Rapid Communication

Records of two non-indigenous fish species *Synanceia verrucosa* Bloch and Schneider, 1801 and *Acanthurus sohal* (Forsskål, 1775) from the Gaza strip (eastern Mediterranean Sea)

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Abstract

The sohal surgeonfish *Acanthurus sohal* and the reef stonefish *Synanceia verrucosa* are marine fishes native to the Indo-Pacific realm. A single individual of each of the two species was captured from the coastal waters of the city of Gaza and their pictures were shared on social media. This constitutes the second record of the surgeonfish and the fourth record of the stonefish in the Mediterranean Sea. The proximity to the Suez Canal suggests Lessepsian migration as a likely mode of entry to the Mediterranean Sea for *A. sohal* and adds another record of *S. verrucosa* in the basin.

Key words: sohal surgeonfish, reef stonefish, Lessepsian migration, first record, Palestinian territory

Introduction

The State of Palestine is comprised of two separate regions, the West Bank and the Gaza Strip. Gaza (or Gaza Strip) is located along the southeast Mediterranean Sea, and has about 40 km of coastline with sand dunes and some cliffs (Ali 2002). This region is among the most populated and is subject to serious environmental threats, including soil degradation, underground water contamination, solid waste and sewage pollution (MEnA 2000). Scientific studies on the marine biota from this region are generally lacking or very old (e.g. Liebman 1934, 1935; Haas and Steinitz 1947). For example, a small fishery of the endangered endemic giant devil ray *Mobula mobular* (Bonnaterre, 1788) has gone unnoticed until very recently (Abudaya et al. 2018). The geographic location of the Gaza Strip, about 170 km east of the entrance to the Suez Canal, makes it an interesting area to detect new arrivals of non-indigenous species from the Indo-Pacific realm (Figure 1).

Acanthuridae constitutes a family of bony fishes found throughout the tropical and subtropical realm, except the Mediterranean Sea. The family

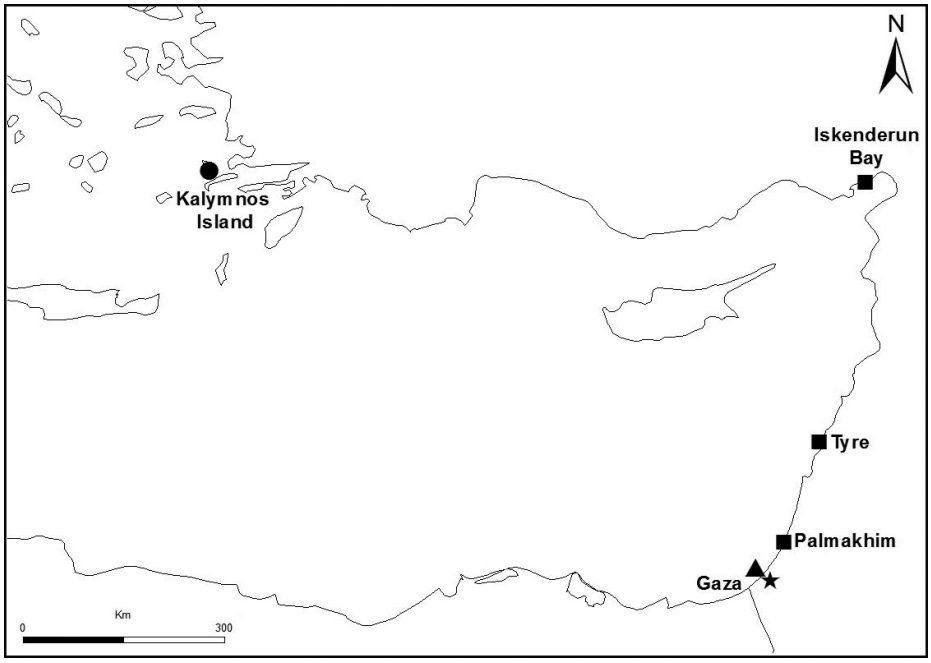

Figure 1. Map showing records of the two non-indigenous fish species *Acanthurus sohal* and *Synanceia verrucosa* in the Mediterranean Sea. The circle and triangle show the first and current record of *A. sohal*, respectively. Similarly, the squares and the star represent previous and current records of *S. verrucosa.*

consists of about 86 species, of which surgeonfishes (Acanthurinae) are characterized by having sharp scalpel-like spines on caudal peduncles (Nelson 2006; Eschmeyer et al. 2017; Froese and Pauly 2018). Many surgeonfishes are popular aquarium fish because of their bright colors. The sohal surgeonfish *Acanthurus sohal* (Forsskål, 1775) is a marine species that is native to the Red Sea and the Persian Gulf, where it is considered common. This is a relatively large species (up to 40 cm TL) that lives mainly on the reef front and is known to be highly territorial and aggressive, causing injuries with its sharp scalpel-like spines at the base of the caudal fin (Froese and Pauly 2018).

Synanceiidae is a family of Indo-pacific bony fishes commonly known as stonefishes. They are characterized by their ability to camouflage as rocks and by the absence of free pectoral rays. They also have skin glands over their body and venom glands at the base of their dorsal fin spines (Nelson 2006; Froese and Pauly 2018). The family consists of about 37 species, out of which five belong to the genus *Synanceia* (Eschmeyer et al. 2017; Froese and Pauly 2018). They are often labelled as the most venomous fishes in the world because of a potent neurotoxin they have, and several deaths have been reported (e.g. Smith 1957; Shiomi et al. 1989; Randall 1995; Williamson et al. 1996; Myers 1999; Poss 1999). The reef stonefish *Synanceia verrucosa* Bloch and Schneider, 1801 is a solitary marine fish, living on the bottom down to 30 m depth and widely distributed in the Indo-Pacific Ocean, including the Red Sea (Heemstra and Heemstra 2004; Froese and Pauly 2018). In its native habitat, it occurs on reef flats and in lagoons, living mainly on sand, rubble or between rocks and seaweeds.

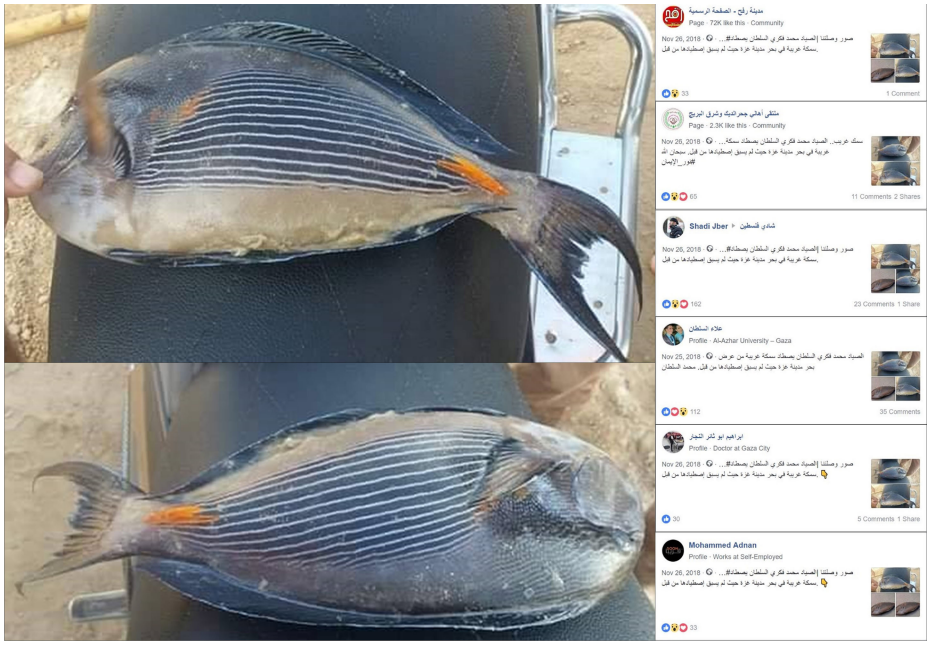

Figure 2. Photographs of the sohal surgeonfish *Acanthurus sohal* captured off Gaza (eastern Mediterranean) and as shared over social media (*e.g.* https://www.facebook.com/pg/kafer.qallil2/photos/?ref=page_internal).

In the present paper, we report the first record of the surgeonfish *A. sohal* and the stonefish *S. verrucosa* from the Palestinian territory of Gaza. This is also the second record of the surgeonfish and the fourth of the stonefish in the Mediterranean Sea.

Results

On 26 November 2018, a single individual of *Acanthurus sohal* was captured off the coast of the city of Gaza, close to the fishing port (approx. 31°31′35.19″N; 34°25′31.09″E) (Figure 1). The surgeonfish was captured in a trammel net at a depth of about 12 m over a rocky bottom. Several pictures of the fish were shared extensively on various local Palestinian Facebook groups. Similarly, a single individual of *Synanceia verrucosa* was captured off the coast of Gaza city (approx. 31°31′3.32″N; 34°25′18.66″E) on 4 December 2018 (Figure 1). The stonefish was caught in a trammel net at a few meters depth, probably scattered with rocks (type of bottom not indicated). The fish was not preserved, and a picture was shared through social media (Facebook group: Mediterranean Marine Life) the following day, with a request for identification. In both cases, the fishes were not preserved and only pictures are available (Figures 2, 3).

Discussion

The presence of *Acanthurus sohal* represents the first record in Gaza and the second of the species in the Mediterranean Sea. The first record of *A. sohal* dates back to 13 August 2017 from Kalymnos Island in the Dodecanese (Giovos et al. 2018). Because of the great distance to the Suez

Figure 3. Photograph of the reef stonefish *Synanceia verrucosa* captured off Gaza (eastern Mediterranean), as shared over social media (https://www.facebook.com/groups/396314800533875/photos/).

Canal and the lack of records from closer regions, the Lessepsian origin of this species was not considered as a possible mode of entry to the Mediterranean Sea. Introduction via ballast water was also excluded for the same reason, and the hypothesis of an aquarium release was favored as most plausible (Giovos et al. 2018). The present record from Gaza indicates that the occurrence of this species in the Mediterranean may indeed be the result of a passage through the Suez Canal, which provides a more plausible interpretation to this record. The hypothesis of a potential aquarium release from the region is also likely and cannot be excluded. *Acanthurus sohal* is characterised by having a convex snout profile and a very lunate caudal fin. The body is bluish-grey and whitish ventrally, with narrow

blackish stripes on the head and along side of the body. A patch of orange is situated beneath the pectoral fin; the caudal spine sheath and socket is also bright orange (Randall 1983, 2001; Sommer et al. 1996; Carpenter et al. 1997). Based on these morphological characteristics, the identification based on photographs can be considered accurate for this species.

Similarly, the individual of the reef stonefish *Synanceia verrucosa* represents a first record for Gaza waters and the fourth in the Mediterranean Sea. The first specimen of the stonefish was reported from south of Tel Aviv-Jaffa (Palmakhim) on 18 April 2010 (Edelist et al. 2011). A second specimen was recorded from Iskenderun Bay (Yumurtalık, Adana) on 18 November 2011 (Bilecenoğlu 2012) and the third from Tyre on 29 January 2012 (Crocetta and Bariche in Crocetta et al. 2015). Among the five species belonging to the genus, *S. verrucosa* can be easily distinguished by fin meristics (Eschmeyer and Rama-Rao 1973; Bilecenoğlu 2012), which cannot be retrieved from the specimen from Gaza, since only a photo exists. However, only *Synanceia nana* Eschmeyer and Rama-Rao, 1973 exists in the Red Sea along with *S. verrucosa* (Golani and Bogorodsky 2010). Besides the number of dorsal fin spines and pectoral fin rays between *S. verrucosa* (XIII dorsal spines; 18–19 pectoral rays) and *S. nana* (XIV dorsal spines; 14–15 pectoral rays), as well as different maximum sizes, the latter is distinguished by visible dark margins located on the pectoral, pelvic and caudal fins (Eschmeyer and Rama-Rao 1973; Poss 1999; Edelist et al. 2011), which are clearly absent in the specimen from Gaza.

The occurrence of the stonefish in the Mediterranean Sea is a likely arrival through the Suez Canal. This is based on the fact that previous individuals have been found exclusively along the coast of the Levant and mainly in its southern part (3 out of 4 records) (Figure 1). According to Edelist et al. (2011), this arrival could be attributed to a pelagic larval dispersal through the Suez Canal instead of active swimming; larger individuals being mostly inactive and rarely moving. Alternatively, the chance of an aquarium release event is very low since the species is not common in the ornamental fish trade, while the records are "close" to the Suez Canal, one of the major pathways of introduction in the Mediterranean (Katsanevakis et al. 2013). Finally, the fact that the species is highly venomous and lives on the bottom in shallow areas with an almost perfect camouflage, is of major concern for the Mediterranean Sea and its inhabitants. In fact, among the 480 million people living in Mediterranean countries, one-third are concentrated along its coastal regions (SOER 2015). Furthermore, the Mediterranean region is a preferred touristic destination around the world, with about 330 million tourists recorded in 2016 (UNWTO 2018). If a large population of *S. verrucosa* establishes in the Mediterranean, this would certainly have a negative impact on the highly developed tourism sector, due to the potential risk from the potent venom it harbors (reviewed in Edelist et al. 2011; Bilecenoğlu 2012).

The proximity to the Suez Canal and the high anthropogenic impact on its coastal zone makes the Gaza strip a suitable zone for the establishment of non-indigenous biota of Indo-pacific origin (Figure 1). The Gaza strip is also among those regions in the Mediterranean that desperately lack marine scientists able to detect and report newly arriving non-indigenous species. The use of social media, which has become an alternative way to detect new arrivals (e.g. Azzurro et al. 2013; Bariche and Azzurro 2016; Rizgalla et al. 2016; Deidun et al. 2018; Giovos et al. 2018), appears to be a useful tool in the context of under-covered regions, like the Gaza Strip. Social media may provide an alternative way to get information on bioinvasions from this region that would have remained non-accessible to scientists otherwise. The conspicuous shape and colours of the two species reported here made them recognizable as non-indigenous fishes in the Mediterranean, even in localities like Gaza, where people are occupied with more urgent matters.

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