. commersonii*. \*Tail filament of the first individual was damaged, as well as a part of its body which could possibly affect other measurements.

Measurements (in mm)	Individual 1 (20.12.2023)	Individual 2 (20.12.2023)	Individual 3 (04.04.2024)
Total length (including the tail filament)	277*	349	423
Total length (excluding the tail filament)	265	263	293
Standard length	249	254	284
Preanal length	204	202	233
Predorsal length	210	213	234
Prepectoral length	103	105	115
Head length	98	100	112
Preorbital length	78	80	97
Eye diameter	7	7	9
Post orbital length	14	15	16
Total weight (g)	6.15	6.55	8.57

Although it is likely impossible to completely eradicate this invasive species from the Adriatic ecosystem which it has colonized, control of its population can potentially be done either through human consumption or its use in other purposes. This species contributes to fishery income in the eastern Mediterranean, but its price is found to be low (Kleitou *et al.*, 2022). Since its abundance in Montenegro remains very low, and it still represents an unusual catch, it is always discarded.



Figure 2. Blunt spines along the posterior lateral line ossifications as a distinctive characteristic of *F. commersonii*

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## Pojave juvenilnih jedinki *Fistularia commersonii* duž crnogorskog primorja (jugoistočni Jadran)

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### SAŽETAK

Invazivne vrste predstavljaju jednu od najvećih prijetnji morskim ekosistemima, pa je potrebno organizovano praćenje pojava i upravljanje ovim vrstama, kako bi se efektivno odgovorilo na njihov uticaj. Ovaj rad prikazuje nove nalaze juvenilnih jedinki ribe trube (*Fistularia commersonii*) u Jadranskom moru, koji su istovremeno i prvi iz voda Crne Gore. Tri ovakve jedinke su zabilježene tokom monitoringa kočarskog ribolova u ovoj zemlji, tokom dvije odvojene ribolovne aktivnosti. Iako je ova vrsta i dalje rijetka u lokalnim ulovima, ovi nalazi idu u korist hipoteze da je njena populacija uspostavljena u južnom Jadranu.

**Ključne riječi:** invazivne vrste, riba truba, Lesepsijska migracija, Crna Gora, Jadransko more