# New records of introduced species in the Mediterranean Sea (February 2025)

Periklis KLEITOU¹, Daryl AGIUS², Sencer AKALIN³, Marco ALBANO⁴, Izdihar Ali AMMAR⁵, Coşkun Menderes AYDIN⁶, Ernesto AZZURRO७, Lucio BELLOMO⁶, Andrea BONIFAZI¹⁰, Gioele CAPILLO¹¹¹, Fabio CROCETTA¹³, Ivan CVITKOVIù⁴, Ana FORTIȹ⁵, Sylvaine GIAKOUMI8¹, Daniele GRECH¹¹¹, Haidar Bassam HASAN¹ゥ, Francesco LASPINA²⁰, Marco LEZZI²¹, Petra LUCIC¹⁴, Emanuele MANCINI²²², Wassim Mahmoud MAYYA²⁴, Mustafa Tunca OLGÜNER³, Panayotis OVALIS²⁵, Luca PISANI², Valentina PITACCO¹⁵, Alp SALMAN³, Lisa SANDRI²6,8,2७, Petra SLAVINEC¹⁵, Francesco TIRALONGO²6,20,7, Francesco TURANO¹७, Alper YILDIZ²ゥ, Argyro ZENETOS³⁰, Adib Hasan ZIENI¹ゥ, and Ante ŽULJEVIù⁴

<sup>1</sup>Marine and Environmental Research (MER) Lab Ltd., 202 Amathountos Av., Marina Gardens, Block B, Parekklisia, Limassol, Cyprus <sup>2</sup>Marine Biology and Conservation section, Aquatic Resources Malta, Marsaxlokk, Malta

<sup>3</sup>Department of Marine and Inland Water Science and Technology, Faculty of Fisheries, Ege University, 35100, İzmir, Türkiye <sup>4</sup>Department of Veterinary Sciences, University of Messina, 98168 Messina, Italy

<sup>5</sup>Department of Marine Biology, High Institute of Marine Research, Tishreen University, Latakia, Syria <sup>6</sup>Mediterranean Fisheries Research, Production and Training Institute, General Directorate of

Agricultural Research and Policies, Demre, Antalya, Türkiye

<sup>7</sup>National Research Council (CNR), Institute for Biological Resources and Marine Biotechnologies, 60125 Ancona, Italy <sup>8</sup>National Biodiversity Future Center (NBFC), Palermo, Italy

<sup>9</sup>Sailing bubbles A.S.D

<sup>10</sup>ARPA Lazio, Dipartimento Stato dell'Ambiente, 00173 Rome, Italy

Department of Chemical, Biological, Pharmaceutical and Environmental Sciences, University of Messina, 98166 Messina, Italy
<sup>12</sup>Sea in Health and Life srl, c/o Department of Chemical, Biological, Pharmaceutical and Environmental Sciences,
Largo Senatore Francesco Arena, Messina, Italy

<sup>13</sup>Department of Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Villa Comunale, I-80121 Naples, Italy
 <sup>14</sup>Institute of Oceanography and Fisheries, Šetalište I. Meštrovića 63, 21 000 Split, Croatia
 <sup>15</sup>Marine Biology Station Piran, National Institute of Biology, SI-6330 Piran, Slovenia

<sup>16</sup>Department of Integrative Marine Ecology, Stazione Zoologica Anton Dohrn, Sicily Marine Centre, 90149 Palermo, Italy
<sup>17</sup>Subacquei per la Scienza, Italy

<sup>18</sup>International Marine Centre (IMC), Loc. Sa Mardini, Torregrande, 09170 Oristano, Italy
<sup>19</sup>Department of Zoology, Faculty of Science, Tishreen University, Latakia, Syria

<sup>20</sup>Ente Fauna Marina Mediterranea, Scientific Organization for Research and Conservation of Marine Biodiversity, 96012 Avola, Italy <sup>21</sup>ARPAE, Regional Agency for Environmental Prevention and Energy of Emilia-Romagna,

Oceanographic Unit Daphne - Cesenatico (FC), Italy

Department of Biological and Environmental Sciences and Technologies (DiSTeBA), University of Salento, 73100 Lecce, Italy
 Ente Fauna Marina Mediterranean, Scientific Organization for Research and Conservation of Marine Biodiversity, Avola, Italy
 Department of Animal Biology, Faculty of Science, Damascus University, Syria

<sup>25</sup>Agisilaou 37-39, Tzitzifies/Kallithea, 17674 Athens, Greece

<sup>26</sup>Department of Earth and Marine Sciences, University of Palermo, 90123 Palermo, Italy

<sup>27</sup>Section of Oceanography, National Institute of Oceanography and Applied Geophysics (OGS), 34151 Trieste, Italy

<sup>28</sup>Department of Biological, Geological and Environmental Science, University of Catania, 95124 Catania, Italy

<sup>29</sup>Akdeniz University Faculty of Fisheries, Department of Aquaculture, Antalya, Türkiye

<sup>30</sup>Hellenic Centre for Marine Research, Institute of Marine Biological Resources (HCMR), Anavissos, 19013, Attica, Greece

### **Abstract**

This Collective Article compiles information on nineteen (19) species recorded in seven (7) Mediterranean countries (Croatia, Cyprus, Italy, Malta, Slovenia, Syria, and Türkiye) and across four major sub-basins (Adriatic, Western, Central, and Eastern Mediterranean). The documented taxa represent eight (8) phyla: Annelida (four species), Arthropoda (three), Bryozoa (one), Chordata (two), Cnidaria (two), Mollusca (five), Chlorophyta (one), and Ochrophyta (one). Observations originated from both dedicated scientific surveys (including trawl sampling, van Veen grabs, and harbor-wall scraping) and citizen science initiatives by divers, shell collectors, and recreational fishers.

Significant first records include Notomastus aberans (Slovenia), Paraprionospio coora (Italy), Polydora cornuta (Tyrrhenian Sea), Coleusia signata (Cyprus), Penaeus aztecus (Malta), Pleopis schmackeri (Syria), Pteragogus trispilus (Italy), Triacanthus biaculeatus (Türkiye), Oculina patagonica (Syria), and Watersipora subatra (Slovenia). In the Mollusca group, Conomurex per-

sicus extends its known range westward to the Messina Strait (southern Italy), and Sepioteuthis lessoniana is recorded for the first time in Italian waters. Additional first reports for Türkiye include Alveinus miliaceus and Retusa desgenettii in the Turkish Levantine Sea. The species Uroteuthis (Photololigo) arabica represents a first record for the entire Mediterranean basin. Finally, Colpomenia peregrina (Chlorophyta) and Caulerpa taxifolia (Ochrophyta) highlight ephemeral "boom-and-bust" occurrences in Croatia, raising questions about transient invasive dynamics. These collective findings underscore the importance of coordinated monitoring efforts, inclusive of both scientific and citizen-based approaches, to better understand and manage marine biodiversity shifts in the Mediterranean.

#### Introduction

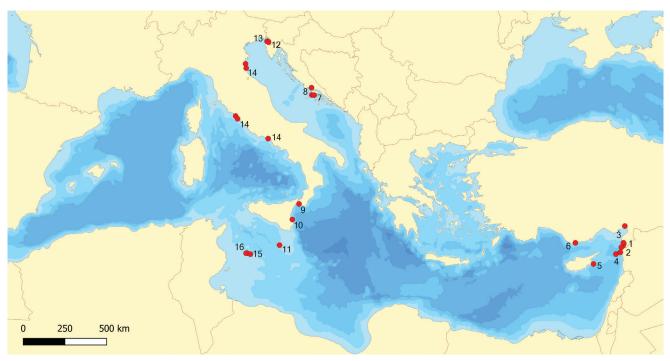
The Mediterranean Sea, recognized globally as a critical hotspot for marine biodiversity, is undergoing accelerated ecological shifts influenced by climate change and anthropogenic pressures. It has also been identified as the most heavily invaded marine region worldwide (Bailey et al., 2020), hosting over 1000 multicellular non-indigenous species (NIS), an increase of 40% in just the last decade (Zenetos et al., 2022). This trend underscores the urgent need for robust and cost-effective surveillance methods, early detection tools, and adaptive management strategies. Yet, practical challenges remain, particularly around consistent monitoring, species-specific data availability, and effective transnational collaboration (Kleitou et al., 2021; Garcia-Lozano et al., 2025). Publishing first records of NIS distributions as short notes in peer-reviewed journals can be challenging. As a result, many initial country or regional records within the Mediterranean often remain unpublished, hindering their documentation unless part of extensive collaborative efforts that consolidate multiple observations (Katsanevakis et al., 2020).

In response, Mediterranean Marine Science has been publishing its "Collective Article A" series since 2011, aiming to remedy gaps in the documentation of marine invasions. Adopting classification criteria from Gerovasileiou *et al.* (2022), this series categorizes introduced species as (i) non-indigenous (NIS), (ii) cryptogenic (unclear origin), (iii) crypto-expanding (uncertain whether expansion is natural or human-mediated), or (iv) species of questionable status. This multifaceted framework acknowledges that many newly reported "introduced" species may be cryptic or long overlooked, complicating their placement within standard invasion paradigms.

Here, we present nineteen (19) new or noteworthy records spanning eight phyla: Annelida (four species), Arthropoda (three species), Bryozoa (one), Chordata (two), Cnidaria (two), Mollusca (five), Chlorophyta (one), and Ochrophyta (one); collected across seven Mediterranean countries: Croatia, Cyprus, Italy, Malta, Slovenia, Syria, and Türkiye (Fig. 1, Table 1). These include two cryptogenic species (Paraprionospio coora and Watersipora subatra) and 17 classified as NIS. Notably, five of these records emerged through citizen science initiatives including diver sightings (Coleusia signata and Pteragogus trispilus), recreational and trammel net fishing captures (Triacanthus biaculeatus, Penaeus aztecus, and Sepioteuthis lessoniana), and shell collecting (Alveinus miliaceus and Retusa desgenettii). The remaining 14 were documented using scientific sampling methods such as trawl surveys (Uroteuthis (Photololigo) arabica), van Veen grabs (*Paraprionospio coora* and *Prionospio pul-chra*), and zooplankton net sampling (*Pleopis schmack-eri*). Such involvement of trained volunteers continues to prove pivotal for early detection.

Notable highlights include:

- i. New records of polychaetes in national waters: *Notomastus aberans* in Slovenian ports (subsection 1.1) and spionids expanding their known distributions in Italy, such as *Polydora cornuta*, previously confined to the Adriatic but now established in the Tyrrhenian Sea, and *Paraprionospio coora*, newly classified as cryptogenic in Italy (subsection 1.2).
- ii. Range expansion of crustaceans: *Coleusia signata* recorded for the first time in Cyprus and filling a gap in the eastern Mediterranean (subsection 2.1), *Penaeus aztecus* caught for the first time in Maltese waters (subsection 2.2) and *Pleopis schmackeri* discovered off the Syrian coast (subsection 2.3), highlighting vectors like ballast water and shipping pathways.
- iii. First in-country fish records: The Indo-Pacific *Tria-canthus biaculeatus* recorded in northern Levantine Türkiye (subsection 4.2) and *Pteragogus trispilus* confirmed for the first time in Italian waters (subsection 4.1), expanding the list of Lessepsian fishes colonizing the central-western Mediterranean basin.
- iv. Hard-bottom invertebrates: The cryptogenic bryozoan *Watersipora subatra* newly reported in Slovenia (subsection 3.1), and the invasive coral *Oculina patagonica* documented for the first time in Syria (subsection 5.2), suggesting ongoing anthropogenic transport and climate-driven range expansions.
- v. Cephalopod introductions: Among molluscan records, *Sepioteuthis lessoniana* was caught in Lampedusa (subsection 6.2), and most strikingly, *Uroteuthis (Photololigo) arabica* represents the first record in the entire Mediterranean (subsection 6.4), pointing to the Suez Canal as a key dispersal route for squid species. Other Mollusca records include *Alveinus miliaceus* and *Retusa desgenettii* collected 13 years ago in 2012 by a shell collector, constituting the first detections in Türkiye and first record from the Levantine area of Türkiye, respectively (subsection 6.3). The species *Conomurex persicus* extends its western distribution in the Mediterranean and is recorded for the first time from Messina Strait, Calabria, Italy (subsection 6.1).
- vi. Ephemeral macroalgae: *Colpomenia peregrina* (Chlorophyta) and *Caulerpa taxifolia* (Ochrophyta) were documented in Croatian waters but vanished in subsequent years (subsection 7.1 and 8.1). Such "boom-



*Fig. 1:* Locations of records for the species presented in the current article. Location numbers (LN) correspond to those listed on Table 1.

**Table 1.** Information about species records by phylum. Basin (EMED = eastern Mediterranean (i.e., Aegean and Levantine), CMED = central Mediterranean (i.e., Central and Ionian Sea), ADRIA = Adriatic, WMED = western Mediterranean), Region (sensu Spalding et al., 2007), country, and location number as in Figure 1 (LN). SC: the subsection of this article in which the species' record appears.

Taxon	Basin	Region	Country	Location	SC	LN
Phylum Annelida						
Notomastus aberans Day, 1957	ADRIA	Adriatic Sea	Slovenia	Front of the port of Koper	1.1	13
Paraprionospio coora Wilson, 1990	WMED	Western Mediterranean	Italy	Latium coast	1.2	14
Polydora cornuta Bosc, 1802	WMED	Western Mediterranean	Italy	Commercial Port of Civitavecchia	1.3	14
Prionospio pulchra Imajima, 1990	ADRIA	Adriatic Sea	Italy	Foce Reno and Lido Adriano	1.4	14
Phylum Arthropoda						
Coleusia signata (Paulson, 1875)	EMED	Levantine Sea	Cyprus	Protaras	2.1	5
Penaeus aztecus Ives, 1891	CMED	Ionian Sea	Malta	Saint Paul's Bay	2.2	11
Pleopis schmackeri (Poppe, 1889)	EMED	Levantine Sea	Syria	Ras Al Basit	2.3	4
Phylum Bryozoa						
Watersipora subatra (Ortmann, 1890)	ADRIA	Adriatic Sea	Slovenia	Front of the port of Koper	3.1	12
Phylum Chordata						
Pteragogus trispilus Randall, 2013	CMED	Tunisian Plateau / Gulf of Sidra	Italy	Pelagie Islands	4.1	16
Triacanthus biaculeatus (Bloch, 1786)	EMED	Levantine Sea	Türkiye	Hatay	4.2	1
Phylum Cnidaria						
Cassiopea cf. andromeda (Forskål, 1775)	CMED	Ionian Sea	Italy	Augusta	5.1	10

Table 1 continued

Taxon	Basin	Region	Country	Location	SC	LN
Oculina patagonica de Angelis D'Ossat, 1908	EMED	Levantine Sea	Syria	Ibn Hani	5.2	2
Phylum Mollusca						
Conomurex persicus (Swainson, 1821)	CMED	Western Mediterranean	Italy	Calabria	6.1	9
Sepioteuthis lessoniana R. P. Lesson, 1831	CMED	Tunisian Plateau / Gulf of Sidra	Italy	Lampedusa	6.2	15
Alveinus miliaceus (Issel, 1869)	EMED	Levantine Sea	Türkiye	Iskenderun Gulf	6.3	3
Retusa desgenettii (Audouin, 1826)	EMED	Levantine Sea	Türkiye	Iskenderun Gulf	6.3	3
Uroteuthis (Photololigo) arabica (Ehrenberg, 1831)	EMED	Levantine Sea	Türkiye	Anamur coast	6.4	6
Phylum Ochrophyta						
Colpomenia peregrina Sauvageau 1927	ADRIA	Adriatic Sea	Croatia	Vira Cove fishing shelter	7.1	8
Phylum Chlorophyta						
Caulerpa taxifolia (M.Vahl) C.Agardh, 1817	ADRIA	Adriatic Sea	Croatia	Stari Grad Bay	8.1	7

and-bust" patterns may indicate pathogens, local environmental stressors, or insufficient conditions for long-term establishment, offering valuable case studies of ephemeral invasions.

Organized alphabetically by Kingdom and Phylum (Table 1), contributions in this collective article highlight the important role of collaborative research efforts,

including citizen science and targeted scientific surveys. The combination of morphological analyses, genetic tools (where available), and careful field observations has shed light on the taxonomic intricacies and expansion dynamics of species that might otherwise remain undetected or misidentified.

### 1. ANNELIDA

## 1.1 First record of the polychaete Notomastus aberans Day, 1957 (Annelida, Capitellidae) in Slovenian waters

## Lisa SANDRI and Valentina PITACCO

The polychaete *Notomastus aberans* Day, 1957, is a capitellid distributed from the Indian Ocean to the Red Sea (Day, 1957; Çinar, 2009). Today it is considered a Lessepsian migrant and is colonizing the Mediterranean (Çinar, 2009). It has spread from the southern part of the Aegean and the Adriatic to the Tyrrhenian and Ligurian Seas, the Gulf of Lion, the Iberian Mediterranean coasts and the Alboran Sea (Parapar *et al.*, 2015 and citation therein). It has also been reported in the northern Adriatic Sea, in Italy (Cabrini *et al.*, 2016) and Croatia (Mikac, 2015), but it has never been reported in Slovenia.

As part of the Slovenian National Monitoring Programme, a field sampling campaign was carried out in May and September 2024. A total of five specimens of *N. aberans* were collected at 3 stations (Site 1: 45.559650° N, 13.719983° E, 16 m; Site 2: 45.591667° N, 13.666667° E, 22.4 m; Site 3: 45.590000° N, 13.632167° E, 24.7 m) in front of the port of Koper (Slovenia, northern Adriatic).

The specimens were identified as N. aberans, based on morphological traits, in agreement with the descriptions by Day (1957) and Parapar et al. (2015). All specimens were broken but still showed the main morphological features to identify them (Fig. 2A). The prostomium of *N. aberans* is conical with rather undefined eyespots. The peristomial ring is achaetous, followed by 11 thoracic segments. The first chaetiger has only notopodial capillaries, chaetigers 2-11 have capillaries in both rami (Fig. 2B). The transition from thorax to abdomen does not show any significant change in size. The hooks are long and thin with a slightly curved handle. The species differs from Notomastus formianus Eisig, 1887 because the main tooth is topped by four rows of denticles instead of 5-6 rows of denticles, thoracic branchiae are absent and the genital pore is not well developed. Instead, the other morphologically closest species, Notomastus mossambicus (Thomassin, 1970), has two rows of denticles

above the main tooth of the hook, a prostomium with blunt anterior end and first thoracic segments slightly biannulated

The occurrence of *N. aberans* in commercial ports in the northern Adriatic Sea has been previously documented and its introduction explained *via* ship ballast waters (Cabrini *et al.*, 2016). The vicinity of our sites to the Port of Koper confirms that commercial ports can serve as hotspots for biological invasions. Nevertheless, the presence of *N. aberans* in Slovenia could also be the result of range expansion from other Adriatic populations previously recorded.

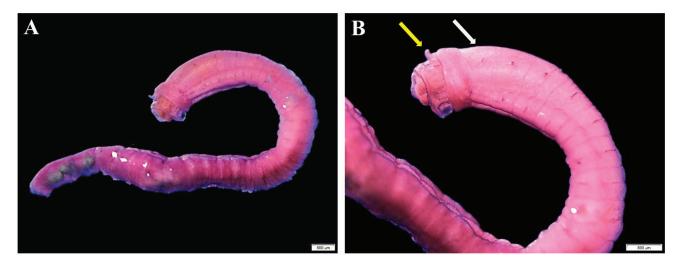


Fig. 2: (A) Identified specimen of *Notomastus aberans*; (B) Anterior region with first abdominal segment side view; the white arrow indicates the first chaetiger with only notopodial capillaries, the yellow arrow indicates the prostomium.

#### 1.2. New records of non-indigenous and cryptogenic spionids (Annelida, Spionidae) in Italian waters

Andrea BONIFAZI, Emanuele MANCINI, and Marco LEZZI

Spionidae Grube, 1850 is one of the most diverse and widespread families of polychaetes in the seas worldwide. In this study, we report the first record of *Paraprionospio coora* Wilson, 1990 in Italian waters, the first record of *Polydora cornuta* Bosc, 1802 in the Tyrrhenian Sea and we confirm the presence of *Prionospio pulchra* Imajima, 1990 in Italian waters. To date, in Italy seven non-indigenous spionid species have been reported, but five of these are considered questionable (Langeneck *et al.*, 2020).

Paraprionospio coora was described from the Pacific coast of Australia and it has been reported along the western Pacific coasts, the European Atlantic coasts (Bay of Biscay), and in the Mediterranean Sea (in Spain, Greece and Türkiye) (Martínez & Adarraga, 2013). Although initially considered an alien species, it is currently classified as a cryptogenic species in the Mediterranean basin (Yokoyama et al., 2010). Polydora cornuta is considered an opportunistic and highly invasive species; its abilities to rapidly colonise disturbed and polluted environments (Çinar et al., 2005) and to spread to new areas using ballast water and fouling as transport vectors makes it one of the most invasive species in the Mediterranean (Bertasi, 2016). In the Mediterranean Sea, it was recorded in Italy, Spain, Türkiye and Greece; however, in Italian waters, P. cornuta has only been recorded in three lagoons in the northern Adriatic Sea (Bertasi, 2016). Prionospio pulchra, which was originally described from Japanese waters, has been reported as an invasive non-indigenous species in both the Eastern Atlantic Ocean and the Eastern Mediterranean Sea (Dağlı & Çinar, 2011; Langeneck et al., 2020).

A total of 12 specimens of P. coora were collected on mud-sandy substrata in the Tyrrhenian Sea: seven specimens in April 2023 in the southern Latium coast at 44 m depth (41.166943° N, 13.701504° E, Central Tyrrhenian Sea) and five in July 2024 in the northern Latium coast at 25 m depth (42.223923° N, 11.664415° E, Central-Northern Tyrrhenian Sea). Paraprionospio coora was identified following Yokoyama et al. (2010): prostomium with two pairs of black eyes; brown pigment patch on the lateral side of the peristomium (Fig. 3A); three pairs of branchiae on setigers 1-3, with the first and second pairs of branchiae of approximately equal length and third branchiae shortest (Fig. 3B); hooded hooks with 3-4 rows of accessory teeth above the main fang (Fig. 3C). In July 2024, 22 individuals of *P. cornuta* were sampled in the same coastal area, within the Commercial Port of Civitavecchia (42.093768° N, 11.787712° E). The individuals were sampled within the Commercial Port of Civitavecchia (2 m deep, on the harbour walls), in an area characterised by intense naval traffic which promotes the deposition of fine sediment on harbour walls (port tug mooring area) (42.093768° N, 11.787712° E). The identification of P. cornuta was carried out following Bertasi (2016): prostomium distally expanded and incised at the frontal edge, with 4 eyes and a short occipital antenna (Fig. 3D); a caruncula extending to the third chaetiger (Fig. 3D); chaetiger 1 without notochaetae; presence of falcate spines and feather-like companion chaetae in chaetiger 5 (Fig.

3E); bidentate hooded hooks from chaetiger 7 (Fig. 3F). A total of about 40 specimens of *P. puchra* were found in December 2019, collected off Foce Reno (44.595487° N, 12.286136° E), and in November 2021, 500 meters off the coasts of Lido Adriano (44.401971° N, 12.327511° E). *Prionospio pulchra* was identified following Dağlı & Çınar (2011): rounded prostomium with 3–5 peaks (Fig. 3H, I); branchiae distinctly longer (at least 4–5 times) than the notopodial lamellae (Fig. 3G, H).

The species *P. coora* and *P. pulchra* were collected by using an 18 L Van Veen grab; *Polydora cornuta* was sampled by scraping on the harbour walls at 2 m depth. All three species have probably been confused with other species (Bertasi, 2016). *Paraprionospio coora* was previously misidentified as *P. pinnata* (Yokoyama *et al.*, 2010),

but it can be differentiated by the presence of pigment patches on peristomium (Fig. 3A), a small papilla on posterior margin of peristomium (Fig. 3B), and a very long first and second pair of branchiae. *Polydora cornuta* was previously misidentified as *Polydora ciliata* (Johnston, 1838) (Bertasi, 2016), but it can be distinguished from the latter by the presence of both the median antenna and feather-like companion chaeta (Çinar *et al.*, 2005). It is important to note that the specimens of *P. cornuta* were sampled within the layer of fine mud (approximately 2 cm) that covered the biofouling of the harbour walls. Although *P. cornuta* is typically associated with mobile substrates (Çinar *et al.*, 2005; Bertasi, 2016), previous studies have demonstrated that this species can also colonise hard substrates in anthropized environments (Karhan *et* 

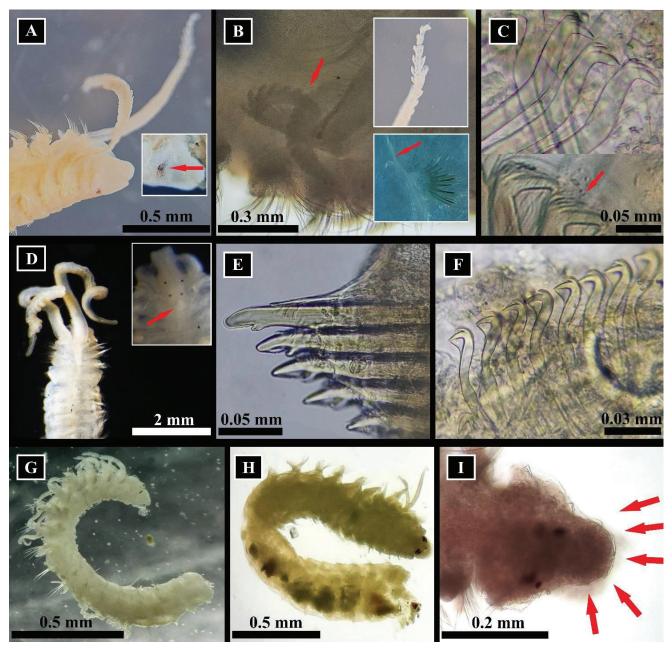


Fig. 3: Paraprionospio coora: (A) Prostomium, peristomium and a focus on the brown pigment patch on its lateral side; (B) focus on the first branchiae and on the small papilla on posterior margin of peristomium; (C) uncini. Polydora cornuta: (D) Prostomium and focus on the four eyes and the short occipital antenna; (E) falcate spines in chaetiger 5; (F) bidentate hooded hooks from chaetiger 7. Prionospio pulchra: (G)-(H) branchiae distinctly longer than the notopodial lamellae; (I) rounded prostomium with 3–5 peaks (scales = 2 mm for D; 0.5 mm for A, G, H; 0.3 mm for B; 0.2 mm for I; 0.05 mm for C, E; 0.03 mm for F).

al., 2008). Dağlı & Çınar (2011) suggested that the morphotype of *Prionospio cirrifera* Wirén, 1883 identified in Italian brackish environments corresponds to *P. pulchra*. This work increases the knowledge of the distribution of non-indigenous and cryptogenic polychaetes in the Med-

iterranean Sea, reporting the first record o *P. coora* in Italian waters, the first record of *P. cornuta* in the Tyrrhenian Sea, and confirming the presence of *P. pulchra* in Italian waters

#### 2. ARTHROPODA

#### 2.1 First record of Coleusia signata (Paulson, 1875) (Decapoda: Leucosiidae) in Cyprus through citizen science

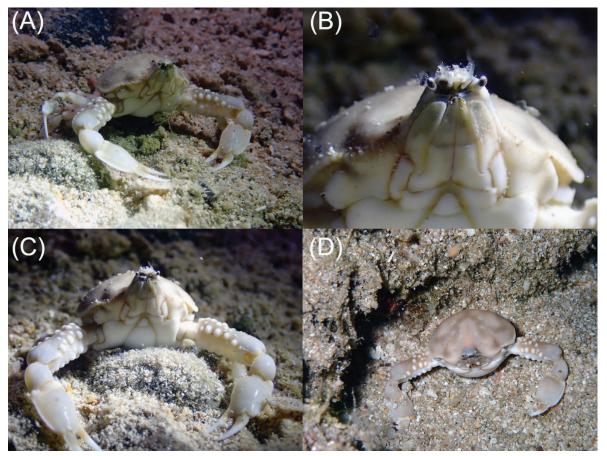
#### Periklis KLEITOU and Fabio CROCETTA

Positioned approximately 400 km north of the Suez Canal, Cyprus is strategically significant for the early detection and study of non-indigenous species (NIS) before they proliferate throughout the Mediterranean. Despite its location and proximity to major pathways of NIS, Cyprus reports fewer NIS compared to neighbouring countries. In the last decade, recent enhancements in social media and citizen science initiatives have led to the finding of several new NIS, suggesting that the previously noted paucity may have been mostly due to insufficient research efforts (Kleitou *et al.*, 2019).

The Indo-Pacific brachyuran *Coleusia signata* (Paulson, 1875) is a member of the family Leucosiidae Samouelle, 1819, first detected in Israel in the Mediter-

ranean in 1953 and then further documented in Egypt, Lebanon, Türkiye, Syria, and Greece (Holthuis, 1956; Galil, 2006). It has a nearly hemispherical carapace, smooth and markedly convex, with a frontal region narrowed and upturned. Its epibranchial margin is thickened, milled, and continuous with finely-milled crest that forms the posterior margin of the dorsum of the carapace. Its chelipeds are massive, carinated in the upper margin of the chela, and ornamented with fungiform granules at the base, while the walking legs are short and slender. These distinctive morphological traits facilitate its reliable and accurate identification in the Mediterranean Sea (Galil, 2006)

During nocturnal SCUBA dives conducted on infralit-



*Fig. 4:* Coleusia signata from Green Bay, eastern Cyprus. Photo credits, Figs A, B, C: Gareth Griffiths, 05/09/2023; Fig. D: Maria Siokouros-Oscarsson, 28/08/2024.

toral waters below 10 m depth, in sandy gravel substrates in eastern Cyprus (Green Bay: ~35.0010° N, 34.0683° E), the species was first observed on 5th September 2023, (Fig. 4A-C), and then on 28th August 2024 (Fig. 4D). In both cases, the specimen remained stationary under the dive lights, thus facilitating the observation. They were soon photographed and reported directly to the authors

of this note as part of the citizen science initiative "Is it alien to you? Share it!!!". These sightings constitute for the first records for Cyprus, increasing the inventory of reported non-indigenous decapod species in Cyprus to 21 taxa (Michail et al., 2024). They also highlight the importance of nocturnal surveys in detecting NIS that may otherwise go unnoticed.

### 2.2. First record of *Penaeus aztecus* Ives, 1891 (Decapoda, Penaeidae) from Maltese waters

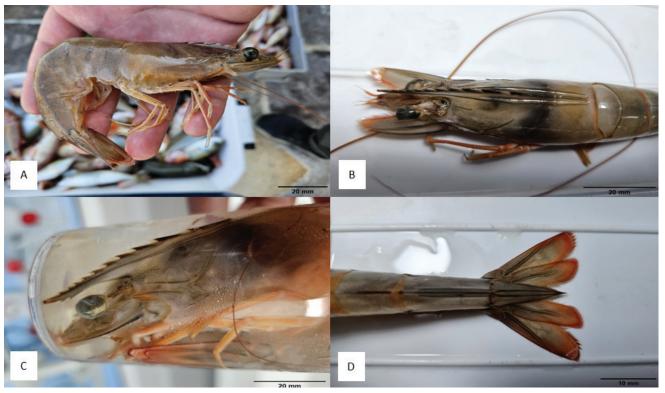
## Daryl AGIUS and Luca PISANI

The brown shrimp Penaeus aztecus Ives, 1891 is native to the western Atlantic (Williams, 1984) and was first recorded in the Mediterranean Sea in 2009 in the Gulf of Antalya (Deval et al., 2010) following records from the Black Sea (Khvorov et al., 2006), where it was misidentified as Penaeus semisulcatus De Haan, 1844. As sightings have increased, an eastern and western spread has become evident, with new records emerging from the Aegean, Adriatic, Ionian, and even Tyrrhenian Seas (Froglia & Scanu, 2023 and references therein). The main vector of introduction of this species into the Mediterranean is thought to be through ballast waters associated with shipping (Deval et al., 2010) but escapee from confinement is suspected to be a secondary vector, responsible for its rapid spread across the Mediterranean. Besides Penaeus aztecus, other non-indigenous species of the genus Penaeus have been recorded in the Mediterranean Sea, including P. semisulcatus, P. hathor Burkenroad, 1959, P. japonicus Spence Bate, 1888 and P. pulchricaudatus Stebbing, 1914 (Galanidi et al., 2023). The native P. kerathurus (Forskål, 1775) remains frequently observed in Maltese waters.

A single female specimen of *P. aztecus* was caught on 6<sup>th</sup> November 2024, off the northeast coast of Malta (35.959617° N, 14.412233° E) through a trammel net fishery at around 30 m depth. The specimen was olive-brown in colour with a red tinge at the extremities of the pereiopods, pleopods, and uropods (Fig. 5A). The carapace length was measured at 41 mm, with a total weight of 49.9 g.

The species was identified following the guidelines in Froglia & Scanu (2023). The adostral groove and crest were found to reach the full length of the carapace (Fig. 5B), the ventral rostrum had two teeth present (Fig. 5C), the telson was without spines or teeth, an ischial tooth on the first pereopod was present, and a well-defined dorsolateral sulcus could be observed on the last abdominal somite (Fig. 5D).

This record confirms the first known occurrence of *P. aztecus* in Maltese waters, bridging a gap previously



*Fig. 5:* Freshly caught *Penaeus aztecus* individual (A); the adostral groove and crest reaching the full length of the carapace (B); two (2) teeth on the ventral side of the rostrum (C); the well-defined dorsolateral sulcus on the last abdominal somite (D).

observed in the distribution of this species in the Central Mediterranean Sea. Whilst only one specimen has been successfully verified to date, fishers have stated that this was not their first encounter with a penaeid specimen exhibiting similar colouration, however one cannot exclude the possibility of misidentifications.

# 2.3. First record of *Pleopis schmackeri* (Poppe, 1889) from Syria (NE Levantine Sea, Eastern Mediterranean)

Haidar Bassam HASAN, Adib Hasan ZIENI and Wassim Mahmoud MAYYA

In this note, *Pleopis schmackeri* (Poppe, 1889) was observed for the first time in the coastal waters of Syria (Latakia basin). This alien cladoceran species was first recorded in southeastern coast of Türkiye (Iskenderun Bay, Cilician basin) in the Mediterranean Sea (Terbiyik Kurt & Polat, 2018), and later it was observed in Kuşadası, Güllük and Gökova Bays in the southeastern coast of Aegean Sea (Bariche *et al.*, 2020). Originally, it was described in waters extending from the South China Sea to the Northeast of Honshu (Japan) (Kim & Onbe, 1989). There are also sporadic records of its presence in Aqaba Bay (Red Sea) (Gurney, 1927), Madagascar (Indian Ocean) (Onbé, 1999), and along the Brazilian coasts (Rocha, 1985).

Zooplankton sampling was carried out on  $23^{rd}$  July 2024 in Ras Al Basit region, north of Latakia, Syria  $(35.5103^{\circ} \, \text{N}, 35.4711^{\circ} \, \text{E})$ . Vertical hauls were performed at one station using WP2 Closing Net with 200  $\mu$  mesh size, from six water layers to a depth of 500 m (0-10, 10-10)

25, 25-50, 50-100, 100-200, 200-500 m), accompanied by measurements of temperature and salinity (30.1°C and 39.3% respectively in the surface water; 16.8°C and 35.2% at 500 m depth). *Pleopis schmackeri* was found in all samples taken from all studied layers very rarely (varied between 0.2 ind/m³ at 200-500 m and 1.9 ind/m³ at 10-25 m), and the average abundance was 0.9 ind/m³ (±0.66 ind/m³, N=6).

*Pleopis schmackeri* is described as an euryhaline species that prefers warm waters (Rocha, 1985). It has a hemispherical body (Fig. 6), four setae on exopods of thoracic limbs 1-3 (Fig. 6B), clearly distinguishing it from *Pleopis polyphemoides*, which has only three setae on exopods of thoracic limbs. The body length of this species varied between 388 and 494 μm. *Pleopis schmackeri* may have entered the eastern Mediterranean as a Lessepsian migrant from the Red Sea via the Suez Canal and was then transported north by alongshore currents towards Syrian coasts until reaching the Aegean Sea.

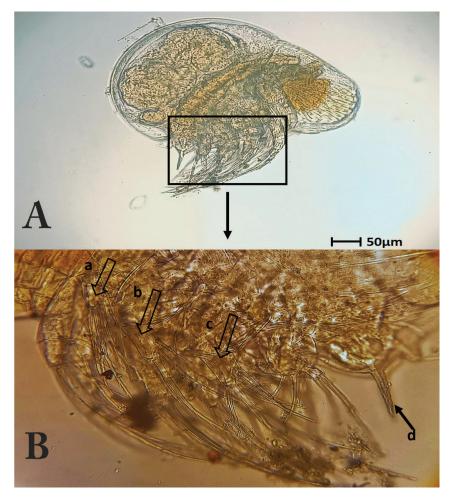


Fig. 6: (A) Pleopis schmackeri, Latakia (Syria), Body appearance, (B) a, b, c: setae exopod of Thoracic limbs, d: Caudal furca.

#### 3. BRYOZOA

# 3.1. On the presence of the introduced *Watersipora subatra* (Bryozoa) and other watersiporid species along the Slovenian coast (northern Adriatic)

### Ana FORTIČ and Petra SLAVINEC

Species within the bryozoan family Watersiporidae are encrusting with a putative cosmopolitan distribution. They are commonly found thriving in ports and marinas, due to their tolerance to copper and other pollutants, coupled with their short life cycle (McKenzie *et al.*, 2012). In Slovenia, the presence of three species within this family was documented until 2020: the non-indigenous *Watersipora arcuata* Banta, 1969 (first recorded in 2017), the cryptogenic *Watersipora subtorquata* (d'Orbigny, 1852) (identified in 2019) (Mavrič *et al.*, 2023) and the native *Terwasipora complanata* (Norman, 1864).

On 20<sup>th</sup> November 2020, a fourth species was discovered at the municipal beach in the city of Koper (45.549625° N, 13.725125° E). The beach is located near

the Port of Koper –the largest port in the region. Several colonies were observed on exposed intertidal rocks during low tide (Fig. 7A) and subsequently collected for laboratory analyses. Initial observations under a stereomicroscope were followed by detailed identification using a scanning electron microscope (SEM), with the support of an expert taxonomist. The species was confirmed as part of the cryptogenic *Watersipora subatra* (Ortmann, 1890) complex, based on diagnostic features such as the presence of latero-oral intrazooidal septulae, the shape and dimensions of the orifice, and the size of the pseudopores (Vieira *et al.*, 2014) (Fig. 7B, C, D). Due to its close resemblance to *W. subtorquata* and the taxonomic inconsistencies in genetic databases, the identifi-

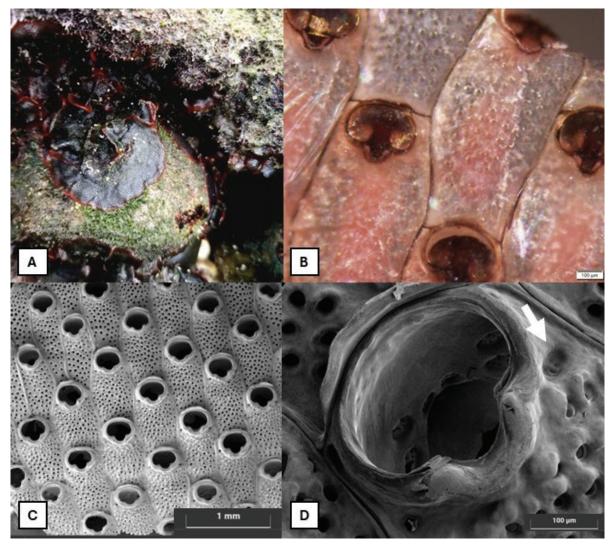


Fig. 7: A) Colonies belonging to the Watersipora subatra species complex observed in the lower intertidal belt in Koper, Slovenia. B) Autozooids viewed with stereomicroscope and SEM at different enlargements C), D) showing the latero-oral intrazooidal septula -white arrow.

cation of *W. subatra* in the Mediterranean Sea has only been recently confirmed (Gauff *et al.*, 2023). However, the species is likely an established introduced species in the region. Beyond the Mediterranean, *W. subatra* is also found in the Pacific Ocean and has been reported as introduced into north Atlantic European waters, although its origin remains unknown (Reverter-Gil *et al.*, 2019; Gauff *et al.*, 2023).

Subsequent monitoring of introduced species along the Slovenian coast, targeted on non-indigenous species hotspots, such as ports, marinas, aquaculture facilities, and coastal wetlands in 2022 and 2023, recorded all four watersiporid species at various surveyed locations (Fig. 8). Rapid assessment methods included rapid scanning of the conspicuous species at the selected sites and selective qualitative sampling of the fouling community to look

for smaller organisms. These organisms were identified in the laboratory and species identification of the watersiporids was carried out using SEM. The map in Figure 8 shows how the non-indigenous, cryptogenic and native watersiporid species are distributed along the Slovenian coast, which changes from east to west, with the greatest diversity observed in the marina Izola. Watersipora subatra was observed in the wider area around Koper and neighbouring Izola, which suggests that its introduction could be related to maritime traffic via the Port of Koper. Colonies of this bryozoan were frequently found in the intertidal zone, attached to the shells of non-indigenous oyster Magallana gigas, present in the Gulf of Trieste since the seventies of the last century (Lipej et al., 2012), on vertical concrete walls, as well as in the upper infralittoral zone.

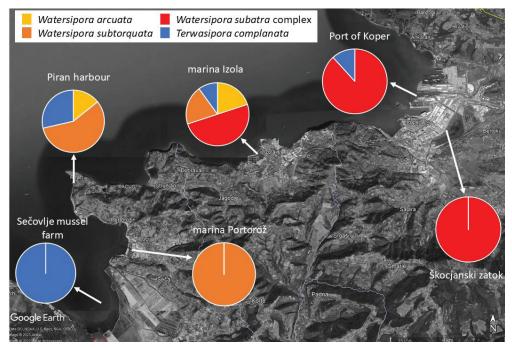


Fig. 8: Distribution of species of the family Watersiporidae found along the Slovenian coast during a survey on introduced species conducted in 2022-2023.

### 4. CHORDATA

#### 4.1. On the occurrence of *Pteragogus trispilus* Randall, 2013 in Italian waters

Ernesto AZZURRO, Sylvaine GIAKOUMI and Lucio BELLOMO

Pteragogus trispilus Randall, 2013 is a small coastal fish of the Labridae family that entered the Mediterranean from the Red Sea via the Suez Canal. The species was first recorded in 1991 along the Israeli coast under the name of Pteragogus pelycus (Golani & Sonin, 1992) and quickly colonized several countries in the eastern Mediterranean, establishing permanent populations in Israel, Lebanon, Syria, Türkiye, Cyprus, Greece, Egypt, and Libya. In 2022, it was reported in Malta (Tiralongo et al., 2022).

On 8th August 2023, an individual of this species

was filmed by one of the authors (LB) while scuba diving for his association 'Sailing Bubbles', at a depth of 7 meters in *Posidonia oceanica* meadows near Lampione (Pelagie Islands, Sicily, 35.5505° N, 12.3933° E). The video, available at this link https://www.youtube.com/watch?v=1ossHRoFRW8, clearly shows the wrasse, with selected frames presented in Figure 9. One year later, on 29<sup>th</sup> July 2024, another individual was observed at less than 300 m from the previous location, in a small patch of *Posidonia* in a rocky habitat at a depth of 6.5 meters (35.5479° N, 12.3169° E). Both individuals were

estimated to be 8–10 cm in total length, displaying a yellowish-brown body with elongated dark spots along the lateral line, and a distinctive black blotch on the operculum encircled by a yellow ring near its edge. These traits clearly distinguish the species from all other Mediterranean wrasses (Golani *et al.*, 2021), including *Symphodus ocellatus* (Forsskål, 1775).

Our findings provide the first confirmed presence of *P. trispilus* in Italian waters, further extending its non-native distribution in the Mediterranean Sea (Azzurro *et al.*, 2023). Notably, these observations were made at a shallower depth than the previously reported range in Fish-Base (Froese & Pauly, 2024).



*Fig. 9:* Frames of the videos of *Pteragogus trispilus* recorded in Lampione Island at a depth of 7 m. The video is available at https://www.youtube.com/watch?v=1ossHRoFRW8

# 4.2. The first record of *Triacanthus biaculeatus* (Bloch, 1786) from the northern Levant, Mediterranean Sea, Türkiye

Mustafa Tunca OLGUNER and Alper YILDIZ

Triacanthus biaculeatus (Bloch, 1786), commonly known as the Shortnose Tripodfish, is widely distributed across the Indo-West Pacific, ranging from the Persian Gulf to South Africa (Matsuura, 2001; Santini & Tyler, 2002). Despite its wide distribution, *Triacanthus biaculeatus* (Bloch, 1786) has been rarely documented,

with previous records limited to the eastern Levant Sea off the Gaza Strip (Abd Rabou *et al.*, 2024) and the Red Sea (Goutham-Bharathi *et al.*, 2024). However, our study represents the first recorded occurrence of this species in the northern Levant, specifically in Türkiye.

A single specimen of Triacanthus biaculeatus was





Fig. 10: Triacanthus biaculeatus (Shortnose Tripodfish) individual caught from Hatay, Northern Levant, Türkiye. Photo credits: E. Guler.

caught in the eastern Mediterranean coastal waters near Hatay, Türkiye (36.03850° N, 35.96272° E) in December 2024. This specimen had a total length of 14.8 cm and a total weight of 55 g. It was caught using a fishing rod by an amateur fisher from the shore (Fig. 10A, B). The identification of the specimen was based on its characteristic morphological features, including a deep, laterally compressed body, two prominent dorsal spines, and a short snout. The distinct colouration, with yellowish markings along the lateral line and a small, rounded mouth, further confirmed its taxonomic identity. These diagnostic traits

are consistent with descriptions provided in Carpenter & Niem (2001). Photographs of the specimen were taken on-site, with permission granted by the fisher (Fig. 10A, B). The occurrence of *T. biaculeatus* is part of a growing trend in the establishment of non-native species in the Mediterranean Sea. Our literature review indicates that this species has not been recorded in the northern Levant or Türkiye. Therefore, this represents the first documented record of *T. biaculeatus* in the northern Levant, specifically along the Turkish coast.

#### 5. CNIDARIA

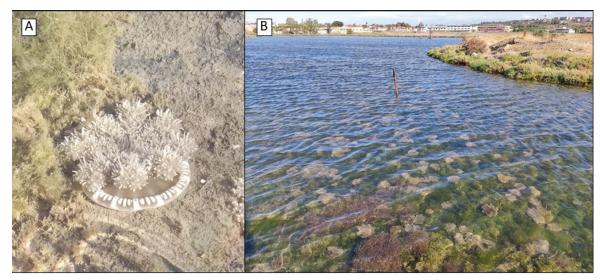
# 5.1. Documenting the invasion: First well-documented record of Cassiopea cf. andromeda in the Italian Ionian Sea

Francesco TIRALONGO and Francesco LASPINA

Cassiopea cf. andromeda, a non-indigenous jellyfish considered to be Lessepsian in the Mediterranean, first entered the basin in 1903, with Maas (1903) documenting its migration from the Red Sea to Cyprus. Subsequently, the species was later reported in the Aegean Sea in 1955 and then in several other countries of the eastern and central Mediterranean (Deidun et al., 2018), as well as in Spanish waters in more recent times (Rubio, 2017). In Italy, Cillari et al. (2018) provided the first documented record in Palermo in 2014 (Tyrrhenian Sea), while Servello et al. (2019) reported an unpublished record of the species in the Bay of Augusta (Ionian Sea). However, no estimates were provided regarding the abundance of the species or details concerning the precise location of the sighting were provided in the latter case. In this work, we photographically documented the presence of the species for the first time from the Italian Ionian Sea (Fig. 11A), inside the salt pans of Augusta (37.24709° N, 15.21569° E).

On 15th September 2024, a very high number of

specimens (estimated density of about 10 individuals/ m<sup>2</sup>) belonging to the genus Cassiopea and attributable to Cassiopea cf. andromeda were observed covering the seabed of Augusta salt pans (Fig. 11B). Individuals had an estimated size ranging from 10 to 20 cm in diameter. The observations took place in the morning under favorable weather conditions. The salt pans, characterized as semi-enclosed and eutrophic environments with minimal water exchange, seem to offer ideal conditions for the proliferation of this invasive jellyfish species. The high tolerance of Cassiopea to environmental fluctuations, combined with its prolific asexual reproduction, suggests that the species may continue to expand its range in these sheltered habitats (Deidun et al., 2018). The dense aggregation observed in the Augusta salt pans highlights the presence of a new hotspot for Cassiopea within the Italian Ionian Sea, which may have significant ecological implications. In particular, the spread of this species could result in shifts in local food webs, with potential



*Fig. 11:* Specimens of *Cassiopea* cf. *andromeda* observed in the salt pans of Augusta on 15<sup>th</sup> September 2024. A: detail of a single specimen; B: a photo demonstrating the high density of the species in Augusta.

impacts on fish larvae, plankton, and other invertebrates that compete for the same resources. *Cassiopea* may contribute to the proliferation of jellyfish blooms, which can result in increased organic matter deposition, altered sediment characteristics, and reduced oxygen levels in benthic habitats (Cillari *et al.*, 2018). These changes could exert further stress on the local ecosystems, espe-

cially in semi-enclosed environments like the salt pans, harbors and coastal lagoons, where water circulation is limited. Continued monitoring and studies on the long-term effects of *Cassiopea* cf. *andromeda* proliferation in the Augusta salt pans are essential in order to predict and mitigate potential ecological and economic consequences in the region.

## 5.2. The status of invasive coral Oculina patagonica De Angelis, 1908 along the Syrian coast

#### Izdihar Ali AMMAR

Oculina patagonica is one of ten species of the genus Oculina mostly found in the Caribbean Sea and the Gulf of Mexico (Cairns, 2000). It was first discovered in the Mediterranean Sea in 1966 near the port of Genova (Zibrowius, 1974) in Italy, and recorded shortly thereafter in the port of Alicante in Spain (Zibrowius, 1974). This invasive coral has spread across the Mediterranean reaching Levantine Basin, most likely fouling on vessels (for distribution details see Serrano et al., 2023). Its status as alien species has been discussed by Leydet & Hellberg (2015) who suggested that Mediterranean populations of O. patagonica have long been isolated from the western Atlantic either in undetectable numbers or overlooked and undersampled sites and habitats, and have only recently been expanding to invasive levels as a result of environmental changes.

Consequently, the species may have arrived in Syrian waters long ago but went unnoticed. This is the first record of this alien coral on the Syrian coast, where a colony was found in the form of a crust covering a rock with a diameter of 50 cm in the Ibn Hani Marine Protected Area (35.5927° N, 35.74191° E). It was detected in March 2020 at a depth of 3 m, by an amateur diver (Fig. 12A). Additional colonies were also observed at the Al-Samra site, far north Syria (35.927828° N, 35.915995° E) during

the same period, and at its presence was well documented in Ibn Hani site north of Lattakia city (35.593462° N, 35.750667° E), at a depth of 3 m on 3<sup>rd</sup> June 2024, (Fig. 12B & C). Bleaching in two adjacent colonies of *O. patagonica* observed in the intertidal zone at Ras al-Basit (35.848972° N, 35.811500° E) (Fig. 13) on 1<sup>st</sup> April 2022, each colony measuring approximately 80 cm in diameter.

Further monitoring and research are required in the future to decide the trend of this coral on Syrian coasts.



*Fig. 13:* Bleaching of *Oculina patagonica* colony at Ras al-Basit (Syria).

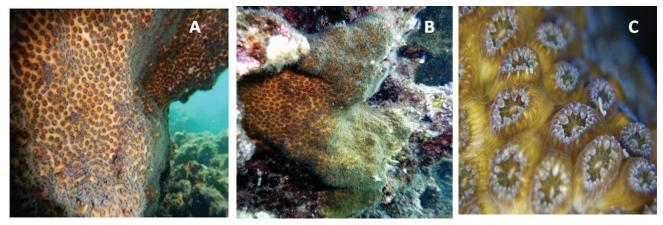


Fig. 12: Oculina patagonica colony at Ibn Hani (north of Latakia, Syria).

#### 6. MOLLUSCA

## 6.1. The Indo-Pacific conch Conomurex persicus (Mollusca: Gastropoda) reached the Messina Strait

Francesco TURANO and Daniele GRECH

On 11th September 2024, nine live specimens of Conomurex persicus (Swainson, 1821) (Fig. 14A, B) were found by FT in Pellaro (38.0198° N, 15.6353°E); southern Calabria side, Messina Strait (Italy). The finding spot was in a sandy area of 5 meters depth close to the breakwaters. Here many specimens of the Indo-Pacific conch were laying on sand and on the rocks. Sea water temperature was 27°C and in presence of pulse current typical of the area (Bignami & Salusti, 1990). Specimens presented the typical cony shaped shell and sharped (Fischer et al., 2023 and references therein) which only slightly resembles the native Conus ventricosus Gmelin, 1791. A few days later, after more extensive searches, eight additional specimens were found, near the first site and in the same habitat. One of the specimens was first photographed underwater with a reflex digital camera by FT. Further pictures of the live collected specimens were made outside the water.

The species is native to the southern coast of Arabia and part of the Persian Gulf and presumably arrived in the Mediterranean through shipping (Zenetos *et al.*, 2004), but accidental, volunteer introduction or subsequent larvae dispersal from other existing sites is possible. The first Mediteranean record dates back 1978 in southern Türkiye. *Conomurex persicus* has spread from its first discovery on the Turkish Mediterranean coast both westwards (Aegean and then Ionian Sea) both eastwards to the Syrian and Israeli coasts, and from there westwards to Egypt, Syria in the eastern Mediterranean. It was also recently reported in Tunisia and Italy (Fischer *et al.*, 2023). It is currently widely distributed and even invasive in Greek soft bottoms (Crocetta *et al.*, 2017) and an arrival through larvae dispersal seems to be highly possible.

In Italy, apart from the unique confirmed recent record



Fig. 14: A, C: Macro photo of the head and eye of Conomurex persicus; B: dorsoventral view. Scale bar is 1 cm.

of Linosa (central Mediterranean Sea, Tunisian Plateau) a few empty shells were found off Muggia (Trieste, Italy), but the record could be misleading. All the specimens reported until now are from the Eastern and Central Mediterranean Sea and the Adriatic Sea. This current report is in the extreme proximity to the western Mediterranean Sea, that up to date has no record of this species. The species is particularly palatable and has been exploited

in Rodos Island (Greece) over recent years and sporadically offered for human consumption in fish restaurants (Katsanevakis *et al.*, 2008). Colour and shape of the species are extremely attractive for citizens, so if properly boosted by rise awareness campaign and training it is a good candidate for alien species citizen science projects (Gerovasileiou *et al.*, 2017).

# 6.2. First record of the Indo-Pacific oval squid *Sepioteuthis lessoniana* Lesson, 1831 from Lampedusa Island (Central Mediterranean Sea)

#### Marco ALBANO and Gioele CAPILLO

The oval squid or bigfin reef squid Sepioteuthis lessoniana Lesson, 1831, is a squid of the genus Sepioteuthis Blainville, 1824 which currently contains three species, belonging to the family Loliginidae Lesueur, 1821 of the order Myopsida. The taxonomy and systematics of these taxa are currently under definition, as confirmed by the huge number of synonymous species, and probably this species represents a pool of similar ones (Okutani, 2005). This cephalopod is a pelagic species, with both diurnal and nocturnal habits, commonly inhabiting coral reefs in several oceans (Roper & Jereb, 2010). Commonly reported at a depth range of 0-100 m, S. lessioniana preys on small fish and crustaceans with an opportunistic behaviour. It reproduces in the late spring/early autumn in native waters, mainly depending on temperature regime (Ikeda et al., 2009). It is reported to reach a maximum length of 38 cm for the bigger males, presenting an oval-shaped body, eight arms armed with two rows of suckers, and a colour from brownish to pinky-violet. Its distribution comprises mainly the Pacific Ocean and Indian Ocean, where it represents an important commercial resource, but also far areas of these basins such as New Zealand and the Red Sea. From the latter area, recently, this species migrated to the Mediterranean Sea though the Suez Canal, as described by Lefkaditou et al. (2009).

Here we report a specimen caught in Lampedusa Is-

land (Italy, Central Mediterranean Sea, 35.501914° N, 12.589783° E) on 24<sup>th</sup> November 2024, by a recreational fisher (Fig. 15). The oval squid was caught from the shore during nighttime by a jigging line with artificial lure, specifically using the eging technique that stimulates active predation on lures mimicking a small fish/prawn. It was an adult female of about 175 mm in mantle length and 205 g in weight.

To the best of our knowledge, this is the first record of *S. lessioniana* documented from Lampedusa Island and Italian waters. This finding, combined with previous records from Libya and Tunisia (Galanidi *et al.*, 2023), indicate the establishment of the species in the central Mediterranean.

The active predatory behaviour of *S. lessoniana*, coupled with its expansion across the Mediterranean basin, might enhance this species' interaction with fishers and lead to more records in the coming years. Indeed, as in this case, recreational fishers represent an essential resource for their accurate and selective techniques, which often attract rare and elusive species. Further studies are required for the molecular and biometric evaluation of *S. lessoniana*, based on multiple samples. We hope that this report will enhance the attention regarding this species in the central Mediterranean Sea.



Fig. 15: Sepioteuthis lessoniana specimen described in this study. (a, b) live specimen soon after capture on 24<sup>th</sup> November 2024, from Lampedusa Island, Italy; (c, d) details of specimen length and weight. Photo credits: Giacomo Sanguedolce (a, c) and Giovanni La Magra (b).

## 6.3. New records of Alveinus miliaceus and Retusa desgenettii from the Levantine coasts of Türkiye

Argyro ZENETOS and Panayotis OVALIS

The Levantine coast of Türkiye hosts a high number of non-indigenous molluscan species (122 species) (Öztürk et al., 2024) versus the 43 species in the Aegean coasts of Türkiye (Zenetos et al., 2025). The Gulf of İskenderun, located in its eastern part, is characterised by intensive maritime traffic and appears to be a hot spot area for marine non-indigenous Mollusca species (Öztürk et al., 2023). Here we report the presence of two micromolluscs new to the Levantine coast of Türkiye namely the bivalve Alveinus miliaceus (Issel, 1869) and the gastropod Retusa desgenettii (Audouin, 1826).

Twelve articulate dead valves of *Alveinus miliaceus* (Fig. 16) were found in shell grit collected on the Burnaz Beach Erzin (36.922555° N, 36.029499° E), Iskenderun Gulf, in August 2012. Until now *A. miliaceus* is only known from Israel (Steger *et al.*, 2018) where it was detected in 2016. Its presence along the Israeli costs was further confirmed by Albano *et al.* (2024) who identi-

fied a live specimen dating to the year 2009 and more in the period 2014-2018. Our finding consists not only the first record for the Levantine coast of Türkiye but also for Türkiye. The present record attributed to P.O. (shell collector) confirms the role and significant contribution of shell collectors in reporting non-indigenous species (Zenetos *et al.*, 2024).

Nine empty shells of *Retusa desgenettii* were found in shell grit collected by scuba diving at Samandağ (36.081671° N, 35.939185° E), İskenderun Gulf in August 2012 (Fig. 17). The species is widely distributed in the eastern Mediterranean (Egypt, Israel, Lebanon, Cyprus and Türkiye). For details on its distribution in the Mediterranean see Crocetta & Tringali (2015). In Türkiye *R. desgenettii* is known from its Aegean coasts (Bozburun: Crocetta & Tringali, 2015) but was until now unreported from the Levantine coast of Türkiye.

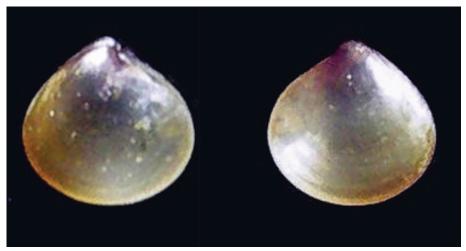


Fig. 16: Alveinus miliaceus (Issel, 1869) collected from the Burnaz Beach; height: 0.95 mm (left: right valve; right: left valve).



Fig. 17: Retusa desgenettii (Audouin, 1826) collected from Samandağ; height 1.63 mm.

# 6.4. The first record of the loliginid squid *Uroteuthis (Photololigo) arabica* (Ehrenberg, 1831) in the Mediterranean

Alp SALMAN, Sencer AKALIN and Coşkun Menderes AYDIN

Loliginid squids are mainly small to medium-sized cephalopods living along coastal and continental shelves in warm and temperate waters, and they usually have commercial value (Jereb & Roper, 2010). In the Mediterranean Sea, the family Loliginidae Lesueur, 1821 is represented so far by five species (Salman et al., 2023): Loligo forbesii Steenstrup, 1856, L. vulgaris Lamarck, 1798, Alloteuthis media (Linnaeus, 1758), A. subulata (Lamarck, 1798), and the Lessepsian cephalopod Sepioteuthis lessoniana Ferussac in Lesson, 1830, recently introduced from the Red Sea (Salman, 2002). Uroteuthis

(*Photololigo*) *arabica* (Ehrenberg, 1831), reported in this study, is the second Lessepsian loliginid species to have arrived via the Suez Canal into the Mediterranean Sea.

In August 2024, one maturing male specimen, which had gonads in stage 2b (the Needham's sac had structureless whitish particles without functional spermatophores) according to Follesa & Carbonara (2019), with a 174 mm mantle length (ML) and 62.7 g total weight, was caught during a scientific trawl survey at 45 meters depth off the Anamur coast (36.077° N – 32.933° E) on the Turkish Mediterranean coast. The sample was fixed on board in a

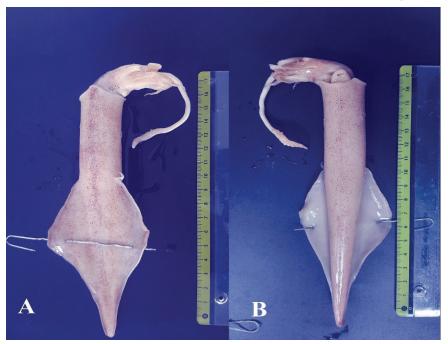


Fig. 18: General view of the specimen of U. (P.) arabica (A: Dorsal; B: Ventral).

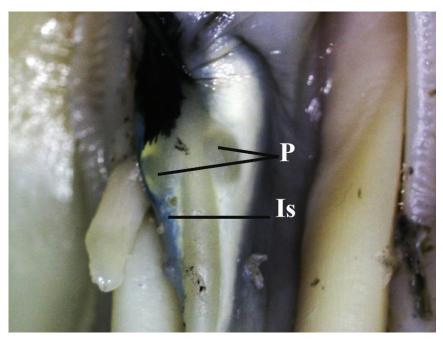


Fig. 19: Photophores on the ventral surface of the ink sac of U. (P.) arabica (P. Photophores; Is: Ink sac).

10% formalin solution and coded as ESFM-CEP/2024-1 at the Ege University Faculty of Fisheries scientific collection. The specimen's mantle was long and narrow. Its mantle width (MW) was 26 mm, and its ratio to the mantle length was about 15%. The fin length and width were 113 and 62 mm, respectively, 65% and 35% of the mantle length (Fig. 18).

Uroteuthis (P.) arabica stands out from all other loliginids in the area due to a pair of bacterial bioluminescent organs (photophores) on the ventral face of the ink sac (Fig. 19). This unique feature is exclusive to the Uroteuthis genus in loliginids (Nesis, 1987). The genus includes 14 species, of which 12 are in 3 subgenera, two are in an undetermined subgenus category, and all live in the Indo-West Pacific Ocean. The significant difference between U. (P.) arabica and its congenerics is the mantle,

which is long and narrow. Mantle width is between 12% and 20% of the mantle length, and the fin length is about 60-65% of the mantle length. Additionally, the number of teeth of the arm and club sucker rings and the hectocotylised arm sucker and papillae formation are different (Jereb & Roper, 2010).

With some exceptions, the distribution route and the probability of encountering any Indo-Pacific species in the Mediterranean ecosystem will start from the east and move towards the west. However, the fact that this record is from a relatively western location may indicate the possibility that *U.* (*P.*) arabica was previously confused with some native loliginid species, especially *L. vulgaris* and *L. forbesii* or its rare distribution in the Mediterranean. Further studies should clarify the actual status of the species' distribution in its new home.

## 7. OCHROPHYTA

## 7.1. First record of brown alga Colpomenia peregrina in the Adriatic Sea

Ivan CVITKOVIĆ and Ante ŽULJEVIĆ

Colpomenia peregrina Sauvageau 1927 originates from the Northwest Pacific but has become a worldwide distributed species as one of the most successful brown algal invaders (Green-Gavrielidis et al., 2019). The first record for the Mediterranean Sea was in Etang de Thau (France) in 1918. It was consecutively recorded throughout the Mediterranean basin except in its south-east part

and in the Adriatic Sea (Verlaque *et al.*, 2015) where it is not considered as an invasive species.

In April 2007 we recorded *C. peregrina* in the small fishing harbour in Vira Cove on the Island of Hvar (Middle Adriatic Sea, Croatia) (43.190555° N, 16.427867° E) which represents its first, still unpublished record for the Adriatic Sea. The species developed as a predominant

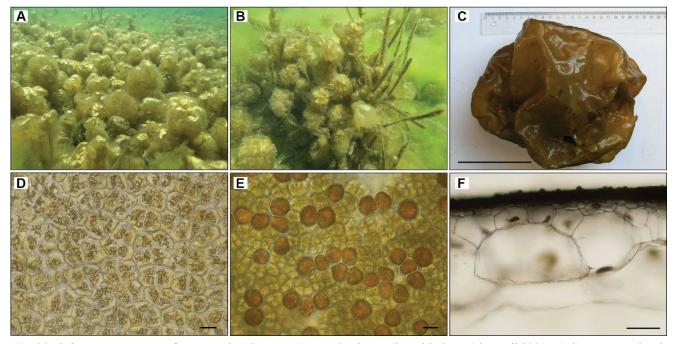


Fig. 20: Colpomenia peregrina from Croatia. Vira Cove (Hvar Island, Croatia, Adriatic Sea) in April 2007: A) *C. peregrina* developed on seagrasses *Cymodocea nodosa* (A) and *Posidonia oceanica* (B) at ca. 3 m depth. C) Large thallus of 25 cm in diameter collected in Kaštela Bay in April 2009. Microscopic photos of thalli from Vira Cove kept in formaldehyde: D) surface view of the cells, E) plurilocular sporangia and ascocysts, F) cross section with 3-4 layers of medullary cells. Scale bars: 10 cm (C), 10 μm (D, E), 100 μm (F).

epiphyte on the leaves of the seagrasses Posidonia oceanica (Linnaeus) Delile and Cymodocea nodosa (Ucria) Ascherson between 1 and 4 m depth. It was outstandingly abundant, developing several thalli on almost every seagrass shoot between 1.5 and 5 m depth (Fig. 20A and B). The affected area was restricted to the very end of the cove and covered approximately 0.3 km<sup>2</sup>. The cove was eutrophic due to the discharge of bycatch from trawlers. Two years later (April 2009), the abundance and distribution of the alga was similar. In April 2009 we detected C. peregrina in a slightly eutrophic part of the Kaštela Bay (Croatia) (43.522582° N, 16.415487° E) where it was abundant as epiphytic and epilithic species on the rocky bottom between 1 and 4 m depth. Despite intensive inspection of the areas of Vira Cove and Kaštela Bay for the purposes of Croatian national monitoring of non-indigenous species and having C. penegrina as a target species, it has not been recorded again since 2009 in Croatian marine waters. Hence, to the best of our knowledge, records in Vira Cove and Kaštela Bay remain the only records of *C. peregrina* in the Adriatic Sea up to now.

Morphological, ecological and anatomic features of the collected specimens correspond to the published features of *C. peregrina* (Cormaci *et al.*, 2012; Mathieson *et al.*, 2016): hollow, spherical light brown thalli that develop epiphytically at 1 to 5 m depth, up to 25 cm in diameter, up to 4 layers of large medullary cells, cortical cells with single cup-shaped plastid, crowded plurilocular sporangia with scattered paraphysis (Fig. 20).

Since the nearest area where *C. peregrina* was recorded is in the Ionian Sea (Greece) (Tsiamis *et al.*, 2010), we assume that propagule dispersal by currents served as the vector for spreading into the Adriatic Sea. The reason why it did not develop in different locations and the reason for its disappearance after successful expansion remain unknown.

#### 8. CHLOROPHYTA

# 8.1. Discovery and disappearance of the last *Caulerpa taxifolia* (Chlorophyta, Bryopsidales) settlement in the Adriatic Sea

Petra LUCIC and Ivan CVITKOVIĆ

The green alga *Caulerpa taxifolia* (M. Vahl) C. Agardh is one of the most famous marine invaders. Its spread in the Mediterranean Sea, as well as in California and Australia, has been accompanied by numerous scientific publications, journal articles, books, documentary films, and four specialized international workshops (Deveney *et al.*, 2008).

Around 2007 and 2008, C. taxifolia massively declined throughout the entire Mediterranean (Meinesz et

al., 2010). This exceptionally interesting event in invasion biology was followed by only a few publications. The only existing site with *C. taxifolia* at that time in the Adriatic Sea was in Stari Grad Bay (Croatia), where a massive die-off also occurred in the winter of 2007/08. During this period, the colony, which had spread over 70 hectares, retreated by more than 90%, while a plant disease is suggested as the most likely cause of such a large-scale mass die-off (Žuljević et al., 2019).



Fig. 21: Caulerpa taxifolia in Stari Grad Bay (Croatia) in autumn 2020. Several thalli formed the last observed colony in the Adriatic Sea.

The very last thalli of *C. taxifolia* in Stari Grad Bay (43.182893° N, 16.582750° E) were detected in autumn 2020 (Fig. 21). *Caulerpa taxifolia* formed a scattered settlement approximately 2 m² in size, developing in a sparse *Posidonia oceanica* (Linnaeus) Delile meadow at a depth of 10 meters. Despite particular monitoring of the area where *C. taxifolia* previously thrived, no records have been noted since 2020, leading us to conclude that the "killer alga" probably no longer exists in Stari Grad Bay. Accordingly, no site with *C. taxifolia* is currently known in the entire Adriatic Sea.

Interestingly, this large-scale, massive, and highly synchronized vanishing of *C. taxifolia* did not occur in other non-native conspecific algae of the genus *Caulerpa* within the Mediterranean Sea, such as *Caulerpa cylindracea* Sonder. Support for the plant disease hypothesis (Žuljević *et al.*, 2019) can be found in studies on diseases affecting *Caulerpa lentillifera* J. Agardh in Asian aqua-

culture facilities (Liang et al., 2019). Such a pathogen might have been introduced into the Mediterranean via ballast water and rapidly dispersed by currents. Similar large-scale mortality was demonstrated with Pinna nobilis Linnaeus, 1758, where a mortality outbreak was found to be caused by a pathogen, most likely Haplosporidium pinnae, which rapidly spread throughout the Mediterranean Sea, causing almost 100% mortality of the pen shell in the majority of the region (Catanese et al., 2018). Identifying algal pathogens is a challenge and requires frequent field monitoring to obtain samples once the disease occurs. Such research could provide tools for successful control of non-native species. Caulerpa taxifolia, at least in Croatia, represents a remarkable example of a boom-and-bust species, where a widely established invader undergoes a rapid collapse, usually with no reasonable explanation.

### Acknowledgements

Lisa Sandri and Valentina Pitacco acknowledge that their work was possible thanks to the financial support of the Ministry of Environment and Spatial planning of the Republic of Slovenia within implementation of WFD and MSFD, of the Agency for Environment within national monitoring of Ecological status of coastal waters within the Republic of Slovenia, and of the Slovenian Research Agency (research core funding No. P1-0237). Periklis Kleitou and Fabio Crocetta are deeply grateful to Gareth Griffiths for recording the first presence of *Coleusia* signata in Cyprus and to Maria Siokouros-Oscarsson for documenting its presence in the following year, as well as for their permission to use observations and photographs. Daryl Agius and Luca Pisani would like to thank Mr. Mifsud for the capture of the *Penaeus aztecus* specimen, and Prof. Julian Evans and Prof. Patrick J. Schembri for their assistance in the identification of the species. Ana Fortič and Petra Slavinec acknowledge that their work was partly conducted during the National monitoring of alien species 2021-2023 (Contract No. 2330-21-670002) with the help of RI-SI- LifeWatch, Ministry of Education, Science and Sport, Slovenia and the European Union, European Regional Development Fund. The authors also thank Leandro Manzoni Vieira for his help with Watersipora subatra identification as well as Domen Trkov and Leon L. Zamuda, who helped with the fieldwork. The study of Ernesto Azzurro, Sylvaine Giakoumi, and Lucio Bellomo, as well as that of Emanuele Mancini, are the results of the project "National Biodiversity Future Center – NBFC", funded by the National Recovery and Resilience Plan (NRRP), Mission 4 Component 2 Investment 1.4 - Call for tender No. 3138 of 16th December 2021, rectified by Decree n.3175 of 18th December 2021 of Italian Ministry of University and Research funded by the European Union - NextGenerationEU, Award Number: Project code CN 00000033, Concession Decree No. 1034 of 17th June 2022, adopted by the Italian Ministry of University and Research, CUP D33C22000960007.

The video of Pteragogus trispilus was recorded by Lucio Bellomo during a charter of 'Sailing Bubbles'. Mustafa Tunca Olguner and Alper Yildiz are grateful to the amateur fisher Eser Guler for his assistance with their study. Marco Albano and Gioele Capillo thank the fisher Mr Giacomo Sanguedolce for his important support with information and data on the Sepioteuthis lessoniana record. Alp Salman, Sencer Akalin, and Coşkun Menderes Aydin express their sincere appreciation to the Republic of Türkiye Ministry of Agriculture and Forestry TAGEM (General Directorate of Agricultural Research and Policies) and FAO (Food and Agriculture Organization of the United Nations) for funding the project "TAGEM/ TBAD/Ü/18/A7/P9/1293 - Monitoring of Demersal Fishery Resources on the Mediterranean Coast of Türkiye" without them the field studies never been completed. They are also grateful to the staff of the "Mediterranean Fisheries Research, Production and Training Institute" and the "R/V Araştırma 1" for their invaluable efforts during the field studies. Studies by Ivan Cvitković, Petra Lučić, and Ante Žuljević are conducted under the Benthic NIS project (IP-2019-04-6702), funded by the Croatian Science Foundation, and the Non-Indigenous Benthic Species project, funded by the National Recovery and Resilience Plan 2021–2026.

## References

Abd Rabou, A.F.N., Salah, J.Y., Abutair, M.A., Al Mabruk, S.A., Zava, B. *et al.*, 2024. Occurrence of *Cheilinus lunulatus* (Labridae), *Triacanthus* cf. *biaculeatus* (Triacanthidae), and four other non-indigenous fish species new to the Gaza Strip waters, Palestine. *Annales: Series Historia Naturalis*, 34 (1), 125-134.

Albano, P.G., Hong, Y., Steger, J., Yasuhara, M., Bartolini, S. *et al.*, 2024. New records of non-indigenous species from the eastern Mediterranean Sea (Crustacea, Mollusca), with

- a revision of genus *Isognomon* (Mollusca: Bivalvia). *PeerJ*, 12, e17425.
- Azzurro, E. (Ed.), 2023. ORMEF. World Wide Web electronic publication. www.ormef.eu (Accessed 18 August 2024).
- Bailey, S.A., Brown, L., Campbell, M.L., Canning-Clode, J., Carlton, J.T. et al., 2020. Trends in the detection of aquatic non-indigenous species across global marine, estuarine and freshwater ecosystems: A 50-year perspective. Diversity and distributions, 26 (12), 1780-1797.
- Bariche, M., AL-Mabruk, S., Ateş, M., Büyük, A., Crocetta, F. et al., 2020. New Alien Mediterranean Biodiversity Records (March 2020). *Mediterranean Marine Science*, 21 (1), 129-145.
- Bertasi, F., 2016. The occurrence of the alien species *Polydora cornuta* Bosc, 1802 (Polychaeta: Spionidae) in North Adriatic lagoons: an overlooked presence. *Italian Journal of Zoology*, 83 (1), 77-88.
- Bignami, F., Salusti, E., 1990. Tidal currents and transient phenomena in the Strait of Messina: A review. p. 95-124. In: *The physical oceanography of sea straits*, Pratt L., J., (Eds). Springer, Berlin/Heidelberg, Germany.
- Cabrini, M., Auriemma, R., Beran, A., Cerino, F., De Olazabal, A. et al., 2016. Harmful and non indigenous species in the port of Trieste (Adriatic sea). Biologia Marina Mediterranea, 23, 86-89.
- Cairns, S.D., 2000. A revision of the shallow-water azooxanthellate Scleractinia of the western Atlantic. *Studies on the Natural History of the Caribbean Region*, 75, 1-240.
- Carpenter, K.E., Niem, V.H., 2001. FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 6. Bony fishes part 4 (*Labridae* to *Latimeriidae*), estuarine crocodiles, sea turtles, sea snakes, and marine mammals. FAO, Rome, pp. 3381-4218.
- Catanese, G., Grau, A., Valencia, J.M., Garcia-March, J.R., Vázquez-Luis, M. et al., 2018. Haplosporidium pinnae sp. nov., a haplosporidan parasite associated with mass mortalities of the fan mussel, Pinna nobilis, in the Western Mediterranean Sea. Journal of Invertebrate Pathology, 157, 9-24.
- Cillari, T., Andaloro, F., Castriota, L., 2018. First documented record of *Cassiopea* cf *andromeda* (Cnidaria: Scyphozoa) in Italian waters. *Cahiers de Biologie Marine*, 59, 193-195.
- Çinar, M.E., 2009. Alien polychaete species (Annelida: Polychaeta) on the southern coast of Turkey (Levantine Sea, eastern Mediterranean), with 13 new records for the Mediterranean Sea. *Journal of Natural History*, 43, 2283-2328.
- Çınar, M.E., Ergen, Z., Dağlı, E., Petersen, M.E., 2005. Alien species of spionid polychaetes (Streblospio gynobranchiata and Polydora cornuta) in Izmir Bay, eastern Mediterranean. Journal of the Marine Biological Association of the United Kingdom, 85 (4), 821-827.
- Cormaci, M., Furnari, G., Catra, M., Alongi, G., Giaccone, G., 2012. Flora marina bentonica del Mediterraneo: Phaeophyceae. *Bollettino dell'Accademia Gioenia di Scienze Naturali*, 45 (375), 1-508.
- Crocetta, F., Tringali, L.P., 2015. Mapping alien Mollusca distribution in the Mediterranean Sea: the Lessepsian immigrant Retusa desgenettii (Audouin, 1826) reaches Turkey. Quaternary International, 390, 15-20.

- Crocetta, F., Gofas, S., Salas, C., Tringali, L.P., Zenetos, A., 2017. Local ecological knowledge versus published literature: a review of non-indigenous Mollusca in Greek marine waters. *Aquatic Invasions*, 12 (4), 415-434.
- Dağlı, E., Çınar, M.E., 2011. Species of the subgenus *Minuspio* (Polychaeta: Spionidae: *Prionospio*) from the southern coast of Turkey (Levantine Sea, eastern Mediterranean), with the description of two new species. *Zootaxa*, 3043 (1), 35-53.
- Day, J.H., 1957. The Polychaete Fauna of South Africa. New Species and Records from Natal and Mocambique. *Annals* of the Natal Museum, 14, 59-129.
- Deidun, A., Gauci, A., Sciberras, A., Piraino, S., 2018. Back with a bang an unexpected massive bloom of *Cassiopea andromeda* (Forskaal, 1775) in the Maltese Islands, nine years after its first appearance. *BioInvasions Records*, 7 (4), 399-404.
- Deval, M.C., Kaya, Y., Guven, O., Gökoglu, M., Froglia, C., 2010. An unexpected find of the western Atlantic shrimp, Farfantepenaeus aztecus (Ives, 1891) (Decapoda, Penaeidae) in Antalya Bay, eastern Mediterranean Sea. Crustaceana, 83, 1531-1537.
- Deveney, M.R., Rowling K.P., Wiltshire, K.H., Fernandes, M.B., Collings, G.J. et al., 2008. Caulerpa taxifolia (M. Vahl) C. Agardh: environmental risk assessment. Prepared for PIRSA Marine Biosecurity. SARDI Aquatic Sciences Publication No. F2008/000854-1. SARDI Aquatic Sciences es Adelaide.
- Fischer, W., Poklękowski, M., Zeimbekis, C., 2023. New localities of *Conomurex persicus* (Swainson, 1821) (Gastropoda: Strombidae) from Tunisia, Corfu, Naxos and other Aegean islands (Greece), and a brief overview of its distribution in the Mediterranean Sea. *Arianta*, 10, 46.
- Follesa, M.C., Carbonara, P. (Eds.), 2019. *Atlas of the maturity stages of Mediterranean fishery resources*. Studies and Reviews. No.99. Rome, FAO. 268 pp.
- Froese, R., Pauly, D. (Eds.), 2024. *FishBase*. World Wide Web electronic publication. Retrieved from www.fishbase.org, version (06/2024) (Accessed 18 August 2024).
- Froglia, C., Scanu, M., 2023. Notes on the Spreading of *Penaeus aztecus* Ives 1891 (Decapoda, Penaeidae) in the Mediterranean Sea and on Its Repeated Misidentifications in the Region. *Biology*, 12, 793.
- Galanidi, M., Aissi, M., Ali, M., Bakalem, A., Bariche, M. *et al.*, 2023. Validated Inventories of Non-Indigenous Species (NIS) for the Mediterranean Sea as Tools for Regional Policy and Patterns of NIS Spread. *Diversity*, 15, 962.
- Galil, B.S., 2006. Contributions to the knowledge of Leucosiidae V. *Coleusia* gen. nov. (Crustacea: Brachyura). *Zoologi*sche Mededelingen, 80 (4), 55-69.
- Garcia-Lozano, C., Pueyo-Ros, J., Canelles, Q., Latombe, G., Adriaens, T. et al., 2025. Management measures and trends of biological invasions in Europe: A survey-based assessment of local managers. Global Change Biology, 31 (1), e70028.
- Gauff, R.P.M., Bouchoucha, M., Curd, A., Droual, G., Evrard, J. et al., 2023. First joint morphological and molecular detection of Watersipora subatra in the Mediterranean Sea presented in an updated genus phylogeny to resolve taxonomic confusion. Aquatic Invasions, 18, 295-312.

- Gerovasileiou, V., Akel, E. S. H. K., Akyol, O., Alongi, G., Azevedo et al., 2017. New Mediterranean Biodiversity Records (July 2017). Mediterranean Marine Science, 18 (2), 355-384.
- Gerovasileiou, V., Bancila, R.I., Katsanevakis, S., Zenetos, A., 2022. Introduced species in Mediterranean marine caves: an increasing but neglected threat. *Mediterranean Marine Science*, 23 (4), 995-1005.
- Golani, D., Sonin, O., 1992. New records of the Red Sea fishes, Pterois miles (Scorpaenidae) and Pteragogus pelycus (Labridae) from the eastern Mediterranean Sea. Japanese Journal of Ichthyology, 39 (2), 167-169.
- Golani, D., Azzurro, E., Dulčić, J., Massutí, E., Orsi-Relini, L., 2021. Atlas of exotic fishes in the Mediterranean Sea. CIESM PUBLISHERS/Paris, Monaco, 365 pp.
- Goutham-Bharathi, M.P., Sirajudheen, T.K., Santucci, R.G., Fricke, R., Dimech, M., 2024. First record of Triacanthidae Bleeker, 1859 (Actinopterygii: Tetraodontiformes) from the Red Sea.
- Green-Gavrielidis, L.A., Hobbs, N-V., Thornber, C.S., 2019.
  The brown macroalga *Colpomenia peregrina* (Sauvageau, 1927) reaches Rhode Island, USA. *BioInvasions Record*, 8 (2), 199-207.
- Gurney, R., 1927. Report on the Crustacea: Copepoda and Cladocera of the Plankton. *The Transactions of the Zoological Society of London*, 22 (2), 139-172.
- Holthuis, L.B., 1956. Notes on a collection of Crustacea Decapoda from the Great Bitter Lake, Egypt, with a list of species of Decapoda known from the Suez Canal. *Zoologische Mededelingen*, 34 (22), 301-330.
- Ikeda, Y., Ueta, Y., Anderson, F.E., Matsumoto, G., 2009. Reproduction and life span of the oval squid Sepioteuthis lessoniana (Cephalopoda: Loliginidae): comparison between laboratory-cultured and wild-caught squid. Marine Biodiversity Records, 2, e50.
- Jereb, P., Roper C.F.E., 2010. Cephalopods of the world. An annotated and illustrated catalogue of cephalopod species known to date. Volume 2. Myopsid and Oegopsid Squids. FAO Species Catalogue for Fishery Purposes. No.4, Vol.2, 605 pp.
- Karhan, S., Kalkan, E., Simboura, N., Mutlu, E., Bekbolet, M., 2008. On the occurrence and established populations of the alien polychaete *Polydora cornuta* Bosc, 1802 (Polychaeta: Spionidae) in the Sea of Marmara and the Bosphorus Strait (Turkey). *Mediterranean Marine Science*, 9 (1).
- Katsanevakis, S., Lefkaditou, E., Galinou-Mitsoudi, S., Koutsoubas, D., Zenetos, A., 2008. Molluscan species of minor commercial interest in Hellenic seas: distribution, exploitation and conservation status. *Mediterranean Marine Science*, 9 (1), 77-118.
- Katsanevakis, S., Poursanidis, D., Hoffman, R., Rizgalla, J., Rothman, S.B.-S. et al., 2020. Unpublished Mediterranean records of marine alien and cryptogenic species. Bioinvasions Records, 9, 165-182.
- Khvorov, S.A., Boltachev, A.R., Reshetnikov, S.I., Pashkov, A.N., 2006. First record of the green tiger prawn *Penae-us semisulcatus* (Penaeidae, Decapoda) in the Black Sea. *Ekologija*, 72, 65-69.
- Kim, S.W., Onbé, T., 1989. Distribution and zoogeography of the marine cladoceran *Podon schmackeri* in the northwest-

- ern Pacific. Marine Biology, 102, 203-210.
- Kleitou, P., Giovos, I., Wolf, W., Crocetta, F., 2019. On the importance of citizen-science: the first record of *Goniobran-chus obsoletus* (Rüppell & Leuckart, 1830) from Cyprus (Mollusca: gastropoda: Nudibranchia). *BioInvasions Records*, 8 (2), 252-257.
- Kleitou, P., Hall-Spencer, J.M., Savva, I., Kletou, D., Hadjistylli, M. et al., 2021. The case of lionfish (*Pterois miles*) in the Mediterranean Sea demonstrates limitations in EU legislation to address marine biological invasions. *Journal of Marine Science and Engineering*, 9 (3), 325.
- Langeneck, J., Lezzi, M., Del Pasqua, M., Musco, L., Gambi, M.C. et al., (2020). Non-indigenous polychaetes along the coasts of Italy: a critical review. Mediterranean Marine Science, 21 (2), 238-275.
- Lefkaditou, E., Corsini-Foka, M., Kondilatos, G., 2009. Description of the first Lessepsian squid migrant, *Sepioteuthis lessoniana* (Cephalopoda: Loliginidae), in the Aegean Sea (Eastern Mediterranean). *Mediterranean Marine Science*, 10 (2), 87-98.
- Leydet, K.P., Hellberg, M.E., 2015. The invasive coral *Oculina* patagonica has not been recently introduced to the Mediterranean from the western Atlantic. *BMC Evolutionary Biology*, 15, 1-13.
- Liang, Z., Liu, F., Wang, W., Zhang, P., Sun, X. et al., 2019. High-throughput sequencing revealed differences of microbial community structure and diversity between healthy and diseased Caulerpa lentillifera. BMC Microbiology, 19 (1), 225.
- Lipej, L., Mavrič, B., Orlando-Bonaca, M., Malej, A., 2012. State of the art of the marine non-indigenous flora and fauna in Slovenia. *Mediterranean Marine Science*, 13 (2), 243-249.
- Maas, O., 1903. Die Scyphomedusen der Siboga Expedition. Siboga Expedition 1901, 11, 1-91
- Martínez, J., Adarraga, I., 2013. First record of *Paraprionospio coora* Wilson, 1990 (Polychaeta: Spionidae) in the Atlantic Ocean. *BioInvasions Records*, 2 (4), 271-280.
- Mathieson A.C., Clinton J.D., Lindsay A.G., Traggis H., 2016. Distribution and ecology of *Colpomenia peregrina* (Phaeophyceae) within the Northwest Atlantic. *Rhodora*, 118 (975), 276-305.
- Matsuura, K., 2001. Triacanthidae. Triplespines. pp. 3905-3910. In: Carpenter, K.E., Niem, V.H. (Eds). FAO species identification guide for fishery purposes. The living marine resources of the Western Central Pacific. Vol. 6. Bony fishes part 4 (Labridae to Latimeriidae), estuarine crocodiles. FAO, Rome.
- Mavrič, B., Orlando-Bonaca, M. Trkov, D., Zamuda, L.L., Kajtna, U. et al., 2023. Spremljanje vrstne pestrosti in abundance tujerodnih vrst v slovenskem morju v obdobju 2021 2023. National monitoring report. NIB, 117 pp.
- McKenzie, L.A., Johnston, E.L., Brooks, R., 2012. Using clones and copper to resolve the genetic architecture of metal tolerance in a marine invader. *Ecology and Evolution*, 2 (6), 1319-1329.
- Meinesz, A., Chancollon, O., Cottalorda, J.M., 2010. Observatoire sur l'expansion de Caulerpa taxifolia et Caulerpa racemosa en Méditerranée: campagne janvier 2008 juin 2010. Université de Nice Sophia Antipolis E.A. 4228 ECO-

- MERS, 50 pp.
- Michail, C., Tanduo, V., Crocetta, F., Giovos, I., Litsiou, S. *et al.*, 2024. Engagement of fishers in citizen science enhances the knowledge on alien decapods in Cyprus (eastern Mediterranean Sea). *Aquatic Ecology*, 58 (1), 107-116.
- Mikac, B., 2015. A sea of worms: polychaete checklist of the Adriatic Sea. *Zootaxa*, 3943 (1), 1-172.
- Nesis, K.N., 1987. *Cephalopods of the World: Squid, Cuttle-fishes, Octopuses*. Tropical Fish Hobbyist Publications, Inc., Ltd, Neptune City, New Jersey, 351 pp.
- Okutani, T., 2005. Past, present and future studies on cephalopod diversity in tropical west pacific. *Phuket Marine Biological Center Research Bulletin*, 66, 39-50.
- Onbé, T., 1999. Ctenopoda and Onychopoda (=Cladocera). p. 797-811. In: *South Atlantic Zooplankton*. Boltovskoy, D. (Ed.) Brachuys Publishers, Leiden.
- Öztürk, B., Bitlis, B., Türkçü, N., 2024. Diversity of Mollusca along the coasts of Türkiye. *Turkish Journal of Zoology*, 48 (6), 531-571.
- Öztürk, B., Türkçü, N., Bitlis, B., 2023. New records of gastropods (Caenogastropoda and Heterobranchia) from the Turkish coasts with observations on some poorly known species. *Turkish Journal of Zoology*, 47 (3), 135-146.
- Parapar, J., Moreira, J., Núñez, J., Barnich, R., Brito, M. et al., (Eds), 2015. Anellida, Polychaeta IV, In: Fauna Iberica. Museo Nacional de Ciencias Naturales, Madrid, 416 pp.
- Reverter-Gil, O., Souto, J., 2019. Watersiporidae (Bryozoa) in Iberian waters: an update on alien and native species. *Marine Biodiversity*, 49 (6), 2735-2752.
- Rocha da, C.E.F., 1985. The occurrence of *Pleopis schmackeri* (Poppe) in the Southern Atlantic and other marine cladocerans on the Brazilian coast. *Crustaceana*, 49 (2), 202-204.
- Roper, C.F.E., Jereb, P., 2010. Cephalopods of the world. An annotated and illustrated catalogue of cephalopod species known to date. Volume 2. Myopsid and Oegopsid Squids.
  FAO Species Catalogue for Fishery Purposes. No. 4, Vol. 2, 605 p.
- Rubio, M., 2017. Una medusa tropical, nueva amenaza para la biodiversidad del mar Menor. https://elclickverde.com/re-portajes/una-medusa-tropical-nueva-amenaza-para-la-biodiversidad-del-mar-menor. (Accessed 28 September 2024).
- Salman, A., 2002. New report of the loliginid squid *Sepioteuthis lessoniana* Lesson, 1830 in the Mediterranean. *Israel Journal of Zoology*, 48, 249-250.
- Salman, A., Akalın, S., Ünlüoğlu, A., Aydın, C.M., 2023. A checklist and some new records on the teuthofauna of Türkiye in the Northeastern Mediterranean Sea. *Ege Journal of Fisheries and Aquatic Sciences*, 40 (3), 189-194.
- Santini, F., Tyler, J.C., 2002. Phylogeny and biogeography of the extant species of triplespine fishes (Triacanthidae, Tetraodontiformes). *Zoologica Scripta*, 31 (4), 321-330.
- Serrano, E., Ribes, M., Bolivari, M., Coma, R., 2023. Fouling of a boat hull by the invasive zooxanthellate coral *Oculina patagonica* could shipping be enhancing its unique largescale spread? *Mediterranean Marine Science*, 24 (1), 76-86.
- Servello, G., Andaloro, F., Azzurro, E., Castriota, L., Chiarore, M.A. *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 biore-gionalization of coastal and shelf areas. *BioScience*, 57 (7), 573-583.
- Steger, J., Stockinger, M., Ivkić, A., Galil, B.S., Albano, P.G., 2018. New records of non-indigenous molluscs from the eastern Mediterranean Sea. *BioInvasions Records*, 7 (3), 245-257.
- Terbiyik Kurt, T., Polat, S., 2018. Introduction of a new Indo-Pacific marine cladoceran to the Mediterranean Sea. *Mediterranean Marine Science*, 18 (3), 517-523.
- Tiralongo, F., Okan, A., Battaglia, P., Beton, D., Bitlis, B. et al., 2022. New alien Mediterranean biodiversity records (August 2022). Mediterranean Marine Science, 23 (3), 725-747.
- Tsiamis, K., Montesanto, B., Panayotidis, P., Katsaros, C., Verlaque, M., 2010. Updated records and range expansion of alien marine macrophytes in Greece (2009). *Mediterranean Marine Science*, 11 (1), 61-80.
- Verlaque, M., Ruitton, S., Mineur, F., Boudouresque, C.-F., 2015. CIESM atlas of exotic species of the Mediterranean. Macrophytes. Monaco: CIESM Publishers, 362 pp.
- Vieira, L.M., Jones, M.S., Taylor, P.D., 2014. The identity of the invasive fouling bryozoan *Watersipora subtorquata* (d'Orbigny) and some other congeneric species. *Zootaxa*, 3857, 151-182.
- Williams, A.B., 1984. Shrimps, lobsters, and crabs of the Atlantic coast of the Eastern United States, Maine to Florida. Smithsonian Institution Press, Washington, DC, p. 550.
- Yokoyama, H., Dağlı, E., Çinar, M.E., 2010. First record of Paraprionospio coora Wilson, 1990 (Polychaeta: Spionidae) from the Mediterranean Sea. Mediterranean Marine Science, 11 (1), 133-142.
- Zenetos, A., Delongueville, C., Scaillet, R., 2024. An Overlooked Group of Citizen Scientists in Non-Indigenous Species (NIS) Information: Shell Collectors and Their Contribution to Molluscan NIS Xenodiversity. *Diversity*, 16 (5), 299.
- Zenetos A., Gofas S., Russo G. Templado J., 2004. *CIESM Atlas of exotic species in the Mediterranean vol. 3 Molluscs*. Briand F. (Ed.), Monaco, CIESM Publishers, 380 pp.
- Zenetos, A., Albano, P. G., Garcia, E. L., Stern, N., Tsiamis, K., et al., 2022. Established non-indigenous species increased by 40% in 11 years in the Mediterranean Sea. Mediterranean Marine Science, 23 (1), 196-212.
- Zenetos, A., Doğan, A., Bakır, A.K., Chatzigeorgiou, G., Corsini-Foka, M. *et al.*, 2025. Non-Indigenous Species (NIS) Know No Geopolitical Borders—An Update of NIS in the Aegean Sea. *Diversity*, 17 (1), 12.
- Zibrowius, H., 1974. *Oculina patagonica*, Scleractiniaire hermatypique introduit en Mediterranee. *Helgolander wiss Meeresunders*, 26, 153-173.
- Žuljević A., Cvitković I., Despalatović M., Lučić P., Žunec A. et al., 2019. Decline of Caulerpa taxifolia in the Adriatic Sea. p. 82-87. In: Proceedings of the 1st Mediterranean Symposium on the Non-Indigenous Species. Langar H., Ouerghi A. (Eds). SPA/RAC, Antalya, Turkey.