

An additional record of the non-indigenous species (NIS) *Seriola fasciata* from the southern coast of Sicily (Central Mediterranean Sea)

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*An additional record of the non-indigenous species (NIS) *Seriola fasciata* from the southern coast of Sicily (Central Mediterranean Sea) is here described in this note.*

*The catch record is the first in the area and confirms the key role of the area for NIS spreading. In addition, an updated map of its spatial distribution is provided as well as a discussion on the possible misidentification and competition with the native greater amberjack *Seriola dumerili*.*

Key words: Herculean species, non-indigenous species, biodiversity, spatial distribution, Strait of Sicily

INTRODUCTION

The biodiversity of the Mediterranean Sea has changed considerably over the past two decades, mainly due to the increasing occurrence of non-indigenous species (NIS) introduced both naturally (i.e. via Suez Canal and the Strait of Gibraltar) and due to anthropic activities, such as marine shipping (ballast waters, fouling) and aquaculture (GALIL *et al.*, 2017). NIS are classified as lessepsian species, if migrate from the Red Sea to the eastern Mediterranean Sea across the Suez Canal, or herculean, if a species naturally via Strait of Gibraltar (GOULLETQUER *et al.*, 2014; LOCKWOOD *et al.*, 2013). Fishes are an important component of NIS and among them the majority are lessepsian species (DEIDUN *et al.*, 2015).

The most successful lessepsian fish species

are *Fistularia commersonii* (Rüppell, 1838) (AZZURRO *et al.*, 2013; VITALE *et al.*, 2016); *Lagocephalus scleratus* (Linnaeus, 1758) (AZZURRO *et al.*, 2014; KARA *et al.*, 2015); *Pterois miles* (J. W. Bennett, 1828) (VAVASIS *et al.*, 2020); *Siganus luridus* (Rüppell, 1828) (AZZURRO & ANDALORO, 2004); *Stephanolepis diaspros* (Fraser-Brunner, 1940) (DEIDUN *et al.*, 2015) and *Upeneus pori* (Ben-Tuvia & Golani, 1989) (DEIDUN *et al.*, 2018; GERACI *et al.*, 2018). Although herculean species represent the minority of NIS their settlement effects on Mediterranean marine communities are not to be neglected, especially if they compete with other species particularly important to the local economies. The Lesser Amberjack *Seriola fasciata* (Bloch, 1973) is a herculean species, widespread across the Atlantic Ocean that may compete with the native greater amber-

jack *Seriola dumerili* (Risso, 1810). In the Mediterranean Sea, it was recorded for the first time in Balearic Island (MASSUTI & STEFANESCU, 1993) and then has spread rapidly eastward up to Israel, Lebanon, Syrian and waters (SONIN *et al.*, 2009; CROCETTA *et al.*, 2015; JAWAD *et al.*, 2015). The rapid natural expansion of the species via Strait of Gibraltar would be supported by an increase in water flux through the strait and hydroclimate modifications, such as temperature increase, which would favour the settlement of species of subtropical and tropical affinity (ANDALORO & RINALDI, 1998; QUIGNARD & TOMASINI, 2000). The present note concerns the first record of *S. fasciata* in the southern coast of Sicily and provides an update of its spatial distribution.

MATERIAL AND METHODS

In November 2016, off the southern coast of Sicily (Terrible Bank: approximate coordinates 37.15000° N, 12.88333° E), one specimen of *S. fasciata* was caught using trammel net at about 50 m depth. It was identified according to the morphological description and meristic given by FISCHER *et al.* (1981) and GOLANI *et al.* (2002). In addition, the meristic and morphometric characteristics of the specimen were compared with other Mediterranean records (ANDALORO *et al.*, 2005; JAWAD *et al.*, 2015; STAMOULI *et al.*, 2017; DOĞDU *et al.*, 2019). In particular, only for ANDALORO *et al.* (2005) the morphometric features of nine specimens were provided as mean values. All measurements were performed through ImageJ software (RUEDEN *et al.*, 2017) to the nearest 0.5 cm while sex was determined macroscopically. Then, maturity stage was determined through Medits (International bottom trawl in the Mediterranean) scale (Anon., 2017). Map of the *S. fasciata* first records in the Mediterranean was made by means Quantum GIS software in order to update its spatial distribution.

RESULTS AND DISCUSSION

Specimen was an immature male, measured 20.5 cm TL and weighted 128.8 g. The end of upper jaw relatively narrow, the typical irregu-



Fig. 1. Specimen of *Seriola fasciata* caught off the southern coast of Sicily

lar dark body bars and meristic count were in agreement with FISCHER *et al.* (1981) and GOLANI *et al.* (2002) (Fig.1). In addition, as shown in Table 1 by comparing the morphometric and meristic features it was emerged that all values were similar with the other Mediterranean studies which strengthen the correct identification of the species and therefore the presence of *S. fasciata* in Strait of Sicily. The occurrence of *S. fasciata* in the Sicilian waters is not totally unexpected indeed the Strait of Sicily may represents an ecological corridor for NIS from the Atlantic Ocean and the Indo-Pacific Ocean as well (SCANNELLA *et al.*, 2017; SERVELLO *et al.* 2019, GERACI *et al.*, 2019; FALSONE *et al.*, 2020). Around Sicily waters, the catch of juveniles of *S. fasciata* with trammel net represents an anomaly considering that it was caught mainly caught by purse seine fishing the common dolphinfish (*Coryphaena hippurus*) with fish aggregating devices (FADs) (ANDALORO *et al.*, 2005; TIRALONGO *et al.*, 2018) (Fig. 2).

Concerning spatial distribution, in the Strait of Sicily *S. fasciata* was never reported in the southern coast of Sicily. Previously it has been reported both in Lampedusa (ANDALORO *et al.*, 2005) and Malta islands (DEIDUN *et al.*, 2011) while the closest finding to the present record was in Egadi Islands (LIPEJ *et al.*, 2017) (Fig. 2). Despite GOLANI *et al.* (2002) stated that most of the Atlantic fish are irregular species and unable to create stable populations in their new habitats, *S. fasciata* represents a successful colonizer becoming a commercial species in central Mediterranean Sea (ANDALORO *et al.*, 2005). It is worth to highlight as to date in the Mediterranean, only

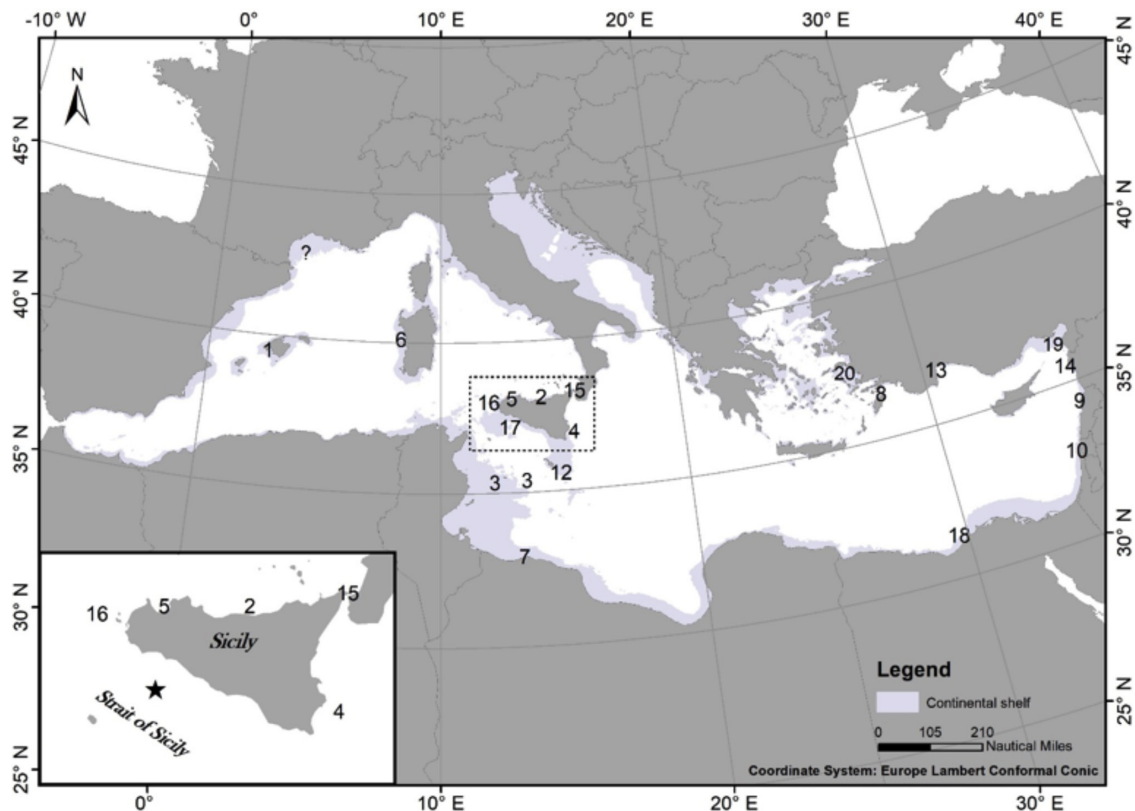


Fig. 2. Updated map showing location of *Seriola fasciata* first records in the Mediterranean basin reported according to the catch date. 1: 1989 (Massuti & Stefanescu, 1993); 2, 3, 4, 5, 6: 1994-1995, 1997-1998, 2002 (Andaloro *et al.*, 2005); 7: 2003 (Shakman *et al.*, 2017); 8: 2004 (Corsini *et al.*, 2006); 9: 2005 (Crocetta & Bariche, 2015); 10: 2008 (Sonin *et al.*, 2009); 11, 12: 2008-2009 (Deidun *et al.*, 2011); 13: 2012 (Özvarol & Gökoğlu, 2014); 14: 2013 (Jawad *et al.*, 2015); 15: 2014 (Castriota & Spinelli, 2016); 16: 2016 (Castriota & Falautano, 2017); 17 (black star): present study; 18: 2017 (Akel and Rizkalla, 2017); 19: 2018 (Doğdu *et al.* 2019); 20: 2018 (Yapici & Filiz, 2020); ?: doubtful record (Quignard, 1996, no published data)

a record above the 40th parallel, i.e. Gulf of Lion, was reported by QUIGNARD & TOMASINI, (2000) based on unpublished record (QUIGNARD, 1996, no published) (Fig. 2). This spatial pattern may be due to the subtropical and tropical affinity of the species that hampers its spreading toward the highest latitudes where the marine waters result generally colder.

Regarding morphological aspects, it should be noted that due to the similarity between the adults of *S. dumerili* and *S. fasciata*, fishers may confuse the two conspecific carangidae. As matter of fact, the only macroscopic difference of the above mentioned species is the supramaxilla, wide in *S. dumerili* narrow in *S. fasciata* (ISPRA, 2012). So, the presence and abundance of *S. fasciata* in the Mediterranean Sea might be

underestimated (TIRALONGO *et al.*, 2018). Indeed, most of the records concern juveniles, which are more easily identifiable than adults. The possible adult misidentification with *S. dumerili* lead to define the *S. fasciata* as cryptogenic questioning if the specie is really a NIS (CROCETTA *et al.*, 2015). Indeed, the term cryptogenic refers to circumtropical species or species with a disjoint distribution, and whose native range is still unknown or its presence may be the result of past introductions not recorded in the literature (CARLTON, 1996). In the light of the above, further investigation will be needed to monitor this species expansion in the southern coast of the Mediterranean sea and better understand its possible competition with the greater amberjack *S. dumerili*.

Table 1. *Seriola fasciata* morphometric and meristic characters of the present study (Strait of Sicily) compared with other Mediterranean Sea records

Morphometric and meristic characters	ANDALORO <i>et al.</i> , 2005	JAWAD <i>et al.</i> , 2015	STAMOULI <i>et al.</i> , 2017	DOĞDU <i>et al.</i> , 2019	YAPICI & FILIZ, 2020	Present study
Weight (g)	NA	NA	49	106.2	587.5	128.8
Total length (cm)	27.4	16.9	16	18.3	34.9	20.5
			% Total Length			
Fork length	86.8%	87.6%	87.5%	87.4%	86.24%	88.9%
Standard length	82.8%	83.4%	77.5%	76.5%	75.64%	84.5%
Pre 1st dorsal fin length	26.4%	33.1%	33.1%	34.3%	27.42%	29.0%
1st dorsal fin length	7.7%	8.3%	10.6%	11.5%	8.49%	10.7%
2nd dorsal fin length	37.4%	36.7%	36.2%	37.7%	34.84%	37.8%
Pre second dorsal fin length	NA	42.0%	41.3%	40.7%	27.42%	40.8%
Height of 2nd dorsal fin lobe	13.5%	NA	10.0%	9.7%	NA	10.7%
Pre pectoral length	NA	NA	26.3%	24.3%	NA	24.0%
Pectoral length	12.8%	NA	10.6%	14.4%	NA	15.5%
Pre ventral fin length	NA	NA	26.9%	30.7%	NA	28.5%
Ventral fin length	19.5%	NA	13.8%	19.2%	NA	19.7%
Pre anal fin length	44.8%	NA	53.8%	52.4%	43.98%	55.6%
Anal fin length	21.4%	24.3%	21.9%	23.9%	19.42%	23.8%
Body depth	29.8%	34.3%	25.6%	30.9%	25.27%	32.8%
Body width	NA	NA	10.6%	24.3%	NA	NA
Caudal-peduncle length	8.7%	NA	13.8%	12.1%	NA	10.6%
Caudal peduncle depth	NA	NA	5.0%	3.7%	3.72%	5.6%
Height of anal fin lobe	NA	NA	8.8%	7.3%	NA	8.5%
Head length	24.3%	24.3%	23.8%	24.2%	23.38%	25.5%
			% Head Length			
Pre Orbital length	37.0%	24.4%	31.6%	31.0%	29.28%	28.2%
Post Orbital length	45.0%	48.8%	60.5%	60.5%		47.5%
Eye diameter	22.4%	26.2%	23.7%	23.4%	24.26%	27.2%
Inter Orbital length	NA	NA	22.1%	21.8%	27.94%	NA
1st dorsal fin rays	VIII	VIII	VIII	VIII	VIII	VIII
2nd dorsal fin rays	I, 29	I+28-33	I + 24	I+29	I+31	I+29
Pectoral fin rays	I, 19	I-19	I + 24	I+19	I+19	I + 19
Pelvic fin rays	I, 5	I-5	I + 5	I+5	I+5	I+5
Anal fin rays	II,I+19	II,I+17-20	II, I+19	II,I+19	II+I, 19	II, I+19

ACKNOWLEDGEMENTS

This finding was obtained thanks to the European Data Collection Framework (DCF) - module CampBiol - funded by European Union and the Italian Ministry for Agricultural, Food and Forestry Policies. We are also grateful to Dr. Fabio Fiorentino for many constructive comments and help, which greatly improved the manuscript.

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Received: 26 August 2019

Accepted: 16 October 2020

Dodatni nalaz rasprostranjenosti *Seriola fasciata* (Carangidae) u Sredozemnom moru

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SAŽETAK

U ovoj je bilješki opisan dodatni nalaz o vrsti *Seriola fasciata* s južne obale Sicilije (Sredozemno more). Ovaj nalaz je prvi na tom području i potvrđuje ključnu ulogu područja za širenje stranih vrsta (NIS).

Osim toga, prikazana je ažurirana karta prostorne raspodjele vrste *Seriola fasciata*, kao i rasprava o mogućoj pogrešnoj identifikaciji i kompeticiji s vrstom *Seriola dumerili*.

Ključne riječi: Herkulske vrste, *Seriola fasciata*, biološka raznolikost, prostorna rasprostranjenost, Sicilijski tjesnac