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New records of introduced species in the Mediterranean Sea (November 2023)

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Abstract

This collective article presents new information about 15 introduced taxa belonging to five phyla: one Rhodophyta, one Chlorophyta, one Mollusca, one Annelida, two Arthropoda, and nine Chordata (one Ascidiacea and eight Osteichthyes). The records refer to eight Mediterranean countries and extend from the Alboran Sea to the Levantine Sea as follows: **Spain**: first record of the African hind *Cephalopholis taeniops* for the Alboran Sea, and a further record of the Monrovia surgeonfish *Acanthurus monroviae*, extending its distribution northwards in the Western Mediterranean. **Italy**: an additional record of the squat lobster *Scyllarus subarctus* based on its nisto stage, new records of the lionfish *Pterois miles* in the north-western Ionian Sea, first records of the bivalve *Fulvia fragilis* for the Italian Adriatic coast, and a record of the amphipod *Ptilohyale littoralis* in the northern Adriatic Sea, also representing the first report for the Mediterranean Sea. **Montenegro**: first record of the non-indigenous ascidian *Ciona robusta*. **Albania**: first record of the red cornetfish *Fistularia petimba*. **Greece**: first record of the cryptogenic polychaete *Alitta succinea*

in association with ship fouling, suggesting the possibility of a non-indigenous origin of Mediterranean populations of this species, and first record of the Seychelles dragonet *Synchiropus sechellensis* for the Saronikos Gulf. **Türkiye**: first record of the red alga *Womersleyella setacea*, report of an abundant population of the Indian twospot cardinalfish *Cheilodipterus novemstriatus* in the Turkish Aegean Sea, and first record of *Synodus randalli*, also corresponding to the first report for the Mediterranean Sea. **Syria**: first record of the blenny *Istiblennius* cf. *meleagris*. **Israel**: report of an algal bloom of the green alga *Codium parvulum*, and first record of *Synchiropus sechellensis*.

Introduction

Despite its limited surface, the Mediterranean Sea is characterised by an extremely high biodiversity and by a high percentage of endemic species, making it particularly valuable from the biogeographic point of view (Coll *et al.*, 2010; Bianchi *et al.*, 2012). However, it is also affected by several threats, including overfishing, pollution, a trend of increasing water warming, and the introduction, establishment and spread of non-indigenous species (NIS). While the impact of several NIS is still largely unknown (Tsirintanis *et al.*, 2022), it is likely that indigenous species are threatened by several NIS-related factors, including the increase in competitive interactions with NIS (Pansera *et al.*, 2021; Mutlu *et al.*, 2023), the rise of novel predators (Langeneck *et al.*, 2017; Savva *et al.*, 2020), NIS-associated habitat alterations (Giakoumi, 2014), and the introduction and spread of pathogens (Stabili *et al.*, 2015). In the case of endemic species, the combined impacts of water warming and interactions with NIS might even lead to severe range retractions, or even local extinction. Furthermore, NIS affect several human activities, either directly, by causing massive economic losses, or indirectly, through the modification of ecological processes sustaining human activities (Ghermandi *et al.*, 2015; Mancinelli *et al.*, 2017; Galanidi *et al.*, 2018). For this reason, NIS are currently considered as a major threat to Mediterranean biodiversity, have been the object of several studies, and are one of the main descriptors of environmental status according to the EU Marine Strategy Framework Directive (Olenin *et al.*, 2010). In this context, the timely report of new information on NIS for the Mediterranean Sea, as well as the record of relevant range expansions of already known NIS, is of paramount importance for the monitoring of these species and allow to predict and counteract potential impacts on native assemblages and human activities. The Collective Article A' series of the scientific journal *Mediterranean Marine Science* is dedicated to collecting new distribution data on introduced species, defined here as in a broad sense, i.e., including NIS (also known as alien), cryptogenic, crypto-expanding, and species whose status remains questionable (Gerovasileiou *et al.*, 2022; Fortič *et al.*, 2023).

The present work reports 17 new records of 15 introduced species, belonging to the phyla Rhodophyta (one species), Chlorophyta (one species), Mollusca (one species), Annelida (one species), Arthropoda (two species) and Chordata (nine species). The majority of these species were already known in the Mediterranean Sea, and their records represent range expansions within the basin; however, the amphipod *Ptilohyale littoralis* and the bony fish *Synodus randalli* represent the first occurrences for the Mediterranean Sea. In this article, author names occur in alphabetical order and records were categorised by country and arranged from west to east. The exact localities are illustrated in Figure 1 and detailed in Table 1.

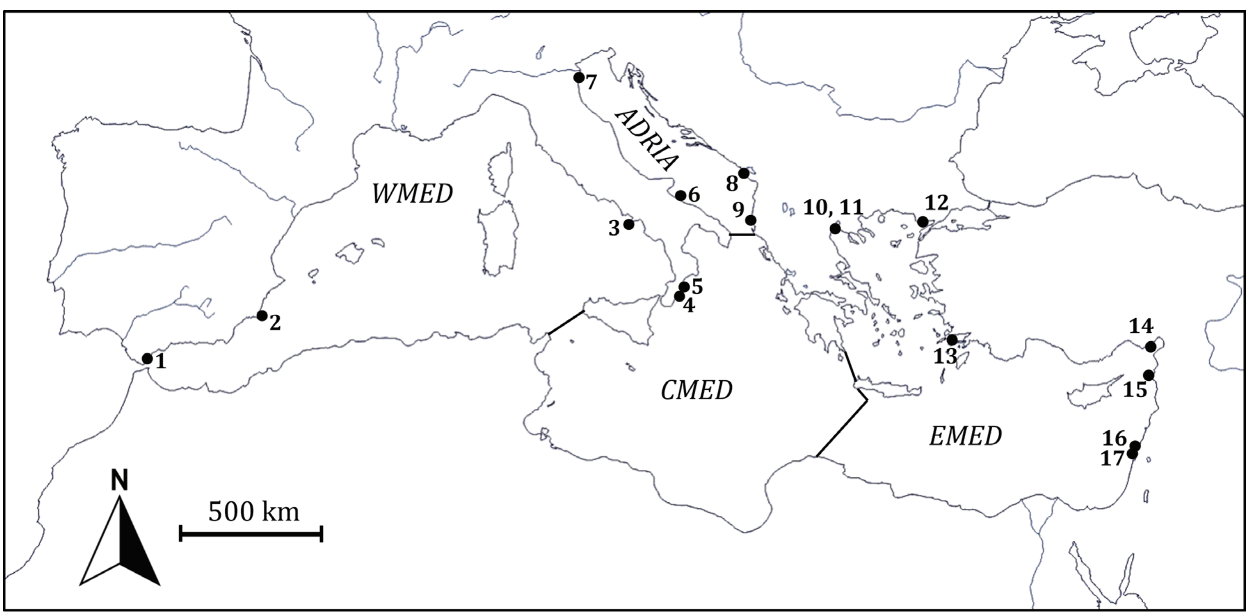

Fig. 1: Approximate locations of species records in the Mediterranean Sea presented in this paper. Location numbers (1-17) correspond with those on Table 1 (WMED - Western Mediterranean Sea, CMED - Central Mediterranean Sea, ADRIA - Adriatic Sea, and EMED - Eastern Mediterranean Sea).

Table 1. Species records metadata by Phylum, Sub-chapters (SC), basin (WMED - Western Mediterranean Sea, CMED - Central Mediterranean Sea, ADRIA - Adriatic Sea, and EMED - Eastern Mediterranean Sea), Location, Ecoregion sensu Spalding *et al*. (2007), and Location Number (LN) as in Figure 1.

Phylum	Species	SC	Basin	Location	Country	Ecoregion	LN
Rhodophyta	*Womersleyella setacea* (Hollenberg) R.E. Norris	6.1	EMED	Saros Bay	Türkiye	Aegean Sea	12
Chlorophyta	*Codium parvulum* (Bory *ex* Audouin) P.C. Silva	8.2	EMED	Haifa BayPort	Israel	Levantine Sea	17
Mollusca	*Fulvia fragilis* (Forsskål, 1775)	2.3	ADRIA	Margherita di Savoia	Italy	Adriatic Sea	6
Annelida	*Alitta succinea* (Leuckart, 1847)	5.1	EMED	Elefsis Bay, Saronikos Gulf	Greece	Aegean Sea	10
Arthropoda	*Ptilohyale littoralis* (Stimpson, 1853)	2.4	ADRIA	Sacca di Goro	Italy	Adriatic Sea	7
	Scyllarus subarctus Crosnier, 1970	2.1	WMED	Ischia Island	Italy	Tyrrhenian Sea	3
Chordata	*Acanthurus monroviae* (Steindachner, 1876)	1.2	WMED	Cabo de Palos	Spain	Western Mediterranean	2
	Cephalopholis taeniops (Valenciennes, 1828)	1.1	WMED	Algeciras	Spain	Alboran Sea	1
	Cheilodipterus novemstriatus (Rüppell, 1838)	6.2	EMED	Bodrum	Türkiye	Aegean Sea	13
	Ciona robusta Hoshino & Tokioka, 1967	3.1	ADRIA	Boka Kotorska	Montenegro	Adriatic Sea	8
	Fistularia petimba Lacepède, 1803	4.1	ADRIA	Bay of Vlora	Albania	Adriatic Sea	9
	Istiblennius cf. *meleagris* (Valenciennes, 1836)	7.1	EMED	Ras Ebn Hani	Syria	Levantine Sea	15
	Pterois miles (Bennet, 1828)	2.2	CMED	Badolato	Italy	Ionian Sea	5
		2.2	CMED	Gioiosa Ionica	Italy	Ionian Sea	4
	Synchiropus sechellensis (Regan, 1908)	5.2	EMED	Saronikos Gulf	Greece	Aegean Sea	11
		8.1	EMED	Northern Israel	Israel	Levantine Sea	16
	Synodus randalli Cressy, 1981	6.3	EMED	Iskenderun Bay	Türkiye	Levantine Sea	14

1. SPAIN

1.1 First record of *Cephalopholis taeniops* (Valenciennes, 1828) from the Strait of Gibraltar

Francesco TIRALONGO and Andrea SPINELLI

The African hind, *Cephalopholis taeniops* (Valenciennes, 1828), is a demersal fish characterised by a reddish-orange body and median fins with scattered small blue spots and by horizontal blue lines just below the eye. Its body is quite stout and high, slightly compressed laterally, with nine dorsal spines (with 15-16 dorsal soft rays) and three anal spines (with 9-10 anal soft rays). It has a large and oblique mouth, with lower jaw projected beyond upper jaw (Ben Abdallah *et al*., 2007). The African hind lives in sandy and rocky bottoms between 10 and 200 m depth (Ragkousis *et al*., 2020). Its natural distribution range include the eastern Atlantic African coast, from Morocco and Angola to Canary Islands, Cape Verde, Principe, and São Tomé Islands (Báez *et al*., 2019; Ragkousis *et al*., 2020). In the Mediterranean Sea, the species was first recorded in 2002 from Libya (Ben Abdallah *et al*., 2007), and subsequently spread in 2008-2016 in the eastern Mediterranean (Strait of Sicily, Malta, Lampedusa, Israel, and Çandarli Gulf in the Aegean Sea) (Ragkousis *et al*., 2020). More recently, the species was also reported from Almeria, western Spain (Stern *et al*., 2019), Syracuse, eastern coast of Italy (Ragkousis *et al*., 2020), and the Levantine coast of Turkey (Özcan *et al*., 2020). On the 21st April 2023, a specimen of *C. taeniops* was captured with a fishing rod by a local fisher (Mr. Francisco Jose Rodríguez López) off the port of Algeciras (Strait of Gibraltar, Spain) (36.13385° N, 5.40112° W) at 23 m of depth. The specimen was photographed immediately at the landing point. The estimated total length was 30 cm with a weight of about 700 g (Fig. 2). The record here reported represents the first from the Strait of Gibraltar and suggests a natural range expansion of this eastern Atlantic

Fig. 2: *Cephalopholis taeniops* from Algeciras, Strait of Gibraltar (Spain). Photo credits: Francisco Jose Rodríguez López.

species. In the current scenario of climate change, and in particular of water warming in Mediterranean waters, it is important to track the expansion of thermophilic species which may be invasive, altering the ecosystem and even affecting the economy.

1.2 Northernmost record of Monrovia surgeonfish [*Acanthurus monroviae* (Steindachner, 1876)] in the Western Mediterranean basin

Víctor ORENES-SALAZAR and José Antonio GARCÍA-CHARTON

The Monrovia surgeonfish, *Acanthurus monroviae* (Steindachner, 1876) (Osteichthyes: Acanthuridae), is a species native to the eastern Atlantic Ocean, inhabiting hard and rocky substrates primarily in inshore waters less than 30 m deep, and also lagoons and river mouths, from the coasts of Morocco to Angola, including Cape Verde archipelagos and the Canaries. In the Mediterranean Sea, *A. monroviae* is considered a range expanding species, as indicated by the increasing number of records of this species throughout the basin (Golani *et al*., 2021). Natural dispersal through the Strait of Gibraltar resulted in the first sighting of individuals of *A. monroviae* in 1981 in Marbella (Alboran Sea, southern Spain; Crespo *et al*., 1987), and later in Israel (1994), Algeria (2001), Libya (2004), Greece (2008), northern Tunisia (2010), Malta (2013), and Lebanon (2019). Until now, this thermophilic species had been officially recorded only twice in the coast of the Iberian Peninsula (Langeneck *et al*., 2015), with few recent unpublished records of scattered small adults, most of them near the Strait of Gibraltar (authors' personal observations), and a very recent record by artisanal fishermen in San José (Cabo de Gata marine reserve, Almería, 36.7622º N, 2.0754º W) (Juan José Núñez, pers. observ., 5th May 2023, https://www.instagram.com/p/Cr30j83s75o/). However, confirmed records of this species in the NW Mediterranean, north of the Almeria-Oran front, have yet to be documented (Golani *et al*., 2021).

On 17th July 2010, a single specimen of *A. monroviae* (Fig. 3) was captured by spearfishing east of La Manga (37.693649° N, 0.726398º W), near the cape of Palos (Spain, southwestern Mediterranean). The specimen was given to the second author by the spearfisherman and

Fig. 3: *Acanthurus monroviae* (Steindachner, 1876) captured in July 2010 east of La Manga, Spain.

identified as *A. monroviae* based on its deep and compressed ellipsoid body, a large caudal spine, and a bright yellow oval area on the caudal peduncle. The individual measured 375 mm in total length and was captured while diving at 12 m depth in a coastal rocky environment surrounded by *Posidonia oceanica* meadow and sandy patches. This record represents the first confirmed and northernmost observation of *A. monroviae* north of the Almeria-Oran front in the western Mediterranean basin.

The range expansion of *A. monroviae* northwards and eastwards in the Mediterranean Sea may be related to climatic changes that resulted in the gradual warming of surface waters, allowing for the immigration and the survival of Atlantic thermophilic species (Bianchi *et al.*, 2018). Therefore, the presence and dynamics of this non-native species should be closely monitored to verify the hypothesis of a more or less small breeding stock in Spanish waters and the potential for a range expansion toward the northwestern Mediterranean basin.

2. ITALY

2.1 A second record of *Scyllarus subarctus* Crosnier, 1970 (Decapoda: Scyllaridae) in the Mediterranean Sea based on its nisto stage

Valentina TANDUO and Fabio CROCETTA

Scyllarids (Arthropoda: Malacostraca: Decapoda: Scyllaridae) are widely known to have a life cycle that can be divided into a series of different developmental phases, whose sampling and identification are often tricky. Such difficulties are mostly due to limitation in obtaining samples and in rearing larvae in the laboratory, with the final result that several species are only known on the basis of their adults or their developmental phases are poorly represented in the scientific literature (Pessani & Mura, 2007; Palero *et al.*, 2009; Spanier & Lavalli, 2013; Genis-Armero *et al.*, 2019).

During the periodic analysis of the bycatch material obtained through commercial trawling operations held in the Gulf of Naples (Tyrrhenian Sea, central-western Mediterranean Sea), a scyllarid nisto stage (also called pseudibacus, the key transition linking the planktonic phyllosoma to the benthic adult) was sampled on the 19th May 2022 off Ischia Island, at a depth of ~400–500 m (~40.6703N, 14.0298E). The specimen was measured with a Vernier calliper (accuracy 0.1 mm), resulting to be 10.3×9.9 mm in carapace length×width and ~28.3 mm in total length from the margin of distal antennal segment to the posterior tip of the telson (Fig. 4A–D). With regards its morphological features and based on comparisons with the six scyllarid species already found in the Mediterranean Sea, it showed: (i) the anterior margin of the antennal segment VI with several well-defined lobes (Fig. 4A, red arrows); (ii) the pleura of pleonal somites II–V with somehow acute tips (Fig. 4A–B, green arrows) and spinulose margins (Fig. 4B, purple arrows); (iii) the thoracic sternum anteriorly U-shaped (Fig. 4C, blue arrow) without a clear tubercle on the last thoracic sternite; (iv) the merus of the pereiopod I bearing two separate spines at articulation with carpus (Fig. 4D, pink arrows). These diagnostic features exclude: (i) *Scyllarides latus* (Latreille, 1803), whose anterior margin of the antennal segment VI is rounded in specimen of a size (38.7 mm in total lenght) similar to the nisto stage hereby found (Spanier & Lavalli, 2013); (ii) *Scyllarus pygmaeus* (Spence Bate, 1888), whose pleura of pleonal somites is rounded, smooth, and without spines on lateral and posterior margins, whose thoracic sternum only has a slightly sunken incision or lacks it, whose tubercle on the last thoracic sternite is blunt, low, and conical, and whose merus of the pereiopod I almost lack spines (Palero *et al.*, 2009); (iii) *Scyllarus arctus* (Linnaeus, 1758), whose tubercle on the last thoracic sternite is somewhat flattened posteriorly and not conical, and whose merus of the pereiopod I has a single terminal spine (Palero *et al.*, 2009). On the other hand, the sample showed some similarities with the nisto stage of *S. subarctus*, only recently described by Genis-Armero *et al.* (2019), although the authors also mentioned a peculiar position and morphology of rostral, pre-gastric, and gastric teeth and a larger number of setae on pereiopods with respect to *S. arctus/S. pygmaeus*, characteristics difficult to compare based on the previously published literature (see Palero *et al.*, 2009) and without nisto stages of *S. arctus/S. pygmaeus* at hand. Finally, with regards the two remaining species recorded in the basin, namely *Scyllarus caparti* Holthuis, 1952 and *Acantharctus posteli* (Forest, 1963), to the best of our knowledge no description of nisto stages is still available (see also Pessani & Mura, 2007). Furthermore all scyllarid species already recorded from the basin are generally known to live at depths shallower than those investigated here; however, the present finding agrees with published literature, as nisto stages can be easily found deeper than adults, where they can develop into small juveniles under less predation threats, before moving to shallower depths (Palero *et al.*, 2009; Spanier & Lavalli, 2013). Thus, notwithstanding all these limitations and considering the paucity of information available in the literature, the most likely and conservative identification based on morphology was that the above-mentioned nisto stage belongs to *S. subarctus*, a species originally described from southern Angola (Eastern Atlantic Ocean) and only known from the Mediterranean Sea on the basis of a single adult specimen (Tanduo *et al.*, 2021). To verify the morphological identi-

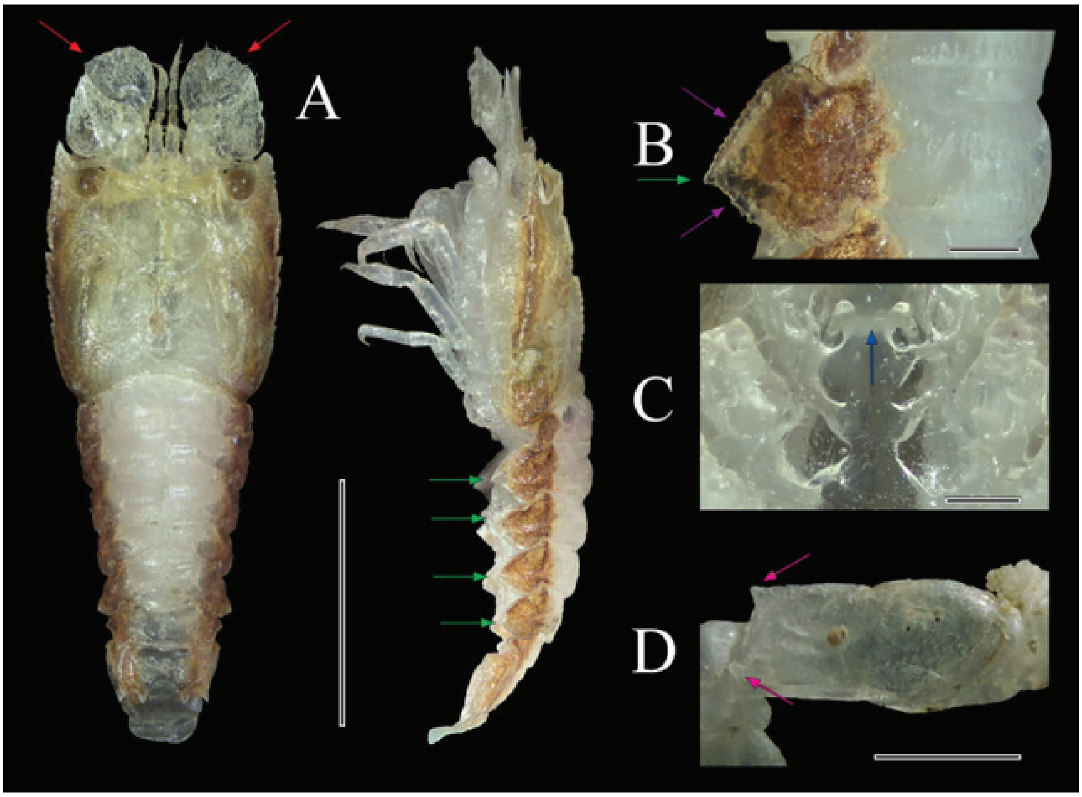

***Fig. 4*: The nisto stage of *Scyllarus subarctus* found in the Gulf of Naples (Tyrrhenian Sea, central-western Mediterranean Sea). A. Dorsal and lateral view. B. II pleonal somite. Red arrows highlighting well-defined lobes on anterior margin of antennal segment VI. Green arrows highlighting acute tips of pleura of pleonal somites II–V. Purple arrows highlighting spines on lateral and posterior margins of pleura. C. Thoracic sternum. Blue arrow highlighting U-shape. D. Merus of the pereiopod I. Pink arrows highlighting spines at articulation with carpus. Scale bars: A. 1 cm. B–D. 1 mm.

fication, barcoding of a partial sequence of the 16S rRNA gene was performed following the methods described in Tanduo *et al.* (2021). BLASTn queries of the 515 base pairs obtained showed a 99.01–99.76% similarity with *S. subarctus*, soon followed (≤98.06%) by *Scyllarus depressus* (Smith, 1881), with both results potentially falling in the known range of conspecificity. On the other hand, almost all the other known species in the genus *Scyllarus* Fabricius, 1775 were already sequenced for the same molecular marker used here (see Tanduo *et al.*, 2021), and similarities ≤94.29% excluded them. A very low genetic divergence between *S. subarctus* and *S. depressus* was already reported in the 16S rRNA sequences (Tanduo *et al.*, 2021 and references herein), but other molecular markers allowed discrimination even between these two species (Tanduo *et al.*, in preparation) and further confirmed the conspecificity of the present nisto stage with the adult of *S. subarctus* already found in the area. Therefore, DNA barcoding definitely assigned the nisto stage to *S. subarctus*. The obtained 16S rRNA sequence was deposited in GenBank with the accession number OP415550, while the specimen was fixed in 99.9% ethanol and deposited in the collection of the Laboratory of Benthos-Napoli (Stazione Zoologica Anton Dohrn, Naples) with the code SZN-B-3505CR121B.

The present sighting accounts for the second record of *S. subarctus* in the Mediterranean Sea and for the first based on its nisto stage. Moreover, it first shows such stage through photographs, facilitating subsequent identifications. Tanduo *et al.* (2021) suggested that this species may have been already present in the Mediterranean Sea and went so far misidentified with the similar *S. arctus* or undetected due to paucity of field monitoring. Alternatively, *S. subarctus* may have only recently expanded its distribution in the Mediterranean due to climate changes, that may have lessened the effectiveness of the barriers between the Atlantic Ocean and the Mediterranean Sea, or may have arrived with the help of human vectors such as shipping and ballast water (Tanduo *et al.*, 2021). Although not supported by the analysis of museum materials, according to us the former hypothesis is still the most plausible. However, also the two latter hypotheses may be true, as the present record may be connected with the previous one and may imply the presence of an established population in the Mediterranean Sea, or at least in the Gulf of Naples. Raising attention on this species, including its nisto stage, may facilitate further records in the Mediterranean basin and thus help shedding light on these uncertainties.

2.2 New records of the invasive common lionfish, *Pterois miles* (Bennet, 1828), in the Italian waters and first records in the Calabria region

Agostino LEONE and Emilio SPERONE

The common lionfish, *Pterois miles* (Bennet, 1828), is a tropical scorpaenid native to the coasts of the Indian Ocean and the Red Sea. It is distinguished from the red lionfish*, Pterois volitans* (Linnaeus, 1758), based on genetic and morphological meristic traits (Wilcox *et al*., 2017). These two species are regarded as some of the most successful invasive marine fishes, thus posing a significant challenge to the endemic biodiversity of the areas they have colonised (Ulman *et al*., 2022). Notably, *P. miles* has invaded the Eastern Mediterranean Sea through the Suez Canal, and within a decade, its range has expanded into the Central Mediterranean, advancing in a westward direction (Ulman *et al.*, 2022). In Italy, documented evidence of the presence of *P. miles* was first recorded off the coasts of Sicily in 2016 (Azzurro *et al*., 2017), and two additional sightings occurred in the Apulia region later in 2021 (Di Martino & Stancanelli, 2021). Below, we present two additional records of its presence along the Italian coasts.

On the 6th April 2023, a single individual of *P. miles*, (Fig. 5) was caught with a cuttlefish trap (keepnet). This occurrence took place on a soft bottom/rocky mixed seabed at a depth of approximately 18 m in the Calabrian Ionian Sea, off the shore of Badolato (approximate coordinates 38.568511° N, 16.578358° E). The specimen, measuring ≈10 cm, was found dead and subsequently discarded.

On the 3rd July 2023, another single individual of *P. miles* (Fig. 6) was photographed by a scuba diver near artificial reefs at a depth of approximately 23 meters. This observation took place on a soft bottom/rocky mixed seabed off Gioiosa Ionica shore, in Calabria (approximate coordinates 38.302745° N, 16.346281° E), approximately 23 nautical miles south of the first recorded sighting in Badolato.

Although the specimens were not preserved, their visible morphological features enabled their identification as *P. miles.* Despite the pictures were not geo-referenced, the EXIF data led to the conclusion that the records were genuine, and thus they represent the first records of *P. miles* in Calabria region.

Although due to the limited number of records, it remains uncertain whether the species has already established itself in Southern Italy, the evidence strongly suggests the ability of *P. miles* to expand westward in the Mediterranean, likely by unaided natural dispersion, in accordance with recent analyses of their thermal boundaries (Dimitriadis *et al*., 2020). In addition, the records reported here indicate that the habitat range expansion for this species might be ongoing.

Fig. 5: Specimen of common lionfish, *Pterois miles*, caught by cuttlefish trap off Badolato shore, Ionian Sea, Calabria, Italy. Photo credits: Massimiliano Cunsolo.

Fig. 6: Specimen of common lionfish, *Pterois miles*, observed on an artificial reef at about 25 m depth off Gioiosa Ionica shore, Ionian Sea, Calabria Italy. Photo credits: Ernesto Sestito.

2.3 The alien cardiid bivalve *Fulvia fragilis* (Forsskål, 1775) arrived in the Italian Adriatic Sea

Pasquale RICCI and Alessia LOGRIECO

Fulvia fragilis (Forsskål, 1775) is a mollusc bivalve species of the family Cardiidae Lamarck, 1809 native to the Indo-Pacific. It is characterised by a fragile and equivalve shell with an almost circular outline and a rounded anterior margin and 34 to 52 rounded ribs with calcareous spines and/or tubercles in its posterior part. Each valve has anterior and posterior lateral teeth, and two cardinal teeth. The shell colour is externally whitish, beige, to yellow, the umbo has a purple stain, while the nacreous layer is white with a purple shade in both the posterior part and the umbonal cavity. The periostracum is beige to yellow (Zenetos *et al.*, 2004).

Since 1939, the species was also recorded in the Mediterranean Sea, where it entered through the Suez Canal and is now widespread in mobile infralittoral bottoms and within *Cymodocea* and *Zostera* seagrass meadows (Zenetos *et al*., 2004; Gvozdenović *et al*., 2019). In Italy, the species was first recorded from the Tyrrhenian Sea in 2003, with subsequent records from the Ionian Sea held in 2007 (Servello *et al.*, 2019). No records still exist from the Italian Adriatic Sea, although the species was already recorded from Albania (Gerovasileiou *et al.*, 2017) and Montenegro (Gvozdenović *et al.*, 2019).

During a clam fishery monitoring survey held with hydraulic dredges on the 3rd October 2023 in the area of Margherita di Savoia (Italy, Adriatic Sea: 41.4280 N, 16.0275 E), a living individual (Fig. 7), and an empty shell of this taxon were found at 3 meters depth in an area characterised by the presence of salt marshes. The total lengths of shells were 32 and 34 mm, respectively (Fig. 8A-B) This finding first testifies the spreading of this species in the Italian Adriatic Sea.

Fulvia fragilis is considered a highly invasive species, able to compete with native bivalve species and to adapt to different environmental conditions (Rifi *et al*., 2011). Therefore, its further spreading in the area should be carefully monitored.

Fig. 7: The living individual of *Fulvia fragilis* found in Margherita di Savoia (Italy, Adriatic Sea).

Fig. 8**:** A-B Total lengths of *Fulvia fragilis* shells found in Margherita di Savoia (Italy, Adriatic Sea).

2.4 First record of the non-indigenous amphipod *Ptilohyale littoralis* (Stimpson, 1853) (Hyalidae, Hyalinae) in the Mediterranean Sea

Emanuele MANCINI, Marco LEZZI and Joachim LANGENECK

The west-Atlantic Hyalidae *Ptilohyale littoralis* (Stimpson, 1853) is considered an invasive species occurring in both euryhaline habitats, such as lagoons and estuaries, and coastal marine environments (Faasse, 2014; Spilmont *et al*., 2016; Marchini & Cardeccia, 2017; Lo Brutto & Iaciofano, 2018). The native range of *P. littoralis* is the North-Western Atlantic coast, but it has recently been reported along the North-Eastern Pacific coast, probably due to an extension of its range (Lo Brutto & Iaciofano, 2018). In European waters this species was reported in the Netherlands and in France (Faasse, 2014; Spilmont *et al*., 2016), but to date it has never been reported in Mediterranean waters (Costello *et al*., 2001). Clarifying the taxonomic identity of this species, and detailing its synonymy with *Ptilohyale explorator* (Arresti, 1989), Lo Brutto & Iaciofano (2018) demonstrated that *P. littoralis* occurs in European waters at least since 1985, and suggested that it might invade the Mediterranean Sea as well. On 19th April 2023, 16 specimens of *P. littoralis* were found on anthropogenic hard substrates located in the northern sector of the Sacca di Goro (Po River Delta, Emilia Romagna, Northern Adriatic Sea) (44.8402° N; 12.2941° E), representing the first record of the species in the Mediterranean Sea. All samples were collected on mooring posts located inside a *Magallana gigas* (Thunberg, 1793) oyster farm at the depth of 1.5 m. Fouling assemblages were sampled by scraping submerged horizontal surfaces through a 20 × 25 cm^2 steel sampling net (1 mm mesh size) armed with a steel blade; all the collected materials were fixed in 90% ethanol and preserved in 70% ethanol. Male specimens of *P. littoralis* (Fig. 9)

Fig. 9: Male individual of *Ptilohyale littoralis* sampled in the Sacca di Goro.

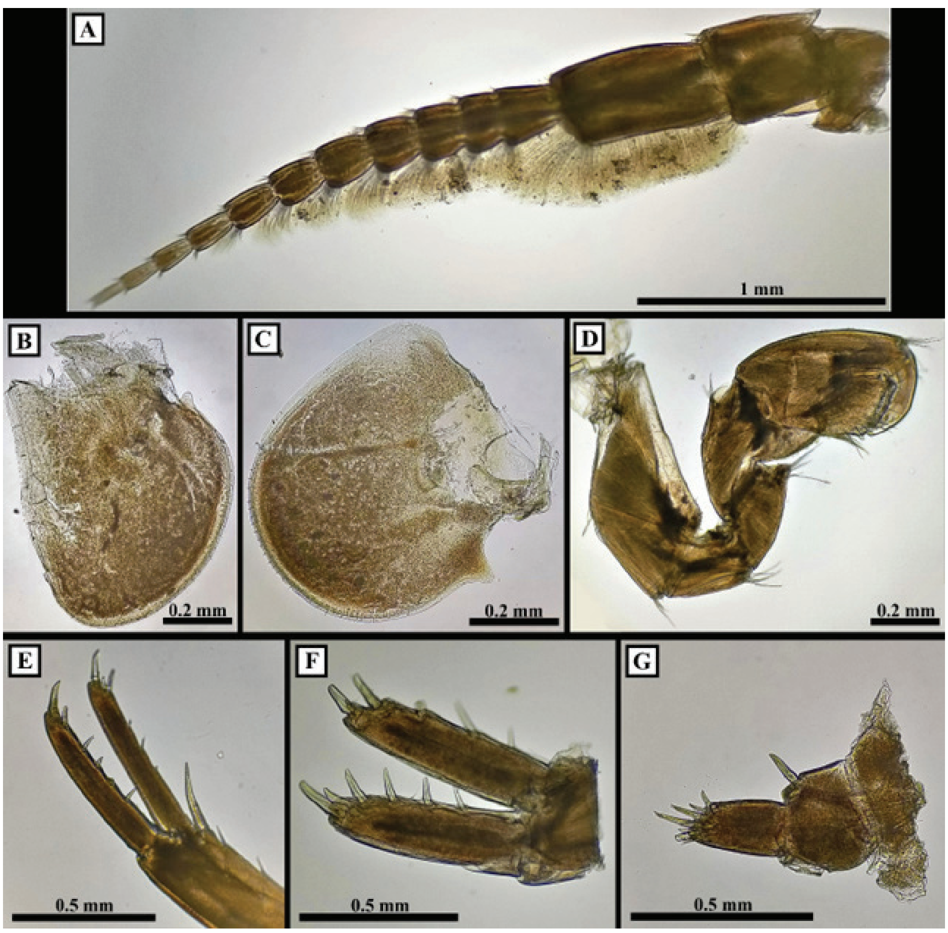

Fig. 10: Male individual of *Ptilohyale littoralis*, diagnostic characters. (A) antenna II; (B) coxa I; (C) coxa II; (D) gnathopod I; (E) uropod I; (F) uropod II; (G) uropod III.

were analyzed and identified following the descriptions of Faasse (2014) and Lo Brutto & Iaciofano (2018). Diagnostic characters include: ventral margin of antenna II densely covered with brush setae (5th peduncular article and first 5-8 articles of flagellum); coxal plate II with characteristics pronounced cups; coxal plate V with anterior lobe biggest than anterior one; basis of gnathopod I without anterodistal lobe; peduncle of uropod I with one distomedial robust seta; outer ramus of uropod I with 4 marginal spines (Fig. 10). It is important to underline that several non-indigenous species (NIS) have been found in the analyzed community: the Amphipoda *Ampithoe valida* S.I. Smith, 1873, *Jassa slatteryi* Conlan, 1990 and *Caprella scaura* Templeton, 1836, the Brachyura *Callinectes sapidus* Rathbun, 1893 and the Polychaeta *Polydora cornuta* Bosc, 1802. In fact, oyster farms and lagoon environments are considered as hotspots for NIS (Marchini & Cardeccia, 2017). In particular, *P. littoralis* was previously reported in association with oyster farms (Faasse, 2014); this suggests that import of *M. gigas* might represent the primary or secondary vector of introduction for this species into Italian waters.

3. MONTENEGRO

3.1 First record of the ascidian *Ciona robusta* Hoshino & Tokioka, 1967 from Montenegro

Slavica PETOVIĆ and Egidio TRAINITO

Ciona robusta Hoshino & Tokioka, 1967 was previously considered as *Ciona intestinalis* (Linnaeus, 1767), until Caputi *et al.* (2007) found that two *C. intestinalis* types, which they called “type A” and “type B” could be told apart by the sperm duct pigmentation, as “type A” individuals have orange sperm duct papillae and an uncoloured duct. Later, Sato *et al*. (2012) defined with greater precision the differences between “type A” and type B”, both for the colouration of the papillae of the sperm duct and for the presence of the characteristic prominences on the tunic of “type A”, described as distinctive of the species *Ciona robusta*. Brunetti *et al*. (2015), based on morphological and molecular studies, confirmed that *C. intestinalis* included the two cryptic species, named “type A” and “type B”. Morphological analysis of specimens belonging to the two types confirmed that only “type A“ specimens possess tunic tubercular prominences, and therefore they assigned it to *Ciona robusta* and type B to *C. intestinalis*. Studying differences within the genus *Ciona,* Mastrototaro *et al*. (2020) confirmed that sperm duct papillae are usually orange-red in *C. robusta.*

During a biological monitoring program of non-indigenous species on 7 November 2022 on the aquaculture site close to Dražin vrt (Boka Kotorska, Montenegro) (42.484804° N, 18.742322° E) we collected specimens of *Ciona robusta*. The program included the analysis of fouling communities on all the immersed structures of the farm at a depth range of 0-15 m. *Ciona robusta* was abundant (i.e., thousands of individuals) on the cages’ nets, and on the ropes that secured the structure to the seabed. Due to its abundance, it can affect adversely the aquaculture activities and hence could be considered invasive. The specimens ranged from 2 to 12 cm in height. Morphological observations were made on specimens before dissection, according to the *in situ* morphological characterization, and on dissected whole animals, separating sperm duct to highlight papillae. Our analyses confirmed the main distinctive characters of the species: a) tunic with tubercular prominences, papilla shaped or elongate, distributed along the whole body and prevalently arranged around the siphons (Fig. 11A); b) orange-red coloured sperm duct papillae (Fig. 11B).

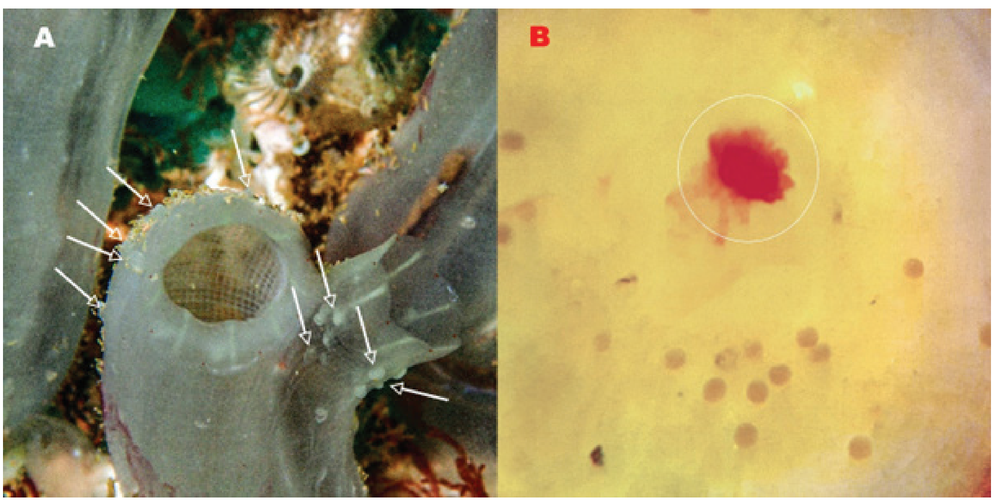

Fig. 11*:* A: *Ciona robusta* photographed *in situ* on the aquaculture structure, Boka Kotorska Bay Montenegro: white arrows highlight tubercular prominences on the tunic; B. Sperm duct papillae are usually orange-red (in the circle).

4. ALBANIA

4.1 First record of the red cornetfish *Fistularia petimba* Lacepède, 1803, in the Adriatic Sea

Rigers BAKIU and Sherif DURMISHAJ

The red cornetfish, *Fistularia petimba* Lacepède, 1803 is a cosmopolitan species of the tropical Atlantic, Indo-West Pacific and the Red Sea (Froese & Pauly, 2019). Firstly, it was recorded close to Western Mediterranean, Sea of Cadiz, Spain in 1996 and the single individual collected was assumed to originate from West Africa (Dragičević *et al*., 2019). Twenty years later, in 2016, two individuals were collected from Antalya Bay, Turkey (Ünlüoğlu *et al*., 2018) and one off the coast of Ashdod, Israel (Stern *et al*., 2018). Later, other individuals were collected from Iskenderun Bay (Turkey) in 2017 (Ünlüoğlu *et al*., 2018), Lebanon (Crocetta *et al*., 2021), Aegean waters of Turkey in 2019 (Cerim *et al*., 2021), Northeastern Aegean islands of Greece (Crocetta *et al*., 2021) and recently from Cyprus in 2019 (Dragičević *et al*., 2019). Its establishment in the Mediterranean Sea has been further documented by Papageorgiou *et al*. (2023) showing its presence in Egypt and Syria.

On October 5th 2023, two individuals of the red cornetfish (Fig. 12A) were caught with the use of trammel nets in the Bay of Vlora (40.33° N, 19.43° E) by a fisher of the Fishing Center Oriku, at a depth of 25 m, over a muddy bottom. Individuals were identified to species level and measured. Total Length (TL) of the largest individual was 57 cm and the relative weight was 74 g, while TL and weight of the other individual were 48 cm and 32 g, respectively.

The morphological, biological and ecological similarities of this species with its congeneric *Fistularia commersonii* Rüppell, 1838 are strong. However, as it is stated in Dragičević *et al*. (2019) there are some morphological characteristics, which distinguish these species from each other. Both individuals were brownish-orange in colour whereas *F. commersoni* is greenish-brown and presented sharp retrorse spines along the posterior lateral line ossifications (blunt in *F. commersonii*) (Fig. 12B). Additionally, *F. petimba* has elongated bony plates embedded in the skin along the midline of its back (Stern *et al*., 2018). Similarly to *F. commersonii*, the red cornetfish is considered a Lessepsian sprinter (Stern *et al*., 2018), showing a rapid and progressive expansion along the Eastern Mediterranean, and recently moving northward in the Aegean Sea (Crocetta *et al*., 2021). Particular attention should be paid in the Adriatic Sea to the management of non-indigenous species which have rapidly and successfully established in the Mediterranean Sea in a very short time after their introduction.

Fig. 12: Red cornetfish *Fistularia petimba* fished in the Bay of Vlore (Albania), (A) photo of the two specimens, (B) the sharp retrorse spines along its posterior lateral line ossifications. Photo credits: Sherif Durmishaj.

5. GREECE

5.1 First record of *Alitta succinea* (Leuckart, 1847) (Annelida: Polychaeta: Nereididae) associated with fouling in Greece

Giorgos CHATZIGEORGIOU and Argyro ZENETOS

Alitta succinea (Leuckart, 1847), common name pile worm, is an aquatic sedentary polychaete usually found in brackish waters and estuaries. It is considered native to Europe's Atlantic coasts but has been introduced in many areas around the world, most likely as a part of fouling community on ships' hulls. On 21/01/2021, during routine cleaning of the oil/chemical tanker "ST MARSEILLE" (IMO 93675358), in Elefsis Bay, Saronikos Gulf (Greece), 20 specimens of *Alitta succinea* were found among the biofouling material collected from the hulls. According to vessel's log book the previous departure ports was Varna in the Black Sea. Indeed, Băncilă *et al*. (2022) have included *A. succinea* among the established alien species in Romania and Bulgaria

Our specimens were identified with morphological and genetic (DNA barcoding of mtCOI gene) techniques (GenBank accession number, OQ152962). According to the description of Villalobos-Guerrero & Carrera-Parra (2015), the pharynx of the species includes conical paragnaths, except some pyramidal in area VII-VIII with the following pattern: Maxillary ring, I=3, in a longitudinal line, II=20-21, two or three irregular curved row with small and large cones, III=35, four irregular rows in a rectangular group and IV area with 28-29 crescent-shaped. Oral ring, V=0, when present two longitudinal or transversal cones, or three cones in triangular form, VI=9 arranged in a circular group, VII-VIII=51, consists of two rows cones and pyramidal. Our specimens appeared to follow the same paragnaths pattern as described above with I=2, II=21, III=35, IV=38, V=1, VI=9 and VII-VIII=50 (Fig. 13). Homogomph notochaetae spinigers are present (homogomph falcigers are absent). Neurochaetae pattern at dorsal fascicle include homogomph spinigers and heterogomph falcigers, while in ventral fascicle heterogomph spinigers and falcigers are present. BLASTN results of OQ152962 showed 99.5% similarity with other GenBank sequences of other *Alitta succinea* records.

In the phylogenetic analysis, selected sequences from all localities of *A. succinea* available were used, while the species *Alitta virens* (accession number: OP038701.1) was used as an outgroup (Fig. 14). Identical sequences from the same localities were omitted. The phylogenetic tree constructed for the mitochondrial COI gene, displays that our specimen is placed within the species *A. succinea*. In detail, our specimen presents >99% similarity to specimens collected worldwide. The majority of sampling sites is characterised as brackish – low salinity and this confirms that *A. succinea* prefers habitats with low to moderate salinity, in contrast with our specimen which was found in a site with high salinity. Consequently, its survival and establishment in high salinity ports such as the Elefsis port (Saronikos Bay) is highly unlikely.

Alitta succinea has been studied with molecular techniques that are currently outdated (Abbiati & Maltagliati, 1992), thus its distribution in the Mediterranean Sea remains uncertain. Many reports of *Alitta succinea* reported also as *Neanthes succinea* may actually refer to *Nereis lamellosa* Ehlers, 1868, which in turn is probably underreported in the Mediterranean. Although, there are several records of *A. succinea* in the Mediterranean (Turkey, Italy, Greece: see https://www.cabdirect.org/cabdirect/abstract/20107601143), most identifications are lacking DNA verifications e.g. the latest record from Alexandria, Egypt (Abdelnaby, 2020).

Villalobos-Guerrero & Carrera-Parra (2015) suggest that detailed morphological and genetic examination of *A. succinea* populations worldwide will be needed to resolve their identity and invasion status. In the lack of se-

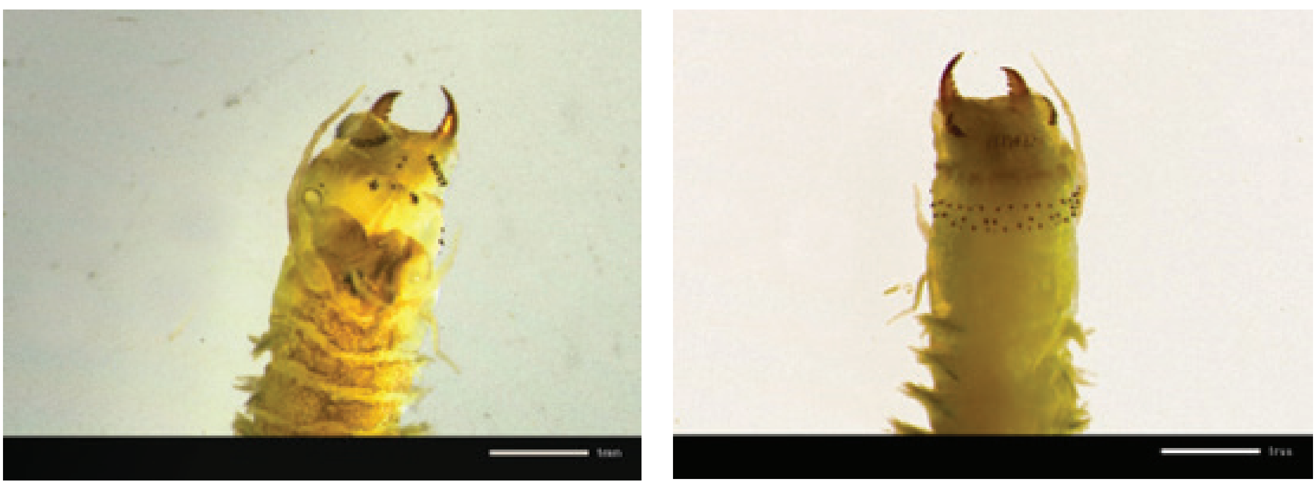

Fig. 13: View of maxillary and oral ring in *Alitta succinea* (left: dorsal view, right: ventral view).

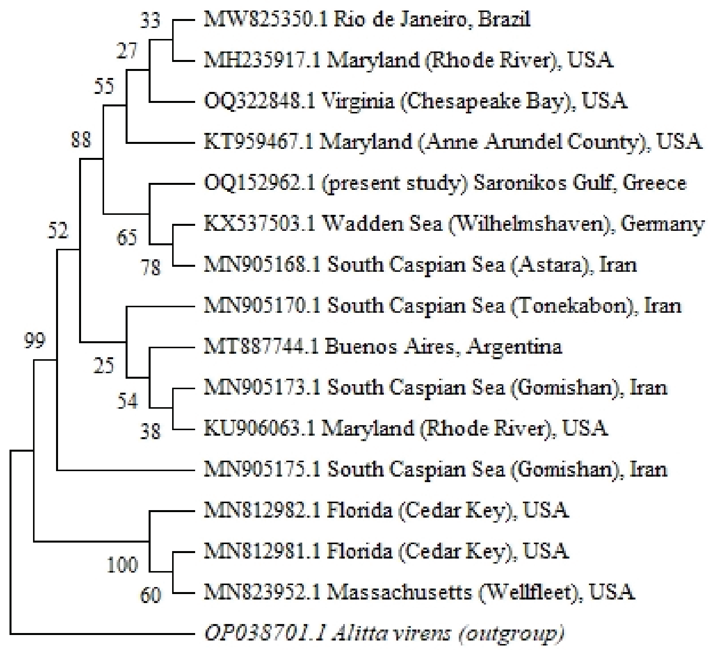

Fig. 14: The phylogenetic position of the *Alitta succinea* specimen (accession number: OQ152962.1) in relation to other COI sequences of the species available in GenBank and/or BOLD databases. Evolutionary analyses were conducted in MEGA X and the Neighbour-joining tree was constructed using Kimura-2P distances and 1000 bootstrap replicates.

quence data for the Mediterranean Sea, besides this work, there is a need for an extensive genetic study of this species in the region.

The species was previously reported on fouling panels in the Aegean Sea (Koçak *et al*., 1999). The present work documents Transport-Stowaway – hull fouling as its vector of transport worldwide and classifies *Alitta succinea* as a cryptogenic species in the Mediterranean.

5.2 First record of *Synchiropus sechellensis* Regan, 1908 in Saronikos Gulf (Greece)

Nikoletta CHALARI and Iasonas ZAFEIRIDIS

Synchiropus sechellensis Regan, 1908, commonly known as Seychelles dragonet, is a small benthic fish belonging to the Callionymidae family. It is widely distributed in the Indo-West Pacific and the Red Sea. The occurrence of the Seychelles dragonet in the Mediterranean Sea, according to the literature, so far, is limited in the southeastern part of the basin. The species was first recorded in the Levantine Basin, from the Gulf of Antalya in Turkey (Gökoğlu *et al*., 2014), Cyprus (Michailidis & Chartosia, 2016), Greece (Kastellorizo: Kondylatos *et al*., 2016) and Egypt (Gerovasileiou *et al*., 2017). In the Southern Aegean the occurrence of the species includes records from the Greek islands Rhodes (Kondylatos *et al*., 2016) and Crete (Metaxakis *et al*., 2019). Further evidence of the species' rapid expansion comes from recent documentation in the Ionian Sea (Yokeş *et al*., 2018). Although these records generally consisted of one or two individuals at a time, it seems that this Lessepsian immigrant has been well established in certain areas of the Levantine region. The substantial number of individuals caught by commercial trawl operation in Egypt (Gerovasileiou *et al*., 2017) strengthens this hypothesis.

A male specimen of *S. sechellensis* of 124 mm total length and 19 g weight was caught for the first time on 15.06.2023 in Saronikos Gulf, Aegean Sea, Greece (37.8865334° N, 23.7005165° E) (Fig. 15). The specimen was collected from the discards in a haul of a trammel net, in a commercial fishing vessel, on a sandy-weedy bottom, at a depth between 14 and 22 m. The present record indicates a northward expansion of this species in the Aegean Sea, showing that the Seychelles dragonet is spreading swiftly in new areas.

Fig. 15: Male specimen of *Synchiropus sechellensis*, Saronikos Gulf, Aegean Sea, Greece.

6. TÜRKIYE

6.1 New record of the alien marine red alga *Womersleyella setacea* (Hollenberg) R.E.Norris for Turkish coasts

Ergün TAŞKIN and Ersin MİNARECİ

The genus *Womersleyella* was established by Hollenberg (1967), and *Womersleyella pacifica* Hollenberg is the type species of the genus. Four species, *Womersleyella herpa* (Hollenberg) R.E.Norris, *Womersleyella kwazuluensis* R.E.Norris, *Womersleyella pacifica* Hollenberg and *Womersleyella setacea* (Hollenberg) R.E.Norris are reported as current names within this genus (Guiry & Guiry, 2023). The alien red macroalga *Womersleyella setacea* (Hollenberg) R.E.Norris (Rhodophyta: Florideophyceae: Ceramiales: Rhodomelaceae) was originally described (as *Polysiphonia setacea* Hollenberg) from the Hawaiian Islands, and is known from the Indo-Pacific Ocean (Indonesia, Micronesia, Philippines, Polynesia, South China Sea, Maldives), Atlantic Ocean (Western Atlantic, Bermuda, Canary Islands) and the Mediterranean Sea (Adriatic Sea, Balearic Islands, Corsica, Cyprus, France, Greece, Italy, Lebanon, Maltese islands, Spain) (Guiry & Guiry, 2023). *Womersleyella setacea* is well-established in the Mediterranean Sea (Ragkousis *et al*., 2023). Low light and low temperature (12ºC) levels are critical for the survival and growth of *W. setacea* in the Mediterranean Sea (Cebrian & Rodríguez-Prieto, 2012). In this study, *W. setacea* is reported for the first time in Türkiye.

Samples were collected in April 2022 by snorkelling at 3 m depth in Saros Bay (Aegean Sea, Türkiye) (40.5087ºN; 26.6933ºE), where the species was epiphytic on the seagrass *Posidonia oceanica*, at a temperature of 12ºC, the salinity of 30 ‰. The material was preserved in 4% formaldehyde in seawater. It was examined at the Department of Biology, Manisa Celal Bayar University (Türkiye) using a light microscope (Nikon SE) with photographic equipment (Nikon P5100). The identification of this alga was made based on Athanasiadis' (2016) account. Thalli were filamentous, 0.5 to 2 cm long and dark pink in colour. They consisted of prostrate and erect axes, and unbranched or sparsely and irregularly branched. Axes consisted of a central axial cell and four pericentral cells, ecorticate. Erect axes has a diameter of 50-70 (-100) µm in middle parts (Fig. 16A), growing from apical cells 8-10 µm in diameter (Fig. 16B). Tetrasporangia were not found in the collected material. *Womersleyella setacea* may have reached Türkiye through the shipping of fouling. Other species present at the collection site included: the brown algae *Cystoseira* spp., *Dictyota dichotoma* (Hudson) J.V.Lamouroux, *Halopteris scoparia* (Linnaeus) Sauvageau and *Padina pavonica* (Linnaeus) Thivy, the red algae *Ellisolandia elongata* (J.Ellis & Solander) K.R.Hind & G.W.Saunders and *Jania rubens* (Linnaeus) J.V.Lamouroux, the green algae *Cladophora* spp. and *Ulva* spp., the seagrasses *Cymodocea nodosa* (Ucria) Ascherson and *Posidonia oceanica* (Linnaeus) Delile.

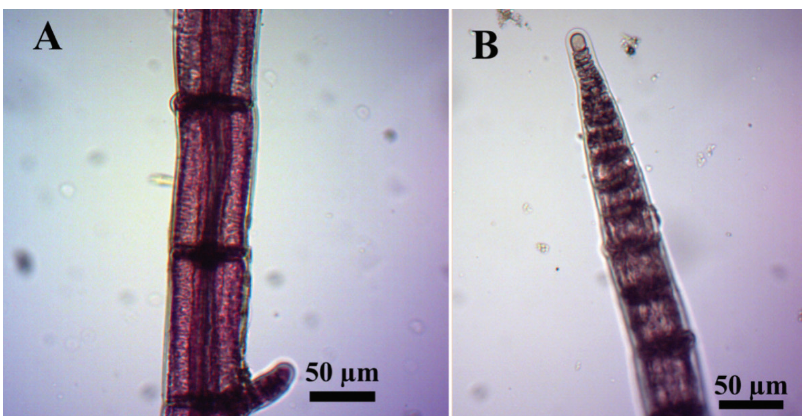

Fig. 16: The invasive red alga *Womersleyella setacea* from Türkiye, erect axes in middle parts (A) and apical cell (B).

6.2 Boom for now not bust yet: Range extension of *Cheilodipterus novemstriatus* (Rüppell, 1838) in the Aegean Sea

Anıl GÜLŞAHİN and Sercan YAPICI

The genus *Cheilodipterus* Lacepède, 1801 includes 17 valid species in the world and is represented by *Cheilodipterus novemstriatus* (Rüppell, 1838) in the Mediterranean (Froese & Pauly, 2023). This species is easily distinguished from other apogonids in the Mediterranean by its unique colour features, such as four distinct black stripes on the body, a large yellow spot on both sides of the caudal fin, a prominent black mark in the middle,

Fig. 17: A school of *Cheilodipterus novemstriatus* in the Aegean Sea.

and a black spot on the dorsal part of the caudal peduncle (Çiçek *et al.*, 2020). The first record of Indian Ocean twospot cardinalfish, *C. novemstriatus,* in the Mediterranean was given from the Israeli coasts by Goren *et al*. (2010). After that, the species were reported from eastern Mediterranean coasts (for details, see Ragkousis *et al*., 2020 and references therein). Its first observation on the Turkish coast was reported in 2014 from İskenderun Bay (Turan *et al*., 2015).

On 08 June 2023, an overpopulation of *C. novemstriatus* was observed by one of the authors (A.G) from off Bodrum, Türkiye (37.1163° N, 27.3114° E), in the South Aegean Sea (Fig. 17). The video was uploaded as an electronic reference and can be viewed online at https://www.youtube.com/watch?v=s4eO1tS4FCo.

Cheilodipterus novemstriatus was introduced in the Mediterranean only thirteen years ago; however, it has been reported multiple times along the eastern Mediterranean coasts, including records from Lebanon, Türkiye, Cyprus, Syria, and Greece (Ragkousis *et al*., 2020 and references therein). Generally, some Lessepsian fish species are probably overlooked in many areas of the Mediterranean Sea because of their small sizes or cryptic behaviour, resulting in detection lags and lags in geographical expansion (Azzurro *et al.*, 2016). Therefore, the actual distribution of *C. novemstriatus* in the Mediterranean could be wider than is known. In addition, a symbiotic relationship between sea urchins, especially with the non-indigenous *Diadema setosum* (Leske, 1778), provides advantages for settlement, increasing biomass, and range expansion for *C. novemstriatus* (Çiçek *et al.*, 2020).

6.3 First record of the non-indigenous Randall's lizardfish *Synodus randalli* Cressey, 1981 in the Mediterranean Sea

Cemal TURAN and Servet Ahmet DOĞDU

Non-indigenous fish species have increasingly penetrated the Mediterranean Sea via the opening of the Suez Canal coupled with climate change (Turan *et al*., 2016). Lizardfishes belong to the family Synodontidae and are currently represented by 83 valid species and four valid genera (Fricke *et al*., 2023). Randall's lizardfish *Synodus randalli* Cressey, 1981 is a native fish species of the Red Sea. It has also been reported from the coast of Madagascar in the Indian Ocean (Fricke *et al*., 2018). Here, we first record *Synodus randalli* in the Mediterranean Sea.

On 23 June 2023, one specimen of *S. randalli* was captured at about 80 m by a trawler from Iskenderun Bay (36.397185° N, 35.444191° E) in the Mediterranean Sea (Fig. 18). The species was identified according to Cressey (1981). It had a total length of 187 mm and weighed 51.89 g. The meristic and morphometric characteristics of the specimen are given in Table 2 and compared with Cressey (1981). The specimen was preserved in freezer at the Molecular Ecology and Fisheries Genetic Laboratory (Department of Marine Sciences, Iskenderun Technical University, Turkey) for further genetic analysis.

Synodus randalli has a fusiform body, a somewhat depressed head and its caudal region is a little compressed. The species has large cycloid scales on its entire body. The snout is sharply pointed and the pectoral fin reaches beyond a line from base of pelvic fin to origin of dorsal fin. It has a series of reddish brown-yellowish saddle-like bands on the body and all fins, especially the dorsal and pelvic fins, have 3 to 5 similarly coloured bars.

Meristic counts agreed with those reported for *S. randalli* in Cressey (1981) (Table 2). Morphological characters distinguishing this species from other congeners, include the caniniform teeth, the arrow-shaped tips of larger teeth, pectoral fin that reaches beyond a line from base of pelvic fin to origin of dorsal fin, and unbranched outer pelvic ray. In the Mediterranean, there is only one indigenous species of the genus *Synodus*, namely the Atlantic lizardfish *Synodus saurus* (Linnaeus, 1758). Recently, another lizardfish of the family Synodontidae, *Saurida gracilis* (Quoy & Gaimard, 1824) was also reported in the Mediterranean Sea from northern Tunisia (Khamassi *et al*., 2023).

The present record is the first record of *S. randalli* in the Mediterranean Sea. However, a single captured spec-

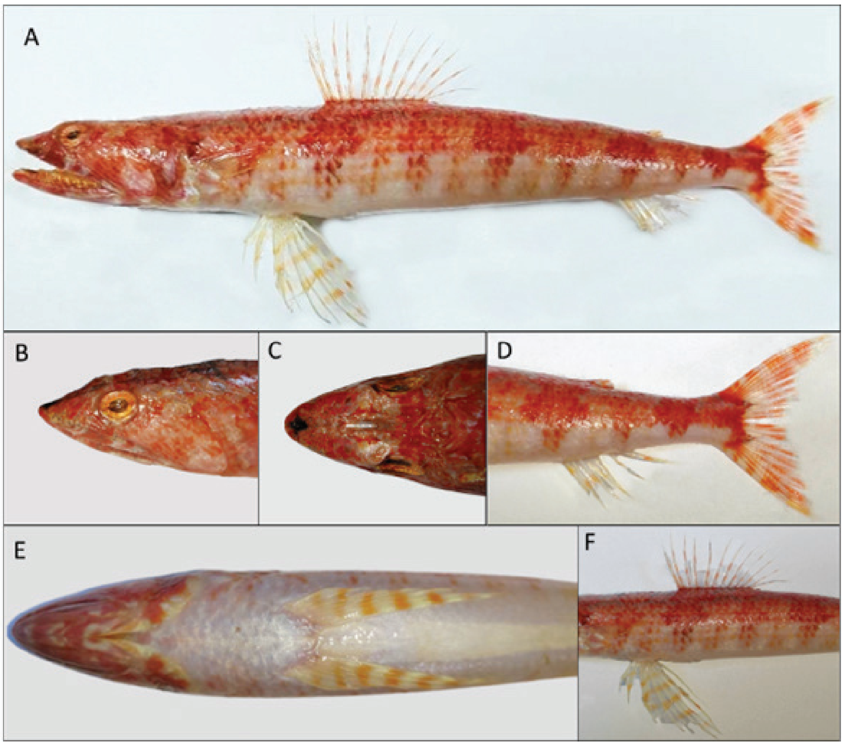

Fig. 18: A) Lateral view of *Synodus randalli* caught from Iskenderun Bay (total length = 187 mm); B) Side view of the head; C) Top view of the head; D) Side view of adipose, anal fin and caudal fin; E) Bottom view of head and pelvic fin; F) Side view of the dorsal and pelvic fin.

Table 2. Morphometric measurements of the *Synodus randalli* individual captured in the Mediterranean Sea and comparison with a previous record from the Red Sea.

Morphometric Measurements (mm)	This Study	Cressey (1981)
Total length	187	-
Fork length	173	-
Standard length	161	113
Head length	45.56	31.97
Snout length	11.21	8.13
Upper jaw length	28.81	20.22
Diameter of bony orbit	11.02	7.68
Least width of bony interorbital	7.39	3.95
Pre-dorsal fin origin	66.91	49.72
Pre-adipose origin	133.79	93.90
Pre-anal fin origin	133.62	92.88
Pre-pelvic fin origin	55.80	43.61
Pre- pectoral fin origin	41.80	40.11
Eye diameter	6.22	-
Counts		
Dorsal fin rays	13	13
Anal fin rays	8	8
Pectoral fin rays	12	12
Ventral fin rays	8	8
Lateral-line scales	58	55
Weight (g)	51.89	-

imen may not necessarily reflect the presence of a settled population. *Synodus randalli* is a native fish species in the Red Sea, and thus, its possible pathway into the Mediterranean Sea is via the Suez Canal. On the other hand, there have been not any records of this species between the Suez Canal and Iskenderun Bay. Therefore, it might also be introduced via ballast waters since Iskenderun has a big harbour.

7. SYRIA

7.1 Further expansion of *Istiblennius* cf. *meleagris* (Valenciennes, 1836) in the Mediterranean Sea: first record from Syria

Francesco TIRALONGO

The peacock rockskipper, *Istiblennius meleagris* (Valenciennes, 1836), is a non-indigenous fish of the Blenniidae family recently recorded in the Mediterranean Sea. Indeed, several specimens were recorded in the period 2016-2019 in Israel (Rothman *et al*., 2020). Subsequently, in 2022, two specimens of this species were recorded in the nearby coast of Lebanon (Badreddine & Tiralongo, 2022).

On 29th June 2023, a male specimen of *Istiblennius* cf. *meleagris* (Fig. 19A, B) was observed and photographed with a Nikon D3000 camera at Ras Ebn Hani (Syria), a coastal marine reserve located in the northern coast of Latakia (35.58957N; 35.73326 E) by a naturalist, that provided to the author photos and data on the records from Syria here reported. The fish had an estimated total length of 15 cm and was found in a small tidal pool of the "spray zone" (supralittoral), several centimeters above the sea level. Other two specimens were observed in the same location and habitat on 6th July 2023. Associated fish species at the site were two other blennies, *Coryphoblennius galerita* (Linnaeus, 1758) and *Salaria pavo* (Risso, 1810). An additional female specimen was caught in the same area on 13th July 2023 with a baited hook and line (Fig. 19C).

Considering the proximity to the Lebanese coasts (265 km in a straight line), and the history of this blenny's introduction and expansion along the Israeli coast, it is possible that our specimens comes from an expanding population established in the southern Levantine Sea. Since no detailed analysis have been conducted on the observed specimens, we considered it as *Istiblennius* cf. *meleagris*. However, it showed typical general morphology and behaviour. The body of the species was thick and

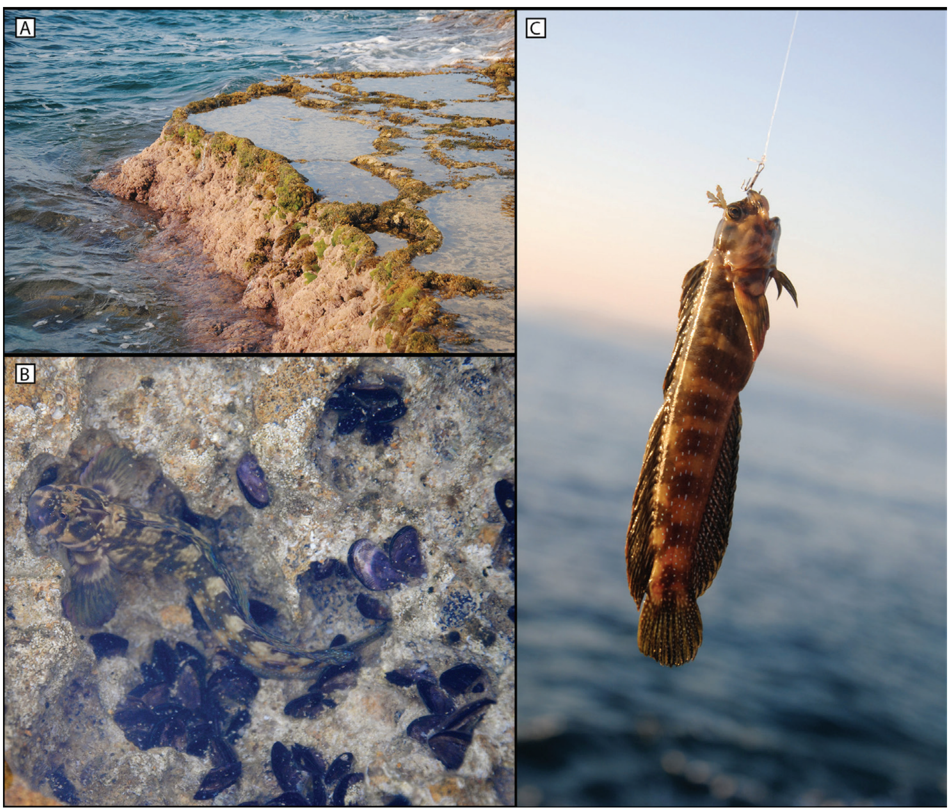

Fig. 19: A) Habitat (tidal pool system) in which the species was observed; B) the male specimen of *Istiblennius* cf. *meleagris* observed at Ras Ebn Hani (Syria) on 29th June 2023; larger mussels are *Brachidontes pharaonis* (non-indigenous species); C) the female specimen of *Istiblennius* cf. *meleagris* caught at Ras Ebn Hani (Syria) on 13th July 2023.

had highly branched orbital cirri; the body was brown, elongated and laterally compressed, with small blue spots (Rothman *et al*., 2020; Badreddine & Tiralongo, 2022). Furthermore, its morphological features did not match any other blenny species reported in the Mediterranean Sea, alien species included (Tiralongo, 2020). The Mediterranean species that resemble it most, in both its habits and morpho-chromatic characters, is the semi-amphibious blenny *C. galerita*. Indeed, this latter species shows a similar colour pattern with small light spots on body, and elongated body and a stout head of similar shape (Tiralongo *et al*., 2016).

Shipping was indicated as the most probable vector of introduction of this species in the Mediterranean Sea (Rothman *et al*., 2020). Furthermore, considering its natural known distribution range (Australian waters), further studies from the morphological and genetic point of views are necessary to better understand the worldwide distribution and origin of this species, but also to better define the species from a taxonomic point of view (Rothman *et al.*, 2020). According to the data available from published literature and the potential invasiveness of the species (Rothman *et al.*, 2020; Badreddine & Tiralongo, 2022), it is probable a further expansion of this species in next years. Another non-indigenous blenny species, namely *Ophioblennius atlanticus* (Valenciennes, 1836), in this case of Atlantic origin, seems to be expanding in the central Mediterranean Sea (Ragkousis *et al*., 2020).

8. ISRAEL

8.1 Levantine 'backward expansion' of the non-indigenous dragonet *Synchiropus sechellensis* Regan, 1908, with its first confirmed genetic documentation

Nir STERN and Aviyam TAGAR

Due to its proximity to the Suez Canal, the Israeli coast is known to host the largest number of marine non-indigenous species (NIS) in the Mediterranean Sea, originating mainly from the Red Sea or Indo-Pacific Ocean (Galil, 2023). In this regard, out of more than a hundred fish NIS known from the Israeli coast, only eight Lessepsian species were documented elsewhere prior to their Israeli report: *Champsdon nudivittis* (Ogilby, 1895), *Heniochus intermedius* Steindachner, 1893, *Jaydia queketti* (Gilchrist, 1903), *Lagocephalus sceleratus* (Gmelin, 1789), *Ostracion cubicus* L., *Platax teira* (Fabricius, 1775), *Tylerius spinosissimus* (Regan,1908), and *Vanderhorstia mertensi* Klausewitz, 1974. In this study, we present the ninth record of this kind, reporting the already established non-indigenous dragonet *Synchiropus sechellensis* Regan, 1908 from the Israeli coast, almost nine years after its first Mediterranean record (Gökoğlu *et al.*, 2014). In addition, we provided the first genetic record of this species throughout its native and invaded distribution.

During a scientific bottom trawl survey conducted in the 12th of June, 2023 in Northern Israel (33.025167° N, 34.999833° E), a single male individual has been collected at depths of 56-67 m, 88 mm in total length and 6.9 g in total weight (Fig. 20). Upon its arrival to the lab, it has been identified to species level based on the criteria of Fricke (2000). Next, total DNA has been extracted from muscle tissue and 698bp of the barcoding gene '*COI*' has been amplified following standard protocols. Lastly, the specimen has been deposited in the Steinhardt Museum of

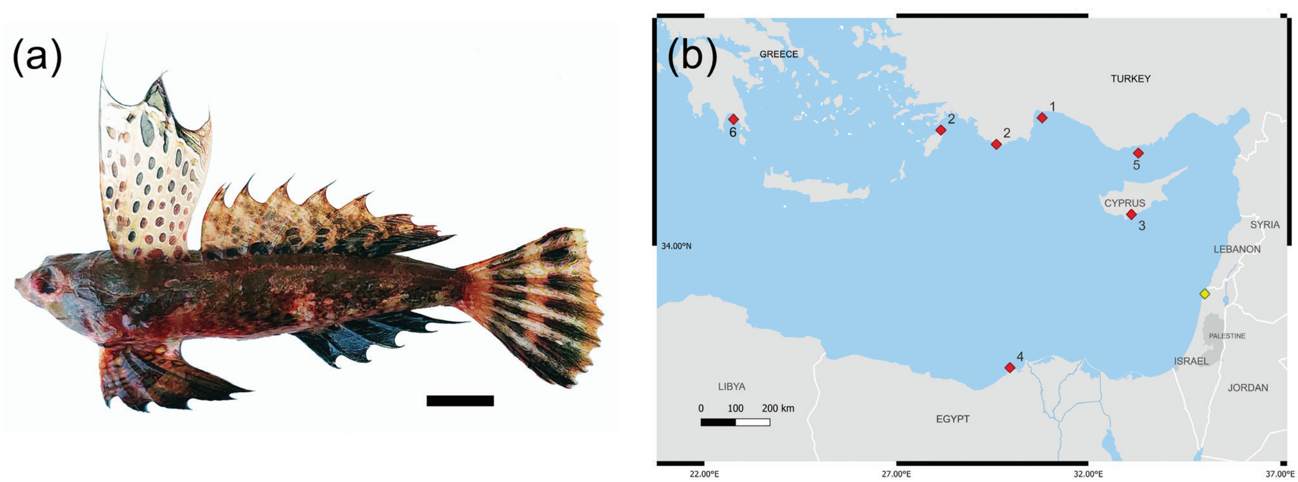

Fig. 20: (a) A male individual of *Synchiropus sechellensis*, northern Israel, 12/06/2023. Scale bar = 1 cm; (b) Chronological previous records of *S. sechellensis* in the Eastern Mediterranean Sea. In yellow, the current report. (1) First record, Antalya Bay, Turkey; (2) Aegean Sea; (3) Offshore Cyprus; (4) Egyptian record near Alexandria; (5) Aydıncık coast, Turkey; (6) Ionian Sea.

Natural History in Tel Aviv University under the voucher SMNHTAU P. 17073 and its sequence has been uploaded to BOLD platform under the accession BIM1170-23.

As noted in its previous records, *S. sechellensis* is a 'classic' Lessepsian NIS that most likely arrived through the Suez Canal (Yokeş *et al.*, 2018). However, its documented historical route in the Levant Basin, as shown in Figure 20b, can also indicate on multiple arrivals and the likelihood of ship stowaway incidents that have transported it directly to Turkish or Greek waters prior to its expansion eastward, as firstly suggested in Gökoğlu *et al.* (2014).

Last, despite the continuous worldwide use of DNA-based methods to describe biodiversity, our current genetic record is found to be the first for this species. Previous *COI* accession that was registered under *S. sechellensis* (PHILA1881-16 in BOLD and OQ385950 in NCBI) is shown here as a misidentification for its congener *Synchiropus altivelis* (Temminck & Schlegel, 1845) based on photo provided in BOLD and by self-BLASTing its sequence in NCBI. This incidence further emphasises the need for verified taxonomy behind DNA sequences in order to accurately describe and monitor biodiversity.

8.2 Recurrent blooms of the invasive seaweed *Codium parvulum* (Bory ex Audouin) P.C.Silva (Bryopsidales, Chlorophyta) in the SE Mediterranean Sea

Razy HOFFMAN and Bella S. GALIL

Codium parvulum (Bory ex Audouin) P.C. Silva, a recent addition from the Red Sea and Indian Ocean to the Mediterranean invasive alien macrophytes, was first noted in 2004 in Israel, and subsequently recorded in Lebanon, Syria, and the Aegean coast of Turkey (Galil *et al*., 2021). Since the first sighting of an extensive drift in winter of 2004, several massive drifts of *C. parvulum* have been observed along Israel's northern shores. In November 2007, the alga washed up on a beach south of Haifa Bay; a smaller drift in February 2008 consisted of *C. parvulum* mixed with the native *Caulerpa prolifera* (Forsskål) Lamouroux (Israel *et al*., 2010). Lesser amounts washed ashore at these sites in 2009 and in February 2011 (Fig. 21). A survey of wrack components in November 2013 along the northern coast of Israel recorded *C. parvulum* at 4 of the 5 sites, with the highest biomass (121.4 gr per 20 cm^2) in the southernmost beach of Haifa Bay (Hoffman *et al*., 2014). Extensive beds were found to grow on the upper shelf at Haifa Bay and at Rosh HaNikra-Achziv marine protected area.

In February 2023, a decade since the last bloom, a sizable drift (about 1000 m long, 200 m wide, 1 m thick at its centre) was noted north of the breakwater of Haifa BayPort (32.832º N, 35.050º E) (Fig. 22). The massive wrack fouled the beach and the adjacent waters, rending it unsuitable for recreation and required costly removal by the municipality.

Macroalgal blooms, a predictable ecological response to elevated nutrient loading in bays, estuaries, and coastal waters, have greatly increased in recent decades (Wang *et al*., 2020). Concentrations of nutrients in Haifa Bay soared in recent years. The highly modified watershed of the Kishon stream delivers into Haifa Bay terrestrial nutrients from episodic rain events during the short winter, resulting in transient nutrient availability. Indeed, the presence of *C. parvulum* wracks in November and February tracks this pattern. Eutrophication was recently exacerbated by hydrographic changes attributed to the construction of the new BayPort (Herut *et al*., 2023). Nutrient loading-linked eutrophication, bioinvasions and macroalgal blooms are likely to engender further phase shifts in the already faltering shelf ecosystems.

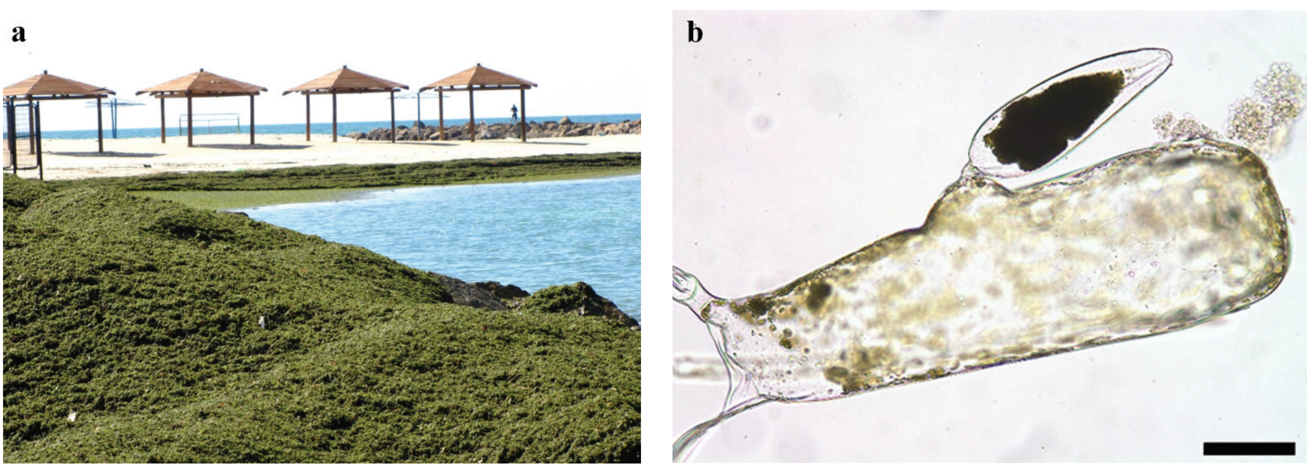

Fig. 21: (a) Massive drift of *Codium parvulum* at Bat Galim Beach, Haifa, Israel, November 2011. Photo credits: A. Flexer. (b) Utricle bearing gametangium of reproductive specimen, scale bar 100 µm.

Fig. 22: Massive drift of *Codium parvulum* at north of BayPort, Haifa, Israel, February 2023. Photo credits: M. Mendelson.

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References

Abbiati, M., Maltagliati, F., 1992. Genetic population structure of *Neanthes succinea* (Polychaeta: Nereididae). *Journal of the Marine Biological Association of the United Kingdom*, 72 (3), 511-517.

Abdelnaby, F.A., 2020. On some Nereididae (Polychaeta) with new records for the Egyptian waters. *Egyptian Journal of Aquatic Biology & Fisheries*, 24 (2), 47-68.

Athanasiadis, A., 2016. *Phycologia Europaea Rhodophyta*. Vol. II. pp. [2], 763-1504. Thessaloniki: Published and distributed by the author.

Azzurro, E., Maynou, F., Belmaker, Y., Golani, D., Crooks, J., 2016. Lag times in Lessepsian fish invasion. *Biological Invasions*, 18, 2761-2772.

Azzurro, E., Stancanelli, B., Martino, V., Bariche, M., 2017. Range expansion of the common lionfish *Pterois miles* (Bennet, 1828) in the Mediterranean Sea: an unwanted new guest for Italian waters. *Bioinvasion Records*, 6 (2), 95-98.

Badreddine, A., Tiralongo, F., 2022. The expansion of the peacock rockskipper *Istiblennius meleagris* (Valenciennes, 1836) in the eastern Mediterranean Sea: first record from the Lebanese intertidal reefs. *Journal of Fisheries & Livestock Production*, 10, 1000362.

Báez, J.C., Rodríguez-Cabello, C., Bañon, R., Brito, A., Falcón, J.M., *et al.*, 2019. Updating the national checklist of marine fishes in Spanish waters: An approach to priority hotspots and lessons for conservation. *Mediterranean Marine Sciences*, 20 (2), 260-270.

Băncilă, R.I., Skolka, M., Ivanova. P., Surugiu. V., Stefanova, K. *et al*., 2022. Alien species of the Romanian and Bulgarian Black Sea coast: state of knowledge, uncertainties, and needs for future research. *Aquatic Invasions*, 17 (3), 353-373.

Ben Abdallah, A., Ben Souissi, J., Méjri, H., Capapé, C., Golani, D., 2007. First record of *Cephalopholis taeniops* (Valenciennes) in the Mediterranean Sea. *Journal of Fish Biology*, 71 (2), 610-614.

Bianchi, C.N., Morri, C., Chiantore, M., Montefalcone, M., Parravicini, V. *et al.*, 2012. Mediterranean Sea biodiversity between the legacy from the past and a future of change. p. 1-55. In: *Life in the Mediterranean Sea: A look at habitat changes.* Noga Stambler (Ed). Nova Science Publishers, Inc., New York.

Bianchi, C.N., Caroli, F., Guidetti, P., Morri, C., 2018. Seawater warming at the northern reach for southern species: Gulf of Genoa, NW Mediterranean. *Journal of the Marine Biological Association of the United Kingdom*, 98 (1), 1-12.

Brunetti, R., Gissi, C., Pennati, R., Caicci, F., Gasparini, F. *et al.*, 2015. Morphological evidence that the molecularly determined *Ciona intestinalis* type A and type B are different species: Ciona *robusta* and *Ciona intestinalis*. *Journal of Zoological Systematics and Evolutionary Research*, 53 (3), 186-193.

Caputi, L., Andreakis, N., Mastrototaro, F., Cirino, P., Vassillo, M. *et al.*, 2007. Cryptic speciation in a model invertebrate chordate. *Proceedings of the National Academy of Sciences of the United States of America,* 104 (22), 9364-9369.

Cebrian, E., Rodríguez-Prieto, C., 2012. Marine invasion in the Mediterranean Sea: the role of abiotic factors when there is no biological resistance. *PLoS ONE,* 7 (2), e31135.

Cerim, H., Yapici, S., Gülşahin, A., Soykan, O., Bilge, G., 2021. The first record of the red Cornetfish (*Fistularia petimba* Lacepède, 1803) in the Aegean Sea. *Düzce Üniversitesi Bilim ve Teknoloji Dergisi*, 9 (2), 607-615.

Çiçek, B.A., Akbora, H.D., Ayas, D., 2020. Does symbiosis of invasive species become common phenomena for the Mediterranean? *Cheilodipterus novemstriatus* (Rüppell, 1838) and *Diadema setosum* (Leske, 1778) is observed together in the Gulf of Iskenderun. *Journal of Wildlife and Biodiversity*, 13-18.

Coll, M., Piroddi, C., Steenbeek, J., Kaschner, K., Ben Rais Lasram, F. *et al.*, 2010. The biodiversity of the Mediterranean Sea: estimates, patterns, and threats. *PLoS One*, 5 (8), e11842.

Costello, M.J., Emblow, C.S., White, R., 2001. European register of marine species. A check-list of the marine species in Europe and a bibliography of guides to their identification. *Patrimoines Naturels*, 50, 1-463.

Crespo, J., Rey, J.C., Garcia, A., 1987. Primera cita de *Acanthurus monroviae* Steindachner, 1876 y de *Diodon eydouxii* Brissout de Barneville, 1846 para la ichthyofauna de Europa. *Miscellania Zoologica*, 11, 271-275.

Cressy, R., 1981. Revision of Indo-west Pacific lizardfishes of the genus *Synodus* (Pisces: Synodontidae). *Smithsonian Contributions to Zoology*, 342, 1-53.

Crocetta, F., Al Mabruk, S., Azzurro, E., Bakiu, R., Bariche, M. *et al*., 2021. New alien Mediterranean biodiversity records (November 2021). *Mediterranean Marine Science*, 22 (3), 724-746.

Di Martino, V., Stancanelli, B., 2021. The alien lionfish, *Pterois miles* (Bennett, 1828), enters the Adriatic Sea, Central Mediterranean Sea. *Journal of the Black Sea / Mediterranean Environment*, 27 (1), 104-108.

Dimitriadis, C., Galanidi, M., Zenetos, A., Corsini-Foka, M., Giovos, I. *et al*., 2020. Updating the occurrences of *Pterois miles* in the Mediterranean Sea, with considerations on thermal boundaries and future range expansion. *Mediterranean Marine Science*, 21 (1), 62-69.

Dragičević, B., Anadoli, O., Angel, D., Benardi, M., Bitar, G. *et al*. 2019. New Mediterranean Biodiversity Records (December 2019). *Mediterranean Marine Science*, 20 (3), 645-656.

Faasse, M.A., 2014. Introduction of *Ptilohyale littoralis* to The Netherlands. *Marine Biodiversity Records*, 7, e28.

Fortič, A., Al-Sheikh Rasheed, R., Almajid, Z., Badreddine, A., Báez, J.C. *et al*., 2023. New records of introduced species in the Mediterranean Sea (April 2023). *Mediterranean Marine Science*, 24 (1), 182-202.

Fricke, R., 2000. Callionymidae of New Caledonia, with Remarks on Related Species and Descriptions of 10 New Species from New Caledonia, Australia, New Guinea, and Hawaii (Teleostei). *Stuttgarter Beiträge zur Naturkunde Serie A (Biologie)*, 617, 1-81.

Fricke, R., Mahafina, J., Behivoke, F., Jaonalison, H., Léopold, M. *et al.*, 2018. Annotated checklist of the fishes of Madagascar, southwestern Indian Ocean, with 158 new records. *FishTaxa*, 3 (1), 1-432.

Fricke, R., Eschmeyer, W.N., Van der Laan, R., 2023. *Eschmeyer's Catalog of Fishes: Genera, Species, References.* (http://researcharchive.calacademy.org/research/ ichthyology/ catalog/fishcatmain.asp). Electronic version accessed 30/06/2023.

Froese, R., Pauly, D., 2023. *Fish Base*. http://www.fishbase.org (Accessed 01 July 2023).

Galanidi, M., Zenetos, A., Bacher, S., 2018. Assessing the socio-economic impacts of priority marine invasive species in the Mediterranean with the newly proposed SEICAT methodology. *Mediterranean Marine Science*, 19 (1), 107-123.

Galil, B.S., 2023. A Sea, a Canal, a Disaster: The Suez Canal and the Transformation of the Mediterranean Biota. In: *The Suez Canal: Past Lessons and Future Challenges* (C. Lutmar, & Z. Rubinovitz eds), Springer International Publishing, pp. 199-215.

Galil, B.S., Mienis, H.K., Hoffman, R., Goren, M., 2021. Non native species along the Israeli Mediterranean coast – tally, policy, outlook. *Hydrobiologia*, 348, 2011-2029.

Genis-Armero, R., Landeira, J., Capaccioni-Azzati, R., Palero, F., 2019. Updated distribution and first description of *Scyllarus subarctus* (Crustacea: Scyllaridae) decapodid stage. *Journal of the Marine Biological Association of the United Kingdom*, 99 (5), 1181-1188.

Gerovasileiou, V., Akel, E., Akyol, O., Alongi, G., Azevedo, F. *et al*., 2017. New Mediterranean biodiversity records (July, 2017). *Mediterranean Marine Science*, 18 (2), 355-384.

Gerovasileiou, V., Bancila, R., Katsanevakis, S., Zenetos, A., 2022. Introduced species in Mediterranean marine caves: an increasing but neglected threat. *Mediterranean Marine Science*, 23 (4), 995-1005.

Ghermandi, A., Galil, B., Gowdy, J., Nunes, P.A.L.D., 2015. Jellyfish outbreak impacts on recreation in the Mediterranean Sea: welfare estimates from a socioeconomic pilot survey in Israel. *Ecosystem Services*, 11, 140-147.

Giakoumi, S., 2014. Distribution patterns of the invasive herbivore *Siganus luridus* (Rüppell, 1829) and its relation to native benthic communities in the central Aegean Sea, Northeastern Mediterranean. *Marine Ecology*, 35 (1), 96-105.

Gökoğlu, M., Özvarol, Y., Fricke, R., 2014. *Synchiropus sechellensis* Regan, 1908 (Teleostei: Callionymidae), a new Lessepsian migrant in the Mediterranean Sea. *Mediterranean Marine Science*, 15 (2), 440-442.

Golani, D., Azzurro, E., Dulčić, J., Massutí, E., Orsi-Relini, L., 2021. *Atlas of Exotic Fishes in the Mediterranean Sea*. 2nd edition, CIESM Publishers, Paris, Monaco, 365 pp.

Goren, M., Lipsky, G., Brokovich, E., Abelson, A., 2010. A ‘flood’ of alien cardinal fishes in the Eastern Mediterranean - first record of the Indo-Pacific *Cheilodipterus novemstriatus* (Rüppell, 1838) in the Mediterranean Sea. *Aquatic Invasions*, 5 (Supplement 1), 49-51.

Guiry, M.D., Guiry, G.M., 2023. *AlgaeBase*. World-wide electronic publication, National University of Ireland, Galway. https://www.algaebase.org (Accessed 13 March 2023).

Gvozdenović, S., Nikolić, M., Pešić, V., Peraš, I., Mandić, M., 2019. First data on the alien mollusc *Fulvia fragilis* (Forsskål in Niebuhr, 1775) (Cardiida: Cardiidae) from the Adriatic Sea. *Acta Zoologica Bulgarica*, 71, 267-272.

Herut, B., Gertner, Y., Segal, Y., Sisma-Ventura, G., Gordon, N. *et al*., 2023. Long-term (2002–2021) trend in nutrient-related pollution at small stratified inland estuaries, the Kishon SE Mediterranean case. *Water*, 15 (3), 484.

Hoffman, R., Sternberg, M., Serio, D., 2014. First report of *Laurencia chondrioides* (Ceramiales, Rhodophyta) and its potential to be an invasive in the eastern Mediterranean Sea. *Botanica Marina*, 57 (6), 449-457.

Hollenberg, G.J., 1967. New genera in the Rhodomelaceae from the Central Pacific. *Bulletin of the Southern California Academy of Sciences,* 66 (3), 201-221.

Hoshino, ZI., Tokioka, T., 1967. An unusually robust *Ciona* from the northeastern coast of Honsyu Island, Japan. *Publications of the Seto Marine Biological Laboratory*, 15 (4), 275-290.

Israel, A., Einav, R., Silva, P.C., Paz, G., Chacana, M.E. *et al*., 2010. First report of the seaweed *Codium parvulum* (Chlorophyta) in Mediterranean waters: recent blooms on the northern shores of Israel. *Phycologia*, 49 (2), 107-112.

Khamassi, F., Ghanem, R., Hassan, B., Karray, S., El Bour, M. *et al.*, 2022. First record of the Gracile lizardfish *Saurida gracilis* (Quoy & Gaimard, 1824) in Mediterranean waters. *Mediterranean Marine Science*, 23 (1), 25-29.

Koçak, F., Ergen, Z., Çinar, M. E., 1999. Fouling organisms and their developments in a polluted and an unpolluted marina in the Aegean Sea (Turkey). *Ophelia*, 50 (1), 1-20.

Kondylatos, G., Corsini-Foka, M., Apostolopoulos, G., Zenetos A., 2016. *Synchiropus sechellensis* (Actinopterygii: Perciformes: Callionymidae), a New Alien in The Aegean Sea and Hellenic Waters. *Acta Adriatica*, 57 (1), 185-190.

Langeneck, J., Boyer, M., De Cecco, P. G., Luciani, C., Marcelli, M. *et al*., 2015. First record of *Acanthurus chirurgus* (Perciformes: Acanthuridae) in the Mediterranean Sea, with some distributional notes on Mediterranean Acanthuridae. *Mediterranean Marine Science*, 16 (2), 427-431.

Langeneck, J., Marcelli, M., Bariche, M., Azzurro, E., 2017. Social networks allow early detection of non indigenous species: first record of the red drum *Sciaenops ocellatus* (Actinopterygii: Perciformes: Sciaenidae) in Italian waters. *Acta Adriatica*, 58 (2), 365-370.

Lo Brutto, S, Iaciofano, D., 2018. A taxonomic revision helps to clarify differences between the Atlantic invasive *Ptilohyale littoralis* and the Mediterranean endemic *Parhyale plumicornis* (Crustacea, Amphipoda). *ZooKeys*, 754, 47.

Mancinelli, G., Chainho, P., Cilenti, L., Falco, S., Kapiris, K. *et al*., 2017. The Atlantic blue crab *Callinectes sapidus* in southern European coastal waters: Distribution, impact and prospective invasion management strategies. *Marine Pollution Bulletin*, 199 (1), 5-11.

Marchini, A., Cardeccia, A., 2017. Alien amphipods in a sea of troubles: cryptogenic species, unresolved taxonomy and overlooked introductions. *Marine Biology*, 164 (4), 69.

Mastrototaro, F., Montesanto, F., Salonna, M., Viard, F., Chimienti, G. *et al*., 2020. An integrative taxonomic framework for the study of the genus *Ciona* (Ascidiacea) and description of a new species, *Ciona intermedia*. *Zoological Journal of the Linnean Society*, 190 (4), 1193-1216.

Metaxakis, E., Giannakaki, A., Peristeraki, P., 2019. First record of the lessepsian immigrant *Synchiropus sechellensis* Regan, 1908 in the seas around Crete. p. 86-89. In: *17th PanHellenic Conference of Ichthyologists*, *Heraklion 31 October-3 November 2019.*

Michailidis, N., Chartosia, N., 2016. New record of the Seychelles dragonet *Synchiropus sechellensis* Regan, 1908 from the Mediterranean: accidental entrance or Lessepsian immigration? *BioInvasions Records*, 5 (4), 291-294.

Mutlu, E., de Meo, I., Miglietta, C., Deval, M.C. 2023. Ecological indicative stressors of native *vs.* non-native fish in an ultra-oligotrophic region of the Mediterranean Sea. *Sustainability*, 15 (3), 2726.

Olenin, S., Alemany, F., Cardoso, A.C., Gollasch, S., Goulletquer, P. *et al*., 2010. *Marine Strategy Framework Directive – Task Group 2 Report – Non-indigenous Species, vol. 10*. EC, JRC.

Özcan, G., Ergüden, D., Özcan, T., 2020. First record of the African hind, *Cephalopholis taeniops* (Valenciennes, 1828), in the Mediterranean Sea coast of Turkey. *Acta Biologica Turcica*, 33 (3), 168-171.

Palero, F., Guerao, G., Clark, P.F., Abello, P., 2009. The true identities of the slipper lobsters *Nisto laevis* and *Nisto asper* (Crustacea: Decapoda: Scyllaridae) verified by DNA analysis. *Invertebrate Systematics*, 23 (1), 77-85.

Pansera, M., Camatti, E., Schroeder, A., Zagami, G., Bergamasco, A., 2021. The non-indigenous *Oithona davisae* in a Mediterranean transitional environment: coexistence patterns with competing species. *Scientific Reports*, 11 (1), 8341.

Papageorgiou, M., Resaikos, V., Petrou, A. 2023. A preliminary assessment of *Fistularia petimba* (Lacepède, 1803) migration in the Mediterranean Sea: historical and new data from Cyprus (Levantine Sea) with biological notes. *Mediterranean Marine Science*, 24 (2), 446-453.

Pessani, D., Mura, M., 2007. The biology of the Mediterranean scyllarids. In: The biology and fisheries of the slipper lobster (K.L. Lavalli & E. Spanier, eds.), pp. 263-286. CRC Press, Boca Raton, FL, USA.

Ragkousis, M., Abdelali, N., Azzurro, E., Badreddine, A., Bariche, M. *et al*., 2020. New Alien Mediterranean Biodiversity Records (October 2020). *Mediterranean Marine Science*, 21 (1), 631-652.

Ragkousis, M., Zenetos, A., Souissi, J.B., Hoffman, R., Ghanem, R. *et al*., 2023. Unpublished Mediterranean and Black Sea records of marine alien, cryptogenic, and neonative species. *BioInvasions Records*, 12 (2), 339-369.

Rifi, M., Le Pennec, G., Ben Salem, M., Ben Souissi, J., 2011. Reproductive strategy of the invasive cockle *Fulvia fragilis* in the Bay of Tunis (Tunisia). *Journal of the Marine Biological Association of the United Kingdom,* 91 (7), 1465-1475.

Rothman, S.B.S., Gayer, K., Stern, N., 2020. A long-distance traveler: the peacock rockskipper *Istiblennius meleagris* (Valenciennes, 1836) on the Mediterranean intertidal reefs. *Biological Invasions*, 22 (8), 2401-2408.

Sato, A., Satoh, N., Bishop, J.D.D., 2012. Field identification of 'types' A and B of the ascidian *Ciona intestinalis* in a region of sympatry. *Marine Biology*, 159, 1611-1619.

Savva, I., Chartosia, N., Antoniou, C., Kleitou, P., Georgiou, A. *et al*., 2020. They are here to stay: the biology and ecology of lionfish (*Pterois miles*) in the Mediterranean Sea. *Journal of Fish Biology* 97 (1), 148-162.

Servello, G., Andaloro, F., Azzurro, E., Castriota, L., Catra, M. *et al.*, 2019. Marine alien species in Italy: A contribution to the implementation of descriptor D2 of the marine strategy framework directive. *Mediterranean Marine Science,* 20 (1), 1-48.

Spalding, M.D., Fox, H.E., Allen, G.R., Davidson, N., Ferdaña, Z.A. *et al.*, 2007. Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. *BioScience*, 57 (7), 573-583.

Spanier, E., Lavalli, K.L., 2013. First record of an early benthic juvenile likely to be that of the Mediterranean slipper lobster, *Scyllarides latus* (Latreille, 1802). *Crustaceana*, 86 (3), 259-267.

Spilmont, N., Hachet, A., Faasse, M. A., Jourde, J., Luczak, C. *et al.*, 2018. First records of *Ptilohyale littoralis* (Amphipoda: Hyalidae) and *Boccardia proboscidea* (Polychaeta: Spionidae) from the coast of the English Channel: habitat use and coexistence with other species. *Marine Biodiversity*, 48, 1109-1119.

Stabili, L., Licciano, M., Longo, C., Lezzi, M., Giangrande, A. 2015. The Mediterranean non-indigenous ascidian *Polyandrocarpa zorritensis*: Microbiological accumulation capability and environmental implications. *Marine Pollution Bulletin*, 101 (1), 146-152.

Stern, N., Badreddine, A., Bitar, G., Crocetta, F., Deidun, A. *et al*., 2019. New Mediterranean Biodiversity Records (July 2019). *Mediterranean Marine Science*, 20 (2), 409-426.

Stern, N., Paz, G., Yudkovsky, Y., Lubinevsky, H., Rinkevich, B., 2018. The arrival of a second 'Lessepsian sprinter'? The first record of the red cornetfish *Fistularia petimba* in the Eastern Mediterranean, *Mediterranean Marine Science*, 18 (3), 524-528.

Tanduo, V., Osca, D., Crocetta, F., 2021. A bycatch surprise: *Scyllarus subarctus* Crosnier, 1970 (Decapoda: Achelata: Scyllaridae) in the Mediterranean Sea. *The Journal of Crustacean Biology*, 41 (2), ruab010.

Tiralongo, F., 2020. *Blennies of the Mediterranean Sea: Biology and identification of Blenniidae, Clinidae, Tripterygiidae*. Amazon Distribution, Leipzig, Germany, pp. 131.

Tiralongo, F., Tibullo, D., Brundo, M.V., Paladini De Mendoza, F., Melchiorri, C. *et al.*, 2016. Habitat preference of combtooth blennies (Actinopterygii: Perciformes: Blenniidae) in very shallow waters of the Ionian Sea, south-eastern Sicily, Italy. *Acta Ichthyologica et Piscatoria*, 46 (2), 65-75.

Tsirintanis, K., Azzurro, E., Crocetta, F., Dimiza, M., Froglia, C. *et al.*, 2022. Bioinvasion impacts on biodiversity, ecosystem services, and human health in the Mediterranean Sea. *Aquatic Invasions*, 17 (3), 308-352.

Turan, C., Ergüden, D., Gürlek, M., 2016. Climate change and biodiversity effects in Turkish Seas. *Natural and Engineering Sciences*, 1 (2), 15-24.

Turan, C., Ergüden, D., Gürlek, M., Erdoğan, Z.A., Sönmez, B. *et al*., 2015. First record of the Indian Ocean twospot cardinalfish, *Cheilodipterus novemstriatus* (Actinopterygii: Perciformes: Apogonidae), from Turkish marine waters. *Acta Ichthyologica et Piscatoria*, 45 (3), 319-322.

Ulman, A., Ali, F.Z., Harris, H.E., Adel, M., Al Mabruk, S.A.A. *et al*., 2022. Lessons from the Western Atlantic Lionfish Invasion to Inform Management in the Mediterranean. *Frontiers in Marine Sciences*, 9, 865162.

Ünlüoğlu, A., Akalın, S., Dal, İ., Tıraşın, E.M., Aydın., C.M., 2018. First record of red cornetfish *Fistularia petimba* (Syngnathiformes: Fistulariidae) from Antalya and Iskenderun Bays along Turkish Coasts of the Mediterranean Sea. *Journal of Applied Ichthyology*, 34 (4), 977-980.

Villalobos-Guerrero, T.F., Carrera-Parra, L.F., 2015. Redescription of *Alitta succinea* (Leuckart, 1847) and reinstatement of *A. acutifolia* (Ehlers, 1901) n. comb. based upon morphological and molecular data (Polychaeta: Nereididae). *Zootaxa*, 3919 (1), 157-178.

Wang, H., Wang, G., Gu, W., 2020. Macroalgal blooms caused by marine nutrient changes resulting from human activities. *Journal of Applied Ecology*, 57 (4), 766-776.

Wilcox, C.L., Motomura, H., Matsunuma, M., Bowen, B.W., 2017. Phylogeography of lionfishes (*Pterois*) indicate taxonomic over splitting and hybrid origin of the invasive *Pterois volitans*. *Journal of Heredity*, 109 (2), 162-175.

Yokeş, M., Andreou, V., Bakiu, R., Bonanomi, S., Camps, J. *et al.*, 2018. New Mediterranean Biodiversity Records (November 2018). *Mediterranean Marine Science*, 19 (3), 673-689.

Zenetos, A., Koutsoubas, D., Vardala-Theodorou, E., 2004. Origin and vectors of introduction of exotic molluscs in Greek waters. *Belgian Journal of Zoology,* 134 (1), 161-168.