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FIRST RECORD OF SERGEANT MAJOR, *ABUDEFDUF SAXATILIS* (LINNAEUS, 1758) IN THE ADRIATIC SEA

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ABSTRACT

A specimen of Sergeant major Abundefduf saxatilis (Linnaeus, 1758) was observed in a shallow rocky area for several weeks in August and September 2019 at Punta Sottile, in waters off Muggia (Gulf of Trieste). The specimen probably entered the Strait of Gibraltar and arrived at northernmost limits of the Adriatic Sea. This is the first record for this species in the Gulf of Trieste and also the Adriatic Sea.

Key words: Sergeant major, damselfish, first record, Atlantic influx, Gulf of Trieste

PRIMO RITROVAMENTO DI DAMIGELLA A STRISCE, *ABUDEFDUF SAXATILIS* (LINNAEUS, 1758) IN MARE ADRIATICO

SINTESI

Un esemplare di damigella a strisce Abundefduf saxatilis (Linnaeus, 1758) è stato osservato in una zona rocciosa poco profonda per diverse settimane ad agosto e settembre 2019, a Punta Sottile, nelle acque al largo di Muggia (Golfo di Trieste). L'esemplare probabilmente è entrato dallo stretto di Gibilterra ed è arrivato ai limiti più settentrionali del mare Adriatico. Si tratta della prima segnalazione per questa specie nel Golfo di Trieste e anche nell'Adriatico.

Parole chiave: damigella a strisce, castagnole, primo ritrovamento, afflusso atlantico, Golfo di Trieste

INTRODUCTION

In recent years, many fish species of tropical origin have been reported from different areas of the Mediterranean Sea. The majority of them enter the Mediterranean Sea through the Suez Canal and are known as Lessepsian migrants. During the last decades, the arrival of newcomers has accelerated due to rapid biotic globalization and various anthropogenic factors such as mariculture, maritime transport, the aquarium trade and others (see Zenetos *et al.*, 2012, 2016; Tsiamis *et al.*, 2018). Certain Atlantic newcomers have also entered the Mediterranean basin through the strait of Gibraltar and could be considered as evidence of natural range expansion (*sensu* Occhipinti *et al.*, 2011), unaided by human activities (Zenetos *et al.*, 2012). Higher temperatures during last decades also enable the spreading of Atlantic fish species into the Mediterranean Sea (Bianchi, 2007). They include many tropical coral reef dwelling fish entering the Mediterranean Sea through both gates.

The Gulf of Trieste, which is the northernmost part of the Adriatic Sea, has witnessed the arrival of some alien species or species related to the phenomenon of tropicalisation. In this paper, we report on the sighting of *Abudefduf saxatilis* (Linnaeus, 1758) at Punta Sottile (Muggia) near Trieste in the summer months of 2019.

To our knowledge, this is the very first evidence of the species's appearance in the Adriatic Sea.

MATERIAL AND METHODS

On August 16th 2019, a single specimen of a non-native damselfish was sighted during snorkeling along the coast off Punta Sottile in the Italian part of the Gulf of Trieste (Figs. 1a and c). The specimen was swimming in waters less than 2 m deep (45°36'13" N; 013°43'05" E), in a low vegetation habitat (turf) (Fig. 1b). The specimen was seen picking organisms on the sea floor and pinching the combjelly *Mnemiopsis leidyi*, present at the time in high density. The species was easy to approach to a distance of only few decimeters. All tentatives to collect the observed specimen with SCUBA diving equipment failed; however, photographic material obtained using a Fuji camera, Finepix XP140, was helpful for species determination. The specimen was observed regularly with the last sighting documented on 16th September 2019.

RESULTS AND DISCUSSION

The specimen was identified as a pomacentrid species of the genus *Abudefduf* due to an oval compressed body, typical colour pattern with light and five blue-black



Fig. 1: A specimen of Sergeant Major *Abudefduf saxatilis* at Punta Sottile (near Trieste) (A and C) at the end of August 2019 in a reef-like habitat, made of sandstone boulders, covered mainly with turf (B) (All photos: D. Stanič).
Sl. 1: Primerek velikega seržanta, *Abudefduf saxatilis* opaženega blizu Tankega rtiča (pri Trstu) (A in C) na koncu avgusta 2019 v grebenastem okolju iz peščenjakovih plošč, poraslih z nizko blazinasto vegetacijo (B) (vse fotografije: D. Stanič).

dark vertical bands, and forked tail. *Abudefduf saxatilis* is often confused with a similar Indopacific relative *A. vaigiensis* (Quoy & Gaimard, 1825) (Fig. 2, below), which has already been reported from the Mediterranean Sea as Lessepsian migrant (Bariche *et al.*, 2015; Vella *et al.*, 2016a). In fact, both species are considered as cryptic species, that do not differ in terms of meristic counts and morphometric parameters (Deidun & Castriota, 2014), although they are not sympatric in their original biogeographic provinces. Some authors such as Tsadok *et al.* (2015) have expressed doubts about the occurrence of *A. vaigiensis* in the Mediterranean Sea.

However, we checked the photographic material and tried to identify the species according to morphological characters. The specimen was identified as *A. saxatilis* (Fig. 2, above) due to the following characteristics (see Allen, 1991; Randall, 1996; Deidun & Castriota, 2014): the origin of the fourth vertical bar is located at the last dorsal spine or immediately behind it (Fig 2, arrow A); the extension of the fifth dark vertical bar from the origin of the dorsal fin to the anal fin (Fig 2; arrows B1 and B2); and the presence of two dark dots on the caudal peduncle (Fig. 2, arrow C). A complete description of the species is available in Allen (1991).

Damselfishes (family Pomacentridae) are common inhabitants of rocky sea floors and coral reefs (Allen, 1991). The Sergeant major is an abundant coral reef fish, generally dwelling in shallow waters up to 10 m of depth. It is normally present in schools. It is an herbivorous fish, feeding on different algae on the sea floor (Allen, 1991). However, young specimens were observed participating in cleaning symbiosis, picking ectoparasites and necrotic tissue from nectonic organisms such as marine turtles (Grossmann *et al.*, 2006).

The authors of this contribution also prepared and published information on the occurrence of Sergeant major in the local Slovenian (Lipej, 2019) and Italian media (Anonymous, 2019). Subsequently, a reader contacted us and informed us that such a specimen was sighted almost daily from June to August in an embayment of the marine protected area of Strunjan (Mesečev zaliv, Slovenia). It was observed cruising among giant boulders, resembling a small reef, in shallow waters below 2 m of depth. We checked whether the specimen was still present in the area on 12th September, but without success. It is probable that the observed specimen is the same as the one of Punta Sottile.

This sighting represents the first record of *A. saxatilis* in the Gulf of Trieste and, as far as we know, also in the Adriatic Sea. The first occurrence of the Sergeant major in the Mediterranean Sea was reported by Azzurro *et al.* (2013) when a specimen was sighted and photographed in shallow waters along the coast of Tarragona, Spain. The presence of *A. saxatilis* has also been confirmed in Maltese (see Deidun & Castriota, 2014; Vella *et al.*, 2016a), Turkish (Bilecenoglu, 2016) and Israeli waters (Tsadok *et al.*, 2015) (Tab. 1).

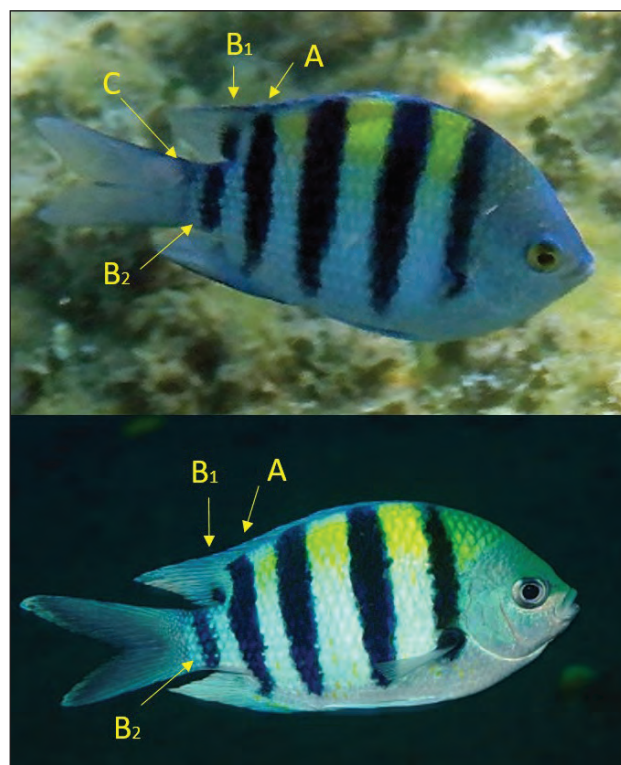


Fig. 2: Comparison of two similar species of *Abudefduf*, both already recorded in the Mediterranean Sea as alien species. Above is the studied specimen of *A. saxatilis* from Punta Sottile (Photo: D. Stanič) and below a specimen of *A. vaigiensis* from the island of Bali, Indonesia (Photo: B. Furlan). The arrow A shows that in *A. saxatilis* the origin of the 4th vertical bar is located under the last dorsal spine, while in *A. vaigiensis* it is placed behind the spine in the soft part of the dorsal fin. The arrow B₁ shows the extension of the 5th black vertical bar from the origin of the dorsal fin to the anal fin in *A. saxatilis*, which is shorter and discontinued in *A. vaigiensis* and is located on the caudal peduncle (arrow B₂). The arrow C shows the presence of two dark dots on the caudal peduncle in *A. saxatilis*.

Sl. 2: Primerjava dveh zelo podobnih vrst seržantov iz rodu *Abudefduf*, ki sta že bili zabeleženi v Sredozemskem morju kot tujerodni vrsti. Zgoraj je obravnavani primerki vrste *A. saxatilis* iz Tankega rtiča (Foto: D. Stanič), spodaj pa primerki vrste *A. vaigiensis* iz voda blizu otoka Bali, Indonezija (Foto: B. Furlan). Puščica A označuje, da je pri vrsti *A. saxatilis* začetek četrte navpične proge pod zadnjim trnom hrbtne plavuti, medtem ko je pri vrsti *A. vaigiensis* nameščen za trnom v delu hrbtne plavuti z mehкими plavutnicami. Puščica B₁ označuje razširitev pete navpične proge, ki se prične od osnove hrbtne plavuti do podrepne plavuti pri vrsti *A. saxatilis*, ki pa je krajša in prekinjena pri vrsti *A. vaigiensis*, obenem pa je nameščena na repnem korenu (puščica B₂). Puščica C označuje navzočnost dveh temnih pik na repnem korenu pri vrsti *A. saxatilis*.

To date, at least six alien damselfish species have been recorded in the Mediterranean Sea. A closely related species *Abudefduf vaigiensis* (Allen, 1991) has also been reported from the Mediterranean Sea as a Lessepsian migrant (Tardent 1959; Goren & Galil 1998; Vacchi & Chiantore 2000; Vella *et al.*, 2016a). The African sergeant major, *A. hoefleri* (Vella *et al.*, 2016b) was caught in Maltese waters, whereas the Scissortail Segeant, *A. sexfasciatus*, was recently reported from the Aegean Sea by Giovos *et al.* (2018). Other alien damselfishes have been recorded in the Mediterranean Sea such as *Stegastes variabilis* (Vella *et al.*, 2015) and *Chrysiptera hemicyanea* (Deidun *et al.*, 2018), both in Maltese waters. *Chrysiptera cyanea*, on the other hand has been recorded in Portorož, in Slovenian waters (Lipej *et al.*, 2014a).

The arrival of species of tropical origin in the Mediterranean Sea could be attributed to different reasons such as Lessepsian migration, Atlantic influx, drift, ballast waters or aquarium trade. The later two reasons seem to be less probable. In fact, Ben Rais Lasram & Mouillot (2009) stated that “the introduction of fish into the Mediterranean Sea by ships and aquaculture-mediated introductions is extremely rare”. However, in the case of another damselfish, the Blue Devil, *C. cyanea*, reported in the waters off Piran (Slovenia), the intentional release of the species from an aquarium seems very reasonable (Lipej *et al.*, 2014a). The native area of distribution

of *A. saxatilis* is the Caribbean Sea and the tropical coastal waters of western Africa (Allen, 1991). As an Atlantic species, *A. saxatilis* most probably entered the Mediterranean through the Strait of Gibraltar. Azzurro *et al.* (2013) mentioned natural range expansion through this gate as a reasonable hypothesis; however, they do not exclude the possibilities of an aquarium escape or ship transport. Schools of damselfish planktivores of the genera *Abudefduf* and *Chromis* are known to associate with floating objects (see Dempster *et al.*, 2002; Luiz *et al.* 2012). The same phenomenon of alien fish, following debris, plastic objects and other floatsam has also been observed with certain alien fish species, already reported from the Adriatic Sea, e.g. *Pampus argenteus* (Dulčić *et al.*, 2004).

Despite its northermost position, the Gulf of Trieste and the adjacent northern Adriatic Sea witnessed records of other alien fish species. The first such alien species was the silver pomfrey *P. argenteus*, caught in waters off Rijeka (Fiume) in 1896 (Dulčić *et al.*, 2004), which was also the first ever recorded Lessepsian migrant in the Adriatic Sea, as well. The second case was the capture of an alien grouper *Epinephelus coioides*, reported by Parenti & Bressi (1998) for the Gulf of Trieste. Later on, some other alien fish species were reported such as *Tetraodon lineatus* in waters off Piran in 2007 (Slovenia) (Lipej *et al.*, 2008), *Siganus luridus* (Poloniato *et al.*, 2010) at Miramare (Trieste), *Stephanolepis diaspros* (Bay of Piran)

Tab. 1: Non-native damselfish records in the Mediterranean Sea according to the available published data.

Tab. 1: Tujerodne vrste rib koralnic v Sredozemskem morju na podlagi razpoložljivih objav.

	Damselfish species	locus	state	source
1	<i>Abudefduf saxatilis</i>	Tarragona	Spain	Azzurro <i>et al.</i> , 2013
	<i>Abudefduf saxatilis</i>	Candarli Bay	Turkey	Bilecenoglu, 2016
	<i>Abudefduf saxatilis</i>	Valetta	Malta	Vella <i>et al.</i> , 2016a
	<i>Abudefduf saxatilis</i>	Valetta	Malta	Deidun & Castriota, 2014
	<i>Abudefduf saxatilis</i>	Sdot-Yam	Israel	Tsadok <i>et al.</i> , 2015
	<i>Abudefduf saxatilis</i>	Trieste	Italy	<i>this work</i>
2	<i>Abudefduf vaigiensis</i>	Gulf of Naples	Italy	Tardent, 1959
	<i>Abudefduf vaigiensis</i>	Ligurian Sea	Italy	Vacchi <i>et al.</i> , 2000
	<i>Abudefduf vaigiensis</i>	Valetta	Malta	Vella <i>et al.</i> , 2016a
	<i>Abudefduf vaigiensis</i>	Lebanese waters	Lebanon	Bariche <i>et al.</i> , 2015
	<i>Abudefduf vaigiensis</i>	North coast	Israel	Goren & Galil, 1998
3	<i>Abudefduf sexfasciatus</i>	Sounio	Greece	Giovos <i>et al.</i> , 2018
4	<i>Abudefduf hoefleri</i>	Southern Malta	Malta	Vella <i>et al.</i> , 2016b
5	<i>Stegastes variabilis</i>	Senglea	Malta	Vella <i>et al.</i> , 2015
6	<i>Chrysiptera cyanea</i>	Portorož	Slovenia	Lipej <i>et al.</i> , 2014
7	<i>Chrysiptera hemicyanea</i>	Manoel Island	Malta	Deidun <i>et al.</i> , 2018

(Lipej *et al.*, 2014b) and *Oplegnathus fasciatus* (Muggia) (Ciriaco & Lipej, 2016). There is also mentioned reference to a Blue Devil (*C. cyanea*) in the waters off Piran, which could be most likely considered as an intentional release from an aquarium. One specimen, which was caught by SCUBA divers, was held in the aquarium tank of the Marine Biology Station for many months till it died (Lipej *et al.*, 2014a).

It is interesting to mention the fact that some alien species were recorded for the very first time in the northernmost part of the Adriatic Sea as is the case of *T. theraps*, *S. luridus*, *O. fasciatus* and now *A. saxatilis*. Neither of those species has been recorded again in the Gulf of Trieste, so we should therefore consider them as 'Casual' species (*sensu* Evans *et al.*, 2015). As with all mentioned cases, in the case of *A. saxatilis* only a single specimen was sighted in the studied area, so it is rather probable that it should be considered as an isolate record. In all cases, specimens were first sighted during the warmer part of the year (e.g. from June to September), with rather high sea temperatures. It is possible that the low winter temperatures in the Gulf of Trieste do not allow the settlement or survival of such alien fish species. The same is also true for the tropical alien algae *Caulerpa cylindracea*. The northernmost record of this species is located in area near the Istrian city of Umag (Sladonja & Banovac-Kuča, 2014); however, to date, it has not been able to reach the adjacent Gulf of Trieste.

If possible, it is always better to follow basic ichthyological procedures for publishing first records as this is the best practice approach (*sensu* Bello *et al.*, 2014); it includes meristics, morphometry or even genetic identification. However, in the case of alien tropical fish species, which are easily detected among the native fish community due to their conspicuous colour pattern, an evidenced record such as photographic material or

footage could also be very helpful. They are normally sighted as single specimens and recorded during the warmer part of the year. For example, the first record of *S. luridus* in the Adriatic Sea was reported from the area of WWF Miramare near Trieste based on photographs and footage recorded in the area (Poloniato *et al.*, 2010). Subsequently, more cases of the same species were reported from the Adriatic Sea by Dulčić *et al.* (2011, 2013) and Đurović *et al.* (2014). The same happened with another alien fish species, *O. fasciatus* (Ciriaco & Lipej, 2016), which was reported for the first time from the Gulf of Trieste, according to a photographed specimen, and later recorded again in Urinj (Rijeka Bay, northern Adriatic Sea) (Dulčić *et al.*, 2016).

To date, 444 fish species have been recorded in the Adriatic Sea (Kovačić *et al.*, submitted) with at least one positive record of the species in the area. Thus, with the inclusion of Sergeant major, the checklist of Adriatic fish fauna now includes 445 fish species. Due to the ongoing arrival of alien fish species through the Suez Canal and range extending species from the Atlantic, the number of fish will certainly increase in the near future.

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*PRVI ZAPIS O POJAVLJANJU VELIKEGA SERŽANTA, ABUDEFDUF SAXATILIS
(LINNAEUS, 1758) V JADRANSKEM MORJU*

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POVZETEK

Primerek velikega seržanta Abudefduf saxatilis (Linnaeus, 1758) so avtorji avgusta in septembra 2019 dalj časa opazovali v plitvinah skalnatega dna pri Tankem rtiču (Punta Sottile, Milje, Tržaški zaliv). Najverjetneje je zašel na skrajni severni del Jadranskega morja skozi gibraltarsko ožino. To je prvi zapis o pojavljanju te vrste v Tržaškem zalivu in tudi Jadranskem morju.

Ključne besede: veliki seržant, riba koralnica, prvi zapis, atlantski prihod, Tržaški zaliv

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