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SECOND OCCURRENCE OF *SIGANUS JAVUS* (SIGANIDAE) IN THE MEDITERRANEAN WATERS

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ABSTRACT

A single specimen of Siganus javus *(Linnaeus, 1766) was captured in December 2021 in the waters off Alexandria, Egypt. This Indo-Pacific species is reported for the second time in the Mediterranean Sea and its occurrence in the basin is briefly discussed.*

Key words: Non-Indigenous species, Siganidae, Mediterranean Egyptian waters, introduction pathway, citizen science

SECONDA SEGNALAZIONE DI *SIGANUS JAVUS* (SIGANIDAE) NEL MEDITERRANEO

SINTESI

Un esemplare di Siganus javus *(Linnaeus, 1766) è stato catturato nelle acque al largo di Alessandria, Egitto, nel dicembre 2021. Si tratta della seconda segnalazione di questa specie di origine Indo-Pacifica nel mar Mediterraneo e la sua presenza nel bacino viene brevemente discussa.*

Parole chiave: Specie non-indigene, Siganidae, acque egiziane del Mediterraneo, percorso di introduzione, citizen science

INTRODUCTION

Six non-indigenous species (NIS) belonging to the Indo-Pacific family Siganidae have been recorded in the Mediterranean Sea: *Siganus rivulatus* Forsskål & Niebuhr, 1775 and *Siganus luridus* (Rüppel, 1829) (Golani *et al.*, 2021), *Siganus javus* (Linnaeus, 1766) (Ibrahim *et al.*, 2010), *Siganus virgatus* (Valenciennes, 1835) (Ahnelt, 2016), *Siganus fuscescens* (Houttuyn, 1782) (Azzurro & Tiralongo, 2020) and *Siganus argenteus* (Quoy & Gaimard, 1825) (Abdelghani *et al.*, 2021). The rabbitfish *S. rivulatus* and *S. luridus* are well established in the basin for a long time, while to date the occurrence of the remaining species is still based on single records. The records of *S. javus* and *S. virgatus* are considered questionable, the first because it was reported in a not peer reviewed abstract of a CIESM Congress (Zenetos *et al.*, 2011, 2022) and also it does not occur in the Red Sea (Golani *et al.*, 2021), the second because it occurs only off eastern India and the labelling of the specimen from the Adriatic Sea deposited at the National History Museum of Vienna may be incorrect (Golani *et al.*, 2021). Considering the above listed *Siganus* NIS, the Red Sea is currently included in the native range of *S. rivulatus*, *S. luridus*, *S. argenteus* (Woodland, 2001; Golani & Fricke, 2018), and *S. javus* (Debelius, 2011).

The first occurrence of the Streaked spinefoot *S. javus* in the Mediterranean waters of Egypt is hereby documented, adding a third siganid species to *S. luridus* and *S. rivulatus* previously recorded in the same area (Halim & Rizkalla, 2011; Akel & Karachle, 2017) and a second record of the species for the whole basin, after its first finding in Syrian waters (Ibrahim *et al.*, 2010).

MATERIAL AND METHODS

On 5 December 2021 a fisherman caught a fish not familiar to him, at Miami Beach, Alexandria, Egypt (31.27234° N, 29.99065° E), with a fishing rod (shrimp as bait), at around 12 m of depth on a rocky area. Video and photo of the freshly captured sample were soon posted to a Facebook group https://m.facebook.com/groups/AlexandrianFisherman/permalink/4457109684407264/?paipv=0&eav=AfYgASY0_i967sRjLs_B1dnj03cNo0S3Vz-MSIDWRqxg7xHf2cj8IxctV_6rBPZIFlg&_rdr. The fisherman identified the fish by its known local generic name (سمكة البطاطا أو السيجان سبحان الخالق, "batata", in English potato fish), but he underlined that he had never seen such a "batata" fish, in particular for the shape of the body and the strange wavy lines on the body sides. The sample was not retained.

RESULTS AND DISCUSSION

The fish was identified as *S. javus* following Woodland (2001), on the basis of the characters observed in Fig. 1 and the available video: body deep and compressed; dorsal fin with XIII strong spines and 10 soft rays, anal fin with VII strong spines and 9 soft rays; mouth small, terminal; dorsal profile of head slightly concave above orbit; snout short and blunt; preopercular angle approximately 80°; caudal fin emarginate; scales minute. Colour: bronze on back and sides to paler below; bluish spots on head and upper sides, smaller and regular on head, larger and irregular in the upper back, extending to the upper caudal peduncle; silvery bluish undulating lines on mid- and lower sides, vanishing on ventral side; spines and rays of dorsal, anal, and pelvic fins golden, membranes golden (particularly in the inner part of anal fin), dusky distally; pectoral fins hyaline in the distal portion, dusky in the proximal; caudal fin dusky; cheek shiny golden greenish. The main measurements of the specimen, obtained from Fig. 1 (the sides of squares in the newspaper having a known length of 4.5 mm), were approximately: total length 260 mm, standard length 201 mm, head length 45 mm, body depth 91 mm (2.2 times in SL), and caudal peduncle depth 15 mm. The diameter of bony orbit is approximately two times the shortest distance between bony orbit and upper lip. Following the identification keys of Woodland (2001), there are more than 29 scale rows between lateral line and base of second to fourth dorsal-fin spines. This count was not possible from the available photos and video. Nevertheless, the comparison of body morphology and colour of our freshly caught fish (Fig. 1) with all the *Siganus* species described and showed in Woodland (2001), Burhanuddin *et al.* (2014), Woodland & Anderson (2014) and Froese & Pauly (2022) led to ascertain its identification as *S. javus*, excluding eventual confusion with other siganid species.

The Streaked spinefoot *S. javus* has a wide range of distribution from the Persian Gulf through the Indo-Malayan Archipelago to Vanuatu and New Caledonia (Froese & Pauly, 2022). This rabbitfish, commonly up to 30 cm in total length, dwells in shallow coastal waters, rocky or coral reefs, brackish lagoons, in mangroves, estuaries and estuarine lakes, feeding primarily on algae attached to the substrate and on floating algal fragments (Woodland, 2001; Borsa *et al.*, 2007; Perpetua *et al.*, 2013), but also on zooplankton (Okamoto *et al.*, 2016). The first occurrence of this Indo-Pacific herbivorous fish in the Mediterranean Sea was observed near the port of Lattakia, Syria, in 2009 (Ibrahim *et al.*, 2010). The second finding of *S. javus* described hereby for the Mediterranean, confirms the presence of this NIS fish in the basin, after twelve years since its first sighting in Syrian waters. While there is no certainties regarding the pathway of introduction of *S. javus* in the Mediterranean, the geographical position of our finding off Alexandria, suggests arrival via the Suez Canal (Lessepsian migration) as the most probable pathway (Ibrahim *et al.*, 2010). On the other hand, a ship-mediated introduction cannot be excluded, considering the intense maritime traffic of the large port of Alexandria (cf. Azzurro &

Fig. 1: The specimen of** Siganus javus **(approximate total length 260 mm) caught off Alexandria, Egypt (photo credit: Yassine Mahmoud Gaber).
Sl. 1: Primerek vrste** Siganus javus **(približna dolžina 260 mm), ujet blizu Aleksandrije, Egipt (Foto: Yassine Mahmoud Gaber).

Tiralongo, 2020). It is possible that *S. javus* was able to adapt and establish in the new ecosystem and expanded an apparently limited population along the Levantine coasts, escaping nevertheless further intermediate detections since its first sighting. Competition with the native herbivorous fishes as well as with the established Lessepsian migrants *S. luridus* and *S. rivulatus* may have prevented the diffusion and increase in abundance of *S. javus*. The Marbled spinefoot *S. rivulatus* is, for example, one of the most important commercial species in the artisanal coastal fishery of the understudied area, around Alexandria (Bakhoum, 2018; Rizkalla & Heneish, 2021). It is also plausible that the species has failed the first attempts of adaptation presenting a new and more recent introduction.

The streaked spinefoot *S. javus* enjoys swimming and therefore it is suitable for large aquarium displays, but not for home aquariums (https://reefapp.net/en/encyclopedia/siganus-javus). Some species of siganids are used in aquaculture, while others, including *S. javus*, are promising candidates for this purpose (Duray, 1998).

The Mediterranean Sea, in particular its eastern basin, is one of the regions of the world most affected by biological invasions (Katsanevakis *et al*., 2020; Occhipinti-Ambrogi, 2021). The Mediterranean Egyptian waters are heavily impacted by NIS, in particular fish of Indo-Pacific/Red Sea origin that migrate into the basin via the Suez Canal corridor (Halim & Rizkalla, 2011). The finding of *S. javus*, although casual for the moment, increases to at least 72 the number of fish species of Indo-Pacific origin recorded in the Mediterranean waters of Egypt (Adel *et al*., 2021; Al Mabruk *et al*., 2021; Mehanna & Osman, 2022; Nour *et al*., 2022a, b). Further field research may substantiate an eventual successful establishment of this NIS in this eastern Mediterranean region.

The finding of *S. javus* from Egypt undoubtedly substantiate the significant support of citizen scientists and sensitized fishers in increasing data on occurrence and spreading of NIS, through the use of new technologies and platforms, particularly in areas where scientific research and monitoring projects are limited, as in the North African countries (Al Mabruk *et al*., 2021a; Nour *et al*., 2022a). Among the above mentioned 72 NIS fishes of Indo-Pacific/Red Sea origin reported from the Mediterranean Egyptian waters, at least ten species have been recently recorded due to the input of citizen science and social media (Al Mabruk *et al*., 2020, 2021b, c; Adel *et al*., 2022; Nour *et al*., 2022a).

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DRUGI ZAPIS O POJAVLJANJU PROGASTEGA MORSKEGA KUNCA, *SIGANUS JAVUS* (SIGANIDAE), V SREDOZEMSKIH VODAH

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POVZETEK

Avtorji poročajo o primerku progastega morskega kunca, Siganus javus *(Linnaeus, 1766), ujetega v decembru 2021 v vodah blizu Aleksandrije v Egiptu. To je drugi zapis o tej indo-pacifiški vrsti v Sredozemskem morju. Avtorji razpravljajo na kratko o njenem pojavljanju v bazenu.*

Ključne besede: tujerodne vrste, Siganidae, Sredozemlje, egiptovske vode, način vnosa, ljubiteljska znanost

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