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VALIAS - Valorization of Marine Invasive Alien Species a Pathway towards the Protection of European Marine Biodiversity: From Destructive Invaders to a Source of Wealth

Deliverable D3.1
Title: Complete list of species

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Project

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1. Introduction

The overarching aim of the VALIAS project is to match the need for managing marine Invasive Alien Species (IAS) with the growing demand for marine derived-products. The valorization of unexploited IAS feedstocks can represent a sustainable strategy for the realization of a circular bio-economy, with the production of stable and safe food, fish feed and cosmetic ingredients. The project brings together experts from the industry and academia specialized in interdisciplinary/inter-sectorial, yet highly complementary, research areas of marine-maritime research, aquaculture, feed-food technology and safety and cosmetology. Specifically, as a joint research and innovation project, VALIAS is based on the development of a strong partnership involving eight partners from five EU countries with different technical backgrounds from both academic and non-academic sectors. The implementation of the project ultimately relies on trans-national secondments (exchanges) of research and innovation staff with an in-built return mechanism strengthening collaborative research among the different countries and sectors.

The achievement of the objectives of knowledge sharing planned in VALIAS rests on seven Work Packages; four of them, i.e., WP3 - Marine invasive alien species' selection, data collection and mapping,WP4 - Recovery and formulation of valuable compounds-Toxicity and safety evaluation, WP5 - Development of final products of commercial interest, and WP6 - Sustainability Assessment-Economic evaluation of valorization pathways, are based on research actions. Specifically, WP3 provides the founding ground for the implementation of the remaining WPs, given its explicit objective to identify a set of marine IAS characterized by a high invasiveness, confirmed negative impacts on invaded systems, and a high potential for utilization in the food, feed and cosmetic industry. To this end, a preliminary set of seven marine IAS was a-priori selected (see next section). However, the planned activities in WP3 include the selection of additional marine IAS that might also be of interest for the objectives of the project, to be addressed in a task (Task 3.1: Selection of species of interest [M2-M12]) and in a deliverable (D3.1) motivating the present report.

2. List of a-priori selected IAS

As already mentioned, in VALIAS a set of seven IAS was selected a-priori; they are listed in Table 1. The species included one red seaweed (*Asparagopsis armata*), two invertebrates (*Crepidula fornicata* and *Diadema setosum*) and four species of fish (*Fistularia commersonii*, *Lagocephalus sceleratus*, *Siganus luridus,* and *S. rivulatus*), with dates of first occurrence in EU waters spanning from 1872 to 2003 (Table 1).

***Table 1**. List of Invasive Alien Species (IAS) originally selected in VALIAS. Common names are reported, together with information on their taxonomy, native range, and date of first record in EU countries.*

Species	Common name	Class	Native range	1st EU record
Asparagopsis armata Harvey, 1855	Red harpoon weed	Florideophyceae	Pacific Ocean	1923
Crepidula fornicata Linnaeus, 1758	Slipper limpet	Gastropoda	Atlantic Ocean	1872
Diadema setosum Leske, 1778	Long-spined sea urchin	Echinoidea	Indian Ocean	2006
Fistularia commersonii Rüppell, 1838	Bluespotted cornetfish	Teleostei	Indian Ocean	2000
Lagocephalus sceleratus Gmelin, 1789	Silver-cheeked toadfish	Teleostei	Indian & Pacific Ocean	2003
Siganus luridus Rüppell, 1829	Dusky spinefoot	Teleostei	Indian & Pacific Ocean	1931
Siganus rivulatus Forsskål & Niebuhr, 1775	Marbled spinefoot	Teleostei	Indian & Pacific Ocean	1924

They are all listed in the European Alien Species Information Network - EASIN (https://easin.jrc.ec.europa.eu/easin) and in the Global Biodiversity Information Facility - GBIF (https://www.gbif.org/), while the are not included in the list of invasive alien species of EU concern

(EU, 2016, 2017, 2019) (Table 2). The selection of the species was based on a preliminary screening of the available literature (including online databases) and on expert judgement regarding their invasion status, abundance and existing knowledge on impacts and potential use (Table 3; see also Figure 1).

***Table 2**. List of Invasive Alien Species (IAS) originally selected in VALIAS. The identification code used in the European Alien Species Information Network - EASIN (https://easin.jrc.ec.europa.eu/easin) is reported; information on their inclusion in the Global Biodiversity Information Facility - GBIF (https://www.gbif.org/) and in the list of invasive alien species of EU concern (EU, 2016, 2017, 2019) is included.*

Species	EASIN code	GBIF	IAS of EU concern
Asparagopsis armata	R01543	Yes	No
Crepidula fornicate	R04358	Yes	No
Diadema setosum	R16608	Yes	No
Fistularia commersonii	R06342	Yes	No
Lagocephalus sceleratus	R08065	Yes	No
Siganus luridus	R14026	Yes	No
Siganus rivulatus	R14027	Yes	No

***Table 3**. Summary of impacts and potential uses of the Invasive Alien Species (IAS) originally selected in VALIAS.*

Species	Impacts	Uses/Properties
Asparagopsis armata	• Reduction of native biodiversity • Habitat alteration	• Cosmetic industry • Antibacterial properties • Revitalizing action, tonic for blood circulation • Cellular regeneration
Crepidula fornicata	• Reduction of native biodiversity • Habitat alteration • Damage to ecosystem services • Negative effects on traditional aquaculture and fisheries	• Model species in scientific research • Soil amendant and fertilizer • Human consumption • Animal feed, fishmeal
Diadema setosum	• Reduction of native biodiversity • Habitat alteration • Negative effects on tourism	• Human consumption
Fistularia commersonii	• Reduction of native biodiversity • Alteration of food web structure • Habitat alteration • Negative effects on traditional aquaculture and fisheries	• Human consumption
Lagocephalus sceleratus	• Reduction of native biodiversity • Habitat alteration • Damage to ecosystem services • Negative effects on traditional aquaculture and fisheries • Negative effects on tourism • Harm to human health	• Materials: leather, TTX, collagen (experimental) • Animal feed, fishmeal (experimental)
Siganus luridus *Siganus rivulatus*	• Reduction of native biodiversity • Habitat alteration • Damage to ecosystem services • Negative effects on traditional aquaculture and fisheries	• Human consumption

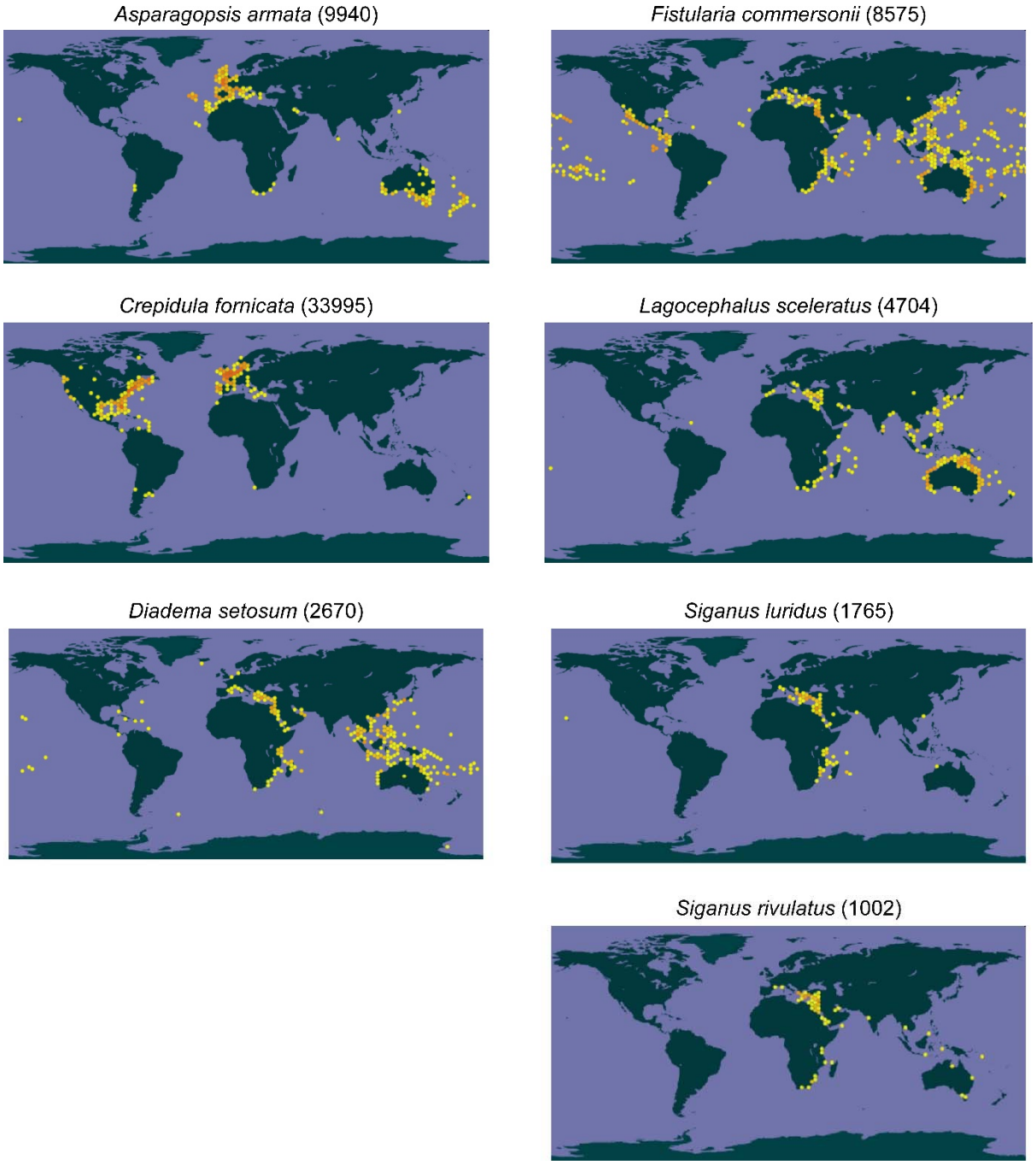

Figure 1. *Distribution maps of the Invasive Alien Species (IAS) originally selected in VALIAS. Data are from the Global Biodiversity Information Facility - GBIF (https://www.gbif.org/; accessed December 22nd, 2024). For each species the total number of occurrences is reported in parentheses.*

The initial screening performed in Task3.1 on the IAS originally selected in VALIAS is to be developed in other WP3 tasks (i.e., Task3.2: Literature review [M2-M24] and Task 3.3: Data extraction and Mapping [M12-M48]). However, the preliminary survey of the information made available in the literature and in online databases made evident i) the scarcely explored potential of the majority the species (excluding *Lagocephalus sceleratus* and *Fistularia commersonii*) as an alimentary product for human consumption or animal feed. This should be related either to a reduced market penetration due to the novelty of the species or to a limited invasive range, where the species is actually utilized. An illustrative example is represented by *Siganus luridus* and *S. rivolatus*, which is commonly found for human consumption in Mediterranean countries - i.e., Cyprus, Turkey, Greece, North African countries - strictly

coinciding with their distribution range; ii) the scarce efforts made to date to scrutinize the biochemical characteristics of some species for which human or animal consumption is not advisable such as *Lagocephalus sceleratus*, and very limited attempts have been made to upscale the results of experimental researches to novel industrial uses in the field of e.g., pharmacology or cosmetics.

3. List of additional IAS selected for inclusion in VALIAS

The criteria used to identify the a-priori selected IAS in VALIAS based on the species invasion status, abundance and existing knowledge and described in the preceding chapter were used to choose an additional set of marine IAS to be further included in the actions planned in the project. After a thorough survey performed at both a national and Mediterranean scale carried out between month 2 and month 8 (February and August 2024, respectively) a preliminary set of eight candidates was identified including seven invertebrate and one fish species (Table 4).

***Table 4**. Preliminary list of Invasive Alien Species (IAS) identified for potential inclusion in VALIAS.*

Species
Anadara kagoshimensis Tokunaga, 1906
Anadara transversa Say, 1822
Arcuatula senhousia W. H. Benson, 1842
Callinectes sapidus Rathbun, 1896
Eriocheir sinensis H. Milne Edwards, 1853
Pinctada imbricata radiata Leach, 1814
Portunus segnis Forskål, 1775
Pterois miles Bennett, 1828
Rapana venosa Valenciennes, 1846

Among these IAS, four species were prioritized after a further screening performed between month 9 and month 12 (September and December 2024, respectively). They included two invertebrates - the Atlantic blue crab *Callinectes sapidus* and the African blue swimming crab *Portunus segnis* - a fish - *Pterois miles* - and a brown seaweed - *Sargassum muticum* (Table 5). They are all listed in the European Alien Species Information Network - EASIN (https://easin.jrc.ec.europa.eu/easin) and in the Global Biodiversity Information Facility - GBIF (https://www.gbif.org/), while the are not included in the list of invasive alien species of EU concern (EU, 2016, 2017, 2019) (Table 6). A preliminary summary of existing knowledge regarding their distribution, impacts, and potential use is presented in Table 7 and in Figure 2.

***Table 5**. List of additional Invasive Alien Species (IAS) finally selected for inclusion in VALIAS. Common names are reported, together with information on taxonomy, native range, and date of 1st record in EU countries.*

Species	Common name	Class	Native range	1st EU record
Callinectes sapidus Rathbun, 1896	Atlantic blue crab	Malacostraca	W-Atlantic Ocean	1900
Portunus segnis Forskål, 1775	African blue swimming crab	Malacostraca	Indian Ocean	1898
Pterois miles Bennett, 1828	Devil firefish	Teleostei	Indian Ocean	1991
Sargassum muticum (Yendo) Fensholt, 1955	Japanese wireweed	Phaeophyceae	W-Pacific Ocean	1972

Table 6. List of additional Invasive Alien Species (IAS) selected for inclusion in VALIAS. The identification code used in the European Alien Species Information Network - EASIN (https://easin.jrc.ec.europa.eu/easin) is reported; information on their inclusion in the Global Biodiversity Information Facility - GBIF (https://www.gbif.org/) and in the list of invasive alien species of EU concern (EU, 2016, 2017, 2019) is included.

Species	EASIN code	GBIF	IAS of EU concern
Callinectes sapidus	R02554	Yes	No
Portunus segnis	R12128	Yes	No
Pterois miles	R16480	Yes	No
Sargassum muticum	R13548	Yes	No

Callinectes sapidus is a portunid native to the western coasts of the Atlantic Ocean; it inhabits estuaries, lagoons and other coastal habitats, is euryhaline and eurythermal, and is characterized by a high fecundity and aggressive behaviour (Millikin and Williams, 1984). The species was introduced in northern Europe in 1900 probably by ballast waters; subsequently, its distribution range has progressively extended throughout the Mediterranean Sea and neighboring waters (Nehring, 2011; Mancinelli et al., 2017a; Mancinelli et al., 2021; Castriota et al., 2024). In native habitats, *C. sapidus* has long been recognized as an important functional component of coastal benthic food webs (Hines, 2007). In invaded ranges, a dramatic impact on bivalves of economic interest such as the Manila clam *Ruditapes philippinarum* has been recently reported (Chiesa et al., 2024); furthermore, adverse interactions with other native crustacean species have been repeatedly suggested and some negative effects on artisanal fishing activities have been episodically reported (Nehring, 2011). Noticeably, *C. sapidus* supports important fisheries in Northern and Central America, while local fisheries are developed in the eastern Mediterranean Sea (Mancinelli et al., 2017b).

Portunus segnis is one of the earliest Lessepsian crustacean invaders recorded in Egyptian and Palestinian waters 30 years after the completion of the Suez Canal (Fox, 1924; Galil, 2011). In the following years, it has successfully colonized the Levantine basin from Egypt to Turkey, the Aegean Sea; eastern Sicily and the northern Tyrrhenian Sea, and more recently, Tunisian, Maltese, Libyan, and Cypriot coastal waters (Mancinelli et al., 2022; Castriota et al., 2022). The species is an opportunist predator, mainly preying on crustaceans, mollusks and fish; accordingly, it is supposed to interfere with native species through competitive or predatory interactions (Hamida et al., 2019). In addition, negative impacts on fishing activities due to the predation on catches and the damage of fishing have been reported (Tsirintanis et al., 2022). *P. segnis* supports an important fishery in native ranges (Bagheri et al., 2020) and to date it is also commercially exploited in the Mediterranean Sea, e.g., in Turkey, Tunisia, and Egypt (Castriota et al., 2022).

The scorpaenid *Pterois miles* was first recorded in the Mediterranean Sea along the coasts of Israel in 1991 (Golani and Sonin, 1992). Since then, the population of *P. miles* has rapidly increased and spread westwards, reaching Sicily and Tunisia (Bottacini et al., 2024). The dramatic invasive success of the species is likely to result from a combination of factors such as early maturation and reproduction, anti-predatory venomous defenses (their spines contain apocrine-type venom glands harmful to humans), high ecological plasticity as well overfishing of native potential predators (Kleitou et al., 2021). Furthermore, The diet of *P. miles* in invaded Mediterranean waters has been found to be similar to that observed in native environments (Indian Ocean) consisting mainly of a wide range of teleost and crustacean prey, suggesting the potential for a strong trophic impact on recipient communities (Savva et al., 2020).

The brown seaweed *Sargassum muticum* was first recorded in Europe in 1972, when a drift specimen was found on the Belgian coast, followed by several sightings in northern France; subsequently, the species spread along both coasts of the English Channel, the Oosterschelde estuary, and the coasts of Denmark (Engelen et al., 2015). The species was reported in the Mediterranean Sea in the Thau Lagoon in 1981 and in the Venice Lagoon in 1992 (Curiel et al., 1995). Nowadays, *S. muticum* is present in suitable habitats (i.e., rocky shores and artificial hard substrata) on most European Atlantic coasts and it is still spreading, especially in the Iberian Peninsula, the coasts of Morocco, and in the British Isles (Engelen et al., 2015). The species has long been recognized as one of the most aggressive

marine invaders as it is able to tolerate a wide range of abiotic conditions such as salinity or temperature, making it a strong competitor that can limit the distribution of native species (Norton, 1976). Additionally, it has rapid growth, high fecundity and is able to produce fertile drifting fragments which constitute an efficient mode of dispersal (Salvaterra et al., 2013).

***Table 7**. Summary of impacts and potential uses of the additional Invasive Alien Species (IAS) selected for inclusion in VALIAS.*

Species	Impacts	Uses/Properties
Callinectes sapidus	• Reduction of native biodiversity • Alteration of food web structure • Negative effects on traditional aquaculture and fisheries	• Human consumption • Biopolimers • Fish meal
Portunus segnis	• Reduction of native biodiversity • Alteration of food web structure • Negative effects on traditional aquaculture and fisheries	• Human consumption • Biopolimers • Fish meal
Pterois miles	• Reduction of native biodiversity • Alteration of food web structure • Negative effects on traditional aquaculture and fisheries • Harm to human health	• Human consumption • Materials • Fish meal
Sargassum muticum	• Reduction of native biodiversity • Habitat alteration	• Antimicrobial and feeding additives

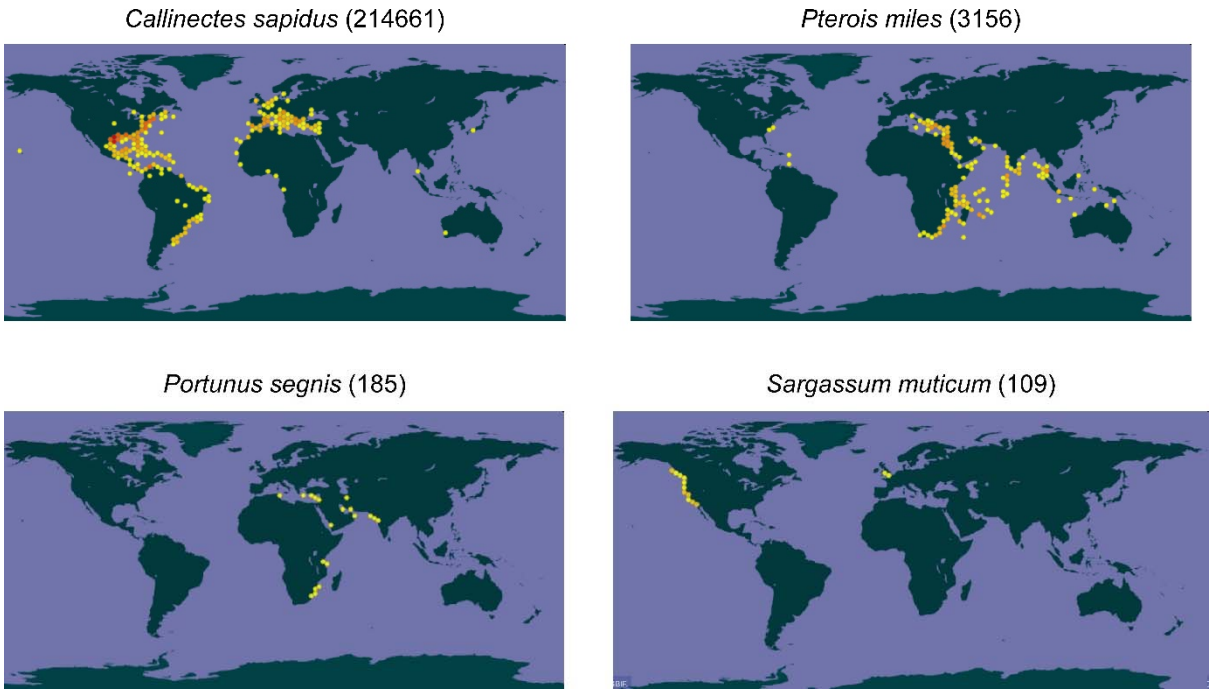

***Figure 2.** Distribution maps of the additional Invasive Alien Species (IAS) selected for inclusion in VALIAS. Data are from the Global Biodiversity Information Facility - GBIF (https://www.gbif.org/; accessed December 22nd, 2024). For each species, the total number of occurrences is reported in parentheses.*

4. Conclusions

The final list of IAS produced in Task 3.1 consists of 11 species, including those a-priori identified in VALIAS (7 species) and four additional species identified a-posteriori. The list will provide the basis for further activities planned in WP3 i.e., in Task 3.2: Literature review [M2-M24] and in Task 3.3: Data extraction and Mapping [M12-M48]. These tasks will allow to collate the existing information on all the selected species, in terms of presence (distribution), abundance, biology, ecology, toxicity and uses (i.e., as fresh food, in food and feed industry) as well as to map their present state of spread.

5. References

Bagheri, D., Farhadi, A., Bargahi, A., Nabipour, I., Sharif, S.R.A., Jeffs, A.G., 2020. Morphometric and genetic characterizations of blue swimming crab *Portunus segnis*, (Forskal, 1775) along the Iranian coasts of the Persian Gulf and Oman Sea. Reg. Stud. Mar. Sci. 34, 101091.

Bottacini, D., Pollux, B.J., Nijland, R., Jansen, P.A., Naguib, M., Kotrschal, A., 2024. Lionfish (*Pterois miles*) in the Mediterranean Sea: a review of the available knowledge with an update on the invasion front. NeoBiota 92, 233-257.

Castriota, L., Falautano, M., Maggio, T., Perzia, P., 2022. The blue swimming crab *Portunus segnis* in the Mediterranean Sea: Invasion paths, impacts and management measures. Biology 11, 1473.

Castriota, L., Falautano, M., Perzia, P., 2024. When nature requires a resource to be used - The case of *Callinectes sapidus*: distribution, aggregation patterns, and spatial structure in northwest Europe, the Mediterranean Sea, and adjacent waters. Biology 13, 279.

Chiesa, S., Petochi, T., Brusà, R.B., Raicevich, S., Cacciatore, F., Franceschini, G., Antonini, C., Vallini, C., Bernarello, V., Oselladore, F., Ciani, M., Di Blasio, L., Campolunghi, M.P., Baldessin, F., Boldrin, L., Marino, G., 2024. Impacts of the blue crab invasion on Manila clam aquaculture in Po Delta coastal lagoons (Northern Adriatic Sea, Italy). Estuar. Coast. Shelf Sci., 109037.

Curiel, D., Rismondo, A., Marzocchi, M., Solazzi, A., 1995. Distribuzione di *Sargassum muticum* (Yendo) Fensholt (Phaeophyta) in Laguna di Venezia. Acqua Aria 8, 831-831.

Engelen, A.H., Serebryakova, A., Ang, P., Britton-Simmons, K., Mineur, F., Pedersen, M.F., Arenas, F., Fernandez, C., Steen, H., Svenson, R., Pavia, H., Toth, G., Viard, F., Santos, R., 2015. Circumglobal invasion by the brown seaweed *Sargassum muticum*. Oceanogr. Mar. Biol. Annu. Rev. 53, 81-126.

EU, 2016. Commission implementing regulation (EU) 2016/1141 of 13 July 2016 adopting a list of invasive alien species of Union concern pursuant to Regulation (EU) No 1143/2014 of the European Parliament and of the Council. Off. J. Eur. Union. L 189, 4-8.

EU, 2017. Updating the list of invasive alien species of Union concern established by Implementing Regulation (EU) 2016/1141 pursuant to Regulation (EU) No 1143/2014 of the European Parliament and of the Council. Off. J. Eur. Union. L 182, 37-39.

EU, 2019. Commission Implementing Regulation (EU) 2019/1262 of 25 July 2019 amending Implementing Regulation (EU) 2016/1141 to update the list of invasive alien species of Union concern. Off. J. Eur. Union. L 199/1, 1-4.

Fox, H.M., 1924. The migration of a Red Sea crab through the Suez Canal. Nature 113, 714-715.

Galil, B.S., 2011. The Alien Crustaceans in the Mediterranean Sea: An Historical Review, in: Galil, B.S., Clark, P.F., Carlton, J.T. (Eds.), In the Wrong Place - Alien Marine Crustaceans: Distribution, Biology and Impacts. Springer-Verlag, Berlin-Heidelberg, pp. 377-401.

Golani, D., Sonin, O., 1992. New records of the Red Sea fishes, *Pterois miles* (Scorpaenidae) and *Pteragogus pelycus* (Labridae) from the eastern Mediterranean Sea. Jap. J. Ichthyol. 39, 167-169.

Hamida, B.A.B.H.O., Hamida, B.H.N., Ammar, R., Chaouch, H., Missaoui, H., 2019. Feeding habits of the swimming blue crab *Portunus segnis* (Forskål, 1775) (Brachyura: Portunidae) in the Mediterranean. J. Mar. Biol. Assoc. U.K. 99, 1343-1351.

Hines, A.H., 2007. Ecology of Juvenile and Adult Blue Crabs, in: Kennedy, V.S., Cronin, L.E. (Eds.), The Blue Crab: *Callinectes sapidus*. Maryland Sea Grant College, College Park, Maryland, pp. 565-654.

Kleitou, P., Rees, S., Cecconi, F., Kletou, D., Savva, I., Cai, L.L., Hall-Spencer, J.M., 2021. Regular monitoring and targeted removals can control lionfish in Mediterranean Marine Protected Areas. Aquat. Conserv. Mar. Freshwat. Ecosyst. 31, 2870-2882.

Mancinelli, G., Bardelli, R., Zenetos, A., 2021. A global occurrence database of the Atlantic blue crab *Callinectes sapidus*. Sci. Data 8, 1-10.

Mancinelli, G., Chainho, P., Cilenti, L., Falco, S., Kapiris, K., Katselis, G., Ribeiro, F., 2017a. The Atlantic blue crab *Callinectes sapidus* in southern European coastal waters: distribution, impact and

prospective invasion management strategies. Mar. Pollut. Bull. 119, 5-11.
Mancinelli, G., Chainho, P., Cilenti, L., Falco, S., Kapiris, K., Katselis, G., Ribeiro, F., 2017b. On the Atlantic blue crab (*Callinectes sapidus* Rathbun 1896) in southern European coastal waters: Time to turn a threat into a resource? Fish. Res. 194, 1-8.
Mancinelli, G., Dailianis, T., Dounas, C., Kasapidis, P., Koulouri, P., Skouradakis, G., Bardelli, R., Di Muri, C., Guerra, M.T., Vizzini, S.J.S., 2022. Isotopic niche and trophic position of the invasive portunid *Portunus segnis* Forskål (1775) in Elounda Bay (Crete Island, Eastern Mediterranean). Sustainability 14, 15202.
Millikin, M.R., Williams, A.B., 1984. Synopsis of biological data on blue crab, *Callinectes sapidus* Rathbun. FAO Fisheries Synopsis 38.
Nehring, S., 2011. Invasion History and Success of the American Blue Crab *Callinectes sapidus* in European and Adjacent Waters, in: Galil, B.S., Clark, P.F., Carlton, J.T. (Eds.), In the Wrong Place - Alien Marine Crustaceans: Distribution, Biology and Impacts. Springer Netherlands, pp. 607-624.
Norton, T.A., 1976. Why is *Sargassum muticum* so invasive. Br Phycol J 11, 197-198.
Salvaterra, T., Green, D.S., Crowe, T.P., O'Gorman, E.J., 2013. Impacts of the invasive alga *Sargassum muticum* on ecosystem functioning and food web structure. Biol. Invasions 15, 2563-2576.
Savva, I., Chartosia, N., Antoniou, C., Kleitou, P., Georgiou, A., Stern, N., Hadjioannou, L., Jimenez, C., Andreou, V., Hall-Spencer, J.M., Kletou, D., 2020. They are here to stay: the biology and ecology of lionfish (*Pterois miles*) in the Mediterranean Sea. J. Fish Biol. 97, 148-162.
Tsirintanis, K., Azzurro, E., Crocetta, F., Dimiza, M., Froglia, C., Gerovasileiou, V., Langeneck, J., Mancinelli, G., Rosso, A., Stern, N., Triantaphyllou, M., Tsiamis, K., Turon, X., Verlaque, M., Zenetos, A., Katsanevakis, S., 2022. Bioinvasion impacts on biodiversity, ecosystem services, and human health in the Mediterranean Sea. Aquat. Invasions 17, 308–352.