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" Distribution and spread of the Blue Swimming Crab *Portunus pelagicus* in the Syrian coast: review data and future expectation"

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□ABSTRACT □

The research aims to conduct a general review of the status of the invasive crab *Portunus pelagicus* (Linnaeus, 1758) in the Syrian marine environment, focusing on its negative effects, commercial value, and the procedures and measures required to manage this species.

The blue swimming crab is widely distributed along the Syrian Coast, and constitutes an important part of the marine catch. It is caught most of the year with different types of fishing nets, and it is the only type of marine crab that is targeted in fishing, displayed for sale in markets, and consumed by local residents.

Keywords: blue crab, crustacean, Syrian coast, animal benthic, invasion impact.

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توزع وانتشار سرطان البحر الازرق السابح*Portunus pelagicus* في السواحل السورية: دراسة مرجعية والتوقعات المستقبلية

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(تاريخ الإيداع 3/2/ 2026 – تاريخ النشر4/5/ 2026)

□ ملخّص □

يهدف هذا البحث إلى إجراء مراجعة شاملة لوضع سرطان البحر الغازي *Portunus pelagicus* (Linnaeus, 1758) في البيئة البحرية السورية، مع التركيز على آثاره السلبية، وقيمته التجارية، والإجراءات والتدابير اللازمة لإدارة هذا النوع.

ينتشر سرطان البحر الأزرق السابح على نطاق واسع على طول الساحل السوري، ويُشكّل جزءًا هامًا من المصيد البحري. يُصطاد هذا النوع معظم أيام السنة باستخدام أنواع مختلفة من شباك الصيد، وهو النوع الوحيد من سرطان البحر الذي يُستهدف في الصيد، ويُعرض للبيع في الأسواق، ويستهلكه السكان المحليون.

الكلمات المفتاحية: سرطان البحر الأزرق، القشريات، الساحل السوري، الحيوانات القاعية، اثار الغزو.

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Introduction

The blue swimming crab *P. pelagicus* is among the exotic species that have invaded the Mediterranean Sea, which is interesting and attracts the attention of researchers and decision makers for two reasons: first, it has a potential impact on biodiversity, being a large predator, etc., and second, because it can represent a valuable living marine resource due to its palatable and delicious meat. The original habitat of this species is the western Indian Ocean (Galil *et al.,*, 2002), and it is widely distributed in coastal areas and estuaries, especially in tropical and subtropical regions (Romano & Zeng, 2008) in the western Indian subcontinent, Pakistan, the Arabian Gulf, the Red Sea, the Mediterranean Sea and the eastern coast of Africa (Lai *et al.,*, 2010). This species constitutes an important part of the commercial catch in many countries of the world such as India, Pakistan and Iran (Safaie, 2016) and has economic importance in the Arabian Gulf.

The invasion paths of *P. pelagicus* in the Mediterranean have been studied since its entry from the Red Sea via the Suez Canal to the present (Castriota *et al.,*, 2022). It is currently abundantly distributed along the Egyptian Mediterranean coast and in the Levantine Sea up to the Gulf of Iskenderun. Its presence in Syria was first recorded in Latakia in 1930 (Monod, 1931). This invasive species is abundant in soft bottoms at depths ranging from (5-90 m) in all areas. The distribution, growth, reproduction, behavior and migration rate of this species depend on the availability of preferred prey (Sanchez-Paz *et al.,* 2006; Vinagre *et al.,* 2007). P. pelagicus is a nocturnal, coastal species, living in several types of substrates (rocky, muddy and sandy) in shallow water, occasionally found in estuaries and in a wide range of coastal and continental shelf areas including algal or seagrass habitats.

Its most important biological characteristics: It is a benthic animal, which can be considered an opportunistic predator and its diet is primarily carnivorous (Tureli *et al.,*, 2017; Giraldes *et al.,*, 2016; Lai *et al.,*, 2018). It has an important role in marine food webs, as it feeds on hermit crabs, gastropods, bivalves, starfish, fish, cephalopods, decapods, annelids and algae. It grows to large sizes that may reach 185 mm, and it is a prey for mammals, birds and fish (Hal *et al.,*, 2006). BSC is widely used as food in many countries and in Syria as well. It has been described in many studies and research conducted in Syria on marine biodiversity since the early nineties of the last century, and the status of invasive alien species (especially crustaceans) was evaluated in the quantities of catch in nets of various types and in fish markets, where types of crustaceans, especially swimming blue crabs and some types of shrimp, constituted the largest proportion in addition to accompanying fish (Ammar, 2016; Ammar *et al.,*, 2019, Ammar *et al.,*, 2023). The data obtained during this research serve in future work within any regional program to confront the risks resulting from these species, protect marine biodiversity, and assess the impact of their accumulation in the Mediterranean Sea.

Materials and methods

The field results related to the study of marine biodiversity of benthic organisms documented in many scientific publications during the past few years (Hasan *et al.,*, 2018; Ammar, 2019; Ammar *et al.,*, 2023; Fadel, 2024) were relied upon. Samples were also obtained and their proportion in the catch was evaluated in the main fishing areas in Syria (Figure 1). Subsequent diving work was carried out to a depth of 11 meters in some coastal sites opposite the city of Latakia and south of Baniyas to monitor the behavior of

this invasive species and its biological activity, during which field and underwater photographs were taken.

Data related to seasonal temperature fluctuations in the surface water layer in some sites during the year 2022 were obtained from the results of research completed during the mentioned period using a field measuring device of the type WTW pH/Cond model i340.



Figure 1. The Syrian coast and its main fishing areas.

Results and Discussion

The issue of alien species and the study of invasive alien species (IAS) in particular, is one of the most raised issues in recent decades due to the tremendous growth of this phenomenon in the world and its repercussions on the environment, health and economy at the local and global levels (Pyšek *et al.,* 2020; Ammar, 2023; Eionet, 2023).

Many studies and research conducted over several decades have covered many aspects related to invasive species, starting from discovering their existence and monitoring their spread and distribution to managing and controlling them. However, there are still matters that have not been realized or explained and there are still knowledge gaps that require study and work, such as the actual origins of these species, their actual distribution range, and the lack of data on their distribution in different regions, areas, and depths (Huseyinoglu *et al.,* 2023; Ragkousis M *et al.,* 2023; Galanidi *et al.,* 2023). The reasons for the entry of these species into new environments, their spread, and their transformation into invasive species are not completely certain, but are discussed on the basis of a set of hypotheses that have been developed based on statistical studies and molecular analyses (Mantelatto *et al.,* 2007; Lai *et al.,* 2010; Lu *et al.,* 2022; Premachandra *et al*., 2023), which indicate two possibilities: the first is the transfer of tropical Atlantic species across the Strait of Gibraltar, and the second is via Lessepsian migration from the Red Sea (Zenetos *et al.,* 2022).

BSC is one of the oldest introduced species in the Mediterranean via the Suez Canal, first recorded in 1898 on the shores of Port Said in Egypt in 1898 (Mehanna & Haggag, 2007), in occupied Palestine and later in Lebanon, Syria and Turkey (Fox. 1924; Saker & Farah, 1994; Galil, 2011), followed by its recording in several Mediterranean regions (Castriota *et al.,*, 2022; Mancinelli *et al.,* 2022), including the Aegean Sea (Altuğ

et al., 2011; Özgül & Akyol 2019), the Ionian Sea (Ghisotti, 1966), and the Tyrrhenian Sea (Crocetta *et al.,* 2015). It has also been reported from Maltese waters, the Gulf of Gabes, northern Tunisia and the coast of Libya (Deidun & Sciberras 2016; Shakman *et al.,* 2017; Shaiek *et al.,* 2021). Its spread has recently expanded to Gabes and the western Mediterranean (Castriota *et al.,* 2022; de Carvalho-Souza *et al.,* 2023). In November 2022, a single individual was recorded near a port in the Adriatic Sea in Italy (Grati *et al.,* 2023). Shipping may play a role in this (Costello *et al.,* 2022).

BSC is one of the most important invasive marine species that inhabit and control the Syrian marine environment (Ammar *et al.,* 2023). It lives in areas with sandy or muddy sandy bottoms and is abundant near river mouths such as the mouth of the northern Kabir River and the Fawwar Spring south of Tartous and near freshwater springs south of Banias, within the infralittoral zone of 5-70 meters. It is caught most of the year with various types of nets, especially the beach trawl net, the gill net with a diameter of 32 mm, and the fixed bottom trammel net, as it constitutes an important part of the marine catch and is widely used as food and is popular with many residents of coastal cities. There is an almost permanent presence of this species in the fish markets in Banias and Lattakia, where these crabs are caught with various types of fishing nets along with other pelagic fish species. Figure 3 shows the amount of BSC in Banias on September 27, 2023.

It has been described in many studies and research conducted at the Higher Institute of Marine Research since the early nineties of the last century due to its nutritional and economic value and its important invasive role (Saker and Farah 1994; Ammar, 2002, 2016, 2017, 2019; Ammar *et al.,* 2013, 2023; Ibrahim *et al.,* 2005; Hasan *et al.,* 2008; Shreky, 2014). It continues to appear in large numbers in most months of the year and reaches its peak in the autumn months. Table 1 shows the location and time of previous records of this species in Syria.

Table 1: Records of the presence of the species *P. pelagicus* in Syria Locations and coordinates Depth, substrate and references

Site	N	E	Year	Depth	Substrare	Reference
Lattakia	-	-	1930	-	-	Monod 1931
Lattakia	-	-	-	5-70 m	-	(Saker & Farah, 1994)
Banias/Arab Almolk/north of Banias/deep sea	35.24557	35.93896	1998, 1999, 2000,2001	up to 90m	sandy bottom	(Ammar, 2002)
Jableh	-	-	-	-	-	(Hatoum. 2010)
Latakia (Ibn Hani-alkorneesh aljanoubi)	-	-	2011-2012	60-80m	Soft bottom	(Sherky, 2014)
Al-Mentar/ South of Tartus	34.81666	35.90000	2003, 2004	up to 20m	sandy bottom	(Ammar, 2017)
North of Latakia	35.583333	35.733333	2003, 2004	up to 20m	sandy bottom	(Ammar, 2017)
Albasit	35.851245	35.830311	2003, 2004	up to 20m	sandy bottom	(Ammar, 2017)
Latakia	-	-	-	-	-	(Hasan *et al.,* 2008)
south of Latakia	-	-	2009-2012	50-70m	Soft bottom	(Ammar *et al.,* 2013)
Nahr Alkabeer Alshamali estwary	35.500448	35.80932	2020-2021	5-7m	sandy bottom	Ammar *et al.,* 2022
Borj Islam/north of Latakia	35.67756	35.75912	2020-2021	5-7m	sandy bottom	Ammar *et al.,* 2022
Latakia//bn Hani	35.592677	35.74121	2019,-2024	sublittoral	Sandy	(Ammar *et al.,* 2023; Fadel, 2024)
South of Latakia (Albassa)	35.495696	35.817412	2019,-2024	sublittoral	Sandy	(Ammar *et al.,* 2023; Fadel, 2024)
Albasit	35.860595	35.83277	2019-2024	sublittoral	Soft bottom	(Ammar *et al.,* 2023; Alo, 2024)
Arab Almolk/north of Banias/deep sea	35.24557	35.93896	2019, 2020.2021	sublittoral	Soft bottom	(Ammar *et al.,* 2023)
Jableh/Alshkaifat	35.428398	35.906765	2019, 2020.2021	sublittoral	Soft bottom	(Ammar *et al.,* 2023)
Alfawar/south of Tartus	34.80198	35.91726	2021	5m	Sandy bottom	(Ammar *et al.,* 2023)

Ecological and biological habits of BSC

This species behaves aggressively and opportunistically in its environment and tends to affect biodiversity and fisheries, aided by several of its biological traits such as early maturity, rapid growth rates, opportunistic diet, high reproductive rates, use of general habitats, long-range larval dispersal, and influential physical and aggressive behavior. All of this facilitates the invasive nature of these crabs and enhances their success in spreading across regions. The breeding season extends throughout the year except winter, and spawning is linked to seasonal changes in sea surface temperature and can occur at different times of the year (Fox, 1924; Giraldes *et al.,* 2016). Local field work showed that sexually mature females can be collected from Syrian marine waters during the period extending from the spring months to November, and that the highest percentage of mature females was obtained during the months of July and October-November (Shreky, 2014; Ammar *et al.,* 2022), and the absence of mature females during the months of January and March, and the association of the ovary maturity stage with the width and length of the ovary (Shreky, 2014).

Figure 2 shows an updated map of the distribution areas of the swimming blue crab in the Mediterranean and the world.

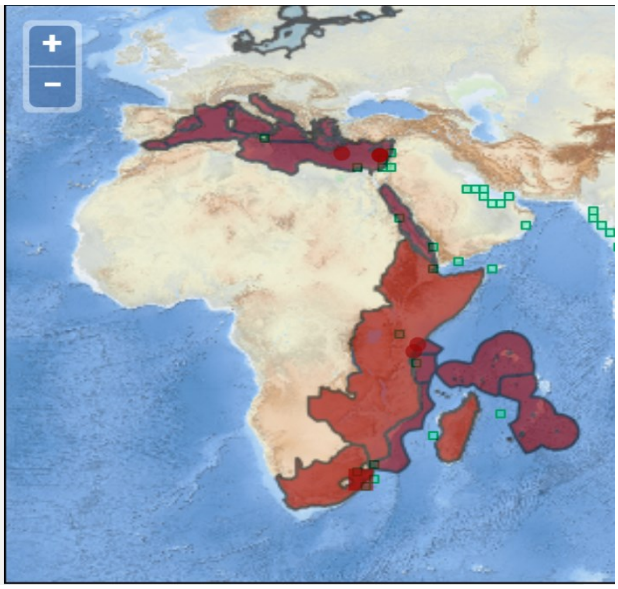


Figure 2. Global distribution map of *P. pelagicus* according to (WoRMS, 2023)

The absolute fertility value ranged between (143510-21435) eggs according to Shreky's research in 2014 for samples collected from the Latakia coast during the period 2011-2012, and the relative fertility rate ranged between (1924-766651) eggs/gram of body weight. In the latest data for samples collected during the years 2021-2020, the length of the shield for females ranged between (5.1-13 cm) and for males (5-13.2 cm), and the width of the shield for females ranged between (4.5-11.3 cm) and for males (4.5-11.3 cm), while the weight of these females ranged (73.44-139.97 gr.) and males (Ammar *et al.,* 2022) (76.92-189.75 gr.). It is noteworthy that in the summer and fall of 2023, a delay in the appearance of BSC individuals was observed until October. At the end of October and the beginning of November, male and female individuals were observed in the mating stage in the shallow coastal area at a depth of 1.5 - 2 meters on the sandy beaches in Baniyas and Lattakia. Figure (3) shows the stages of the life cycle of this species that were documented in the wild and in an experiment to breed this species for this research.

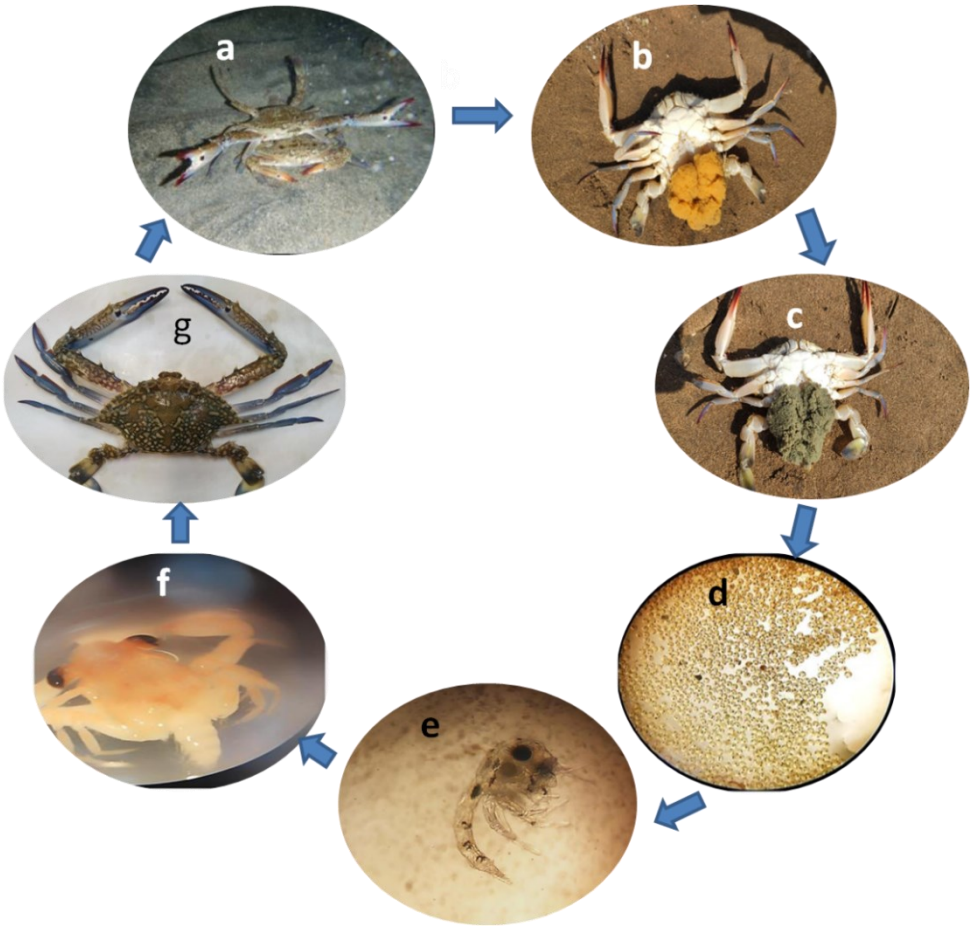


Figure 3. Life cycle of *P. pelagicus* and the growth and development stages documented in the present study.

a- *P. pelagicus* mating in the natural environment (photo by Noah Abbas), **b-** Females of *P. pelagicus* carrying eggs at an early stage, **c-** Females of *P. pelagicus* carrying eggs at a late stage, **d-** Embryos of *P. pelagicus* under stereomacroscope, **e-** Zoea larva under stereomacroscope, **f-** Megalopa larva under stereomacroscope, **g-** Adult

Pollution weakens native species and allows invasive species that tolerate pollution to spread, multiply, and take over. (wilson *et al.,* 2019).

The obtained diversity results can be linked to many variables, including overfishing, pollution, and climate change, which is represented by the increase in the annual average of both water temperature and salinity, as the surface water temperature in Syria ranged between 31-17 °C during the year 2022, with an average of 23.1 °C Salinity ranged between 37.3-38.8 (‰) and an average value of 38.08 (‰). Recent local readings of average temperatures on the Syrian coast are consistent with the values in the eastern Mediterranean basin (Pisano *et al.,* 2020).

The entry of these invasive species into the Mediterranean Sea has caused the displacement or local extinction of local species, although the mechanism is not precisely defined.

Its role is assumed to be negative, and the reasons are that they are predators and much larger than other local crab species, and it is difficult for adult species to prey on them, and thus compete with local species for food and space, and may modify or change marine food webs, and cause a change in the structure of habitats and constitute a disturbance factor for natural ecosystems, and have had a negative impact on the income and production of workers in the shellfish collection sector in many Mediterranean

countries, and they feed on all other species of fish, and their only natural predator, the octopus, is not sufficient to limit their spread.

The blue crab feeds on local fish and destroys fishing nets with its sharp shell and claws, and feeds on fish species that are also caught in these nets or traps. In addition to physical injuries to fishermen and damage to fishing nets, there is a concomitant and subsequent increase in work intensity, a decrease in fish catches due to the presence of blue crabs and damage to fish from blue crab bites, which leads to a decrease in the quality and value of the catch. All of the above will affect global revenues. The swimming blue crab is commercially important in its native habitat, contributing 0.4% of the total global catch (298,000) tons, and representing 5% of the world's crustacean fisheries according to data from the Food and Agriculture Organization of the United Nations (FAO, 2020). Despite its negative environmental and socio-economic role, it is hunted by humans in the eastern Mediterranean for its delicious meat, and today it represents an important resource for fishing and food security in some Mediterranean countries such as Tunisia (Ennouri *et al.,* 2021; Tsirintanis *et al.,* 2022), for example in the Gulf of Gabes in southeastern Tunisia, where blue crabs are widespread during the peak season. They represent more than 70 percent of the catch (Bejaoui *et al.,*, 2017). There, the Food and Agriculture Organization of the United Nations was able to help artisanal and small-scale fishermen transform this threat into a source of income "from invasive species to valuable exports" (FAO, 2023). In 2019 alone, the catch amounted to 3,500 tons in Tunisia alone, with an income value of 12 million euros (Rjiba Bahri *et al.,* 2022). In Lake Bardawil in Egypt, more than 1,085 tons of blue swimming crab (BSC) have been caught annually for the past 30 years, with an increase in production reaching 2,100 tons in 2009 (Abdallah *et al.,* 2022). It is one of the most important living resources in Egyptian fisheries in the Mediterranean, with the catch in Bardawil Bay alone reaching 492 to 1,322 tons between 1995-2005 (Abdel Razek *et al.,* 2006). It is common in Lebanon (Zibrowius & Bitar 2003), and is served in upscale restaurants in southern Turkey (Özcan *et al.,* 2005). It is caught in several areas. It has become commercially fished in the Mediterranean. Its large numbers have made it appear in fish markets in Port Said and Alexandria in Egypt; Known as "Caporia", it is one of the most important species in Egyptian fisheries, Haifa and Acre. The quantity sold was estimated at twenty tons annually (Perlmutter 1956) since the 1920s and is still sold in permanent quantities in Egypt and Haifa (Galil 2007). It is also sold in large quantities in Turkey and Sicily (Crocetta, 2006), and is recently sold in the Tyrrhenian Sea and the Aegean Sea (Yokes *et al.,* 2007). Accordingly, the presence of this species in the western Mediterranean is generally viewed as positive, as a new source of income for some fishermen, and the majority of them (72%) suggested fishing and marketing as the main management measures for invasive species. Despite the interest expressed in exploiting this new resource, many questions have arisen regarding the promotion and development of management strategies for this species in the Mediterranean (Marchessaux *et al.,* 2023). In Syria, this type of crab is the only one consumed and sold in fish markets. Local residents in major coastal cities and towns have been eating it for decades. It is boiled with spices added to the water, peeled and the meat in the chest and tongs is eaten, and soup is made from it. The presence of swimming blue crab in local markets in Baniyas and Latakia is almost constant and in varying quantities. It is sold at prices that have reached up to 150,000 Syrian pounds per kilogram currently. As for the rest of the types of crabs that are caught by accident, they are not desired for consumption and are used as bait.

Future prospects for BSC in Syria and the Mediterranean

Recent records indicate that the distribution range of this species is likely to expand across the Mediterranean basin, aided by rising water temperatures and other environmental factors such as salinity, rainfall and wind (Galil *et al.,* 2018; Grati *et al.,* 2023) and the rapid spread of larvae, especially in areas containing large numbers of this species (Marchessaux *et al.,* 2023). The expansion of the geographical range to the southwestern coast of the Mediterranean raises concerns about the potential impacts on local ecosystems and the local economy and emphasizes the need to develop effective management strategies to prevent its spread and control its impact. Commercial investment in invasive alien species is one of the recently proposed solutions to address the invasion and its negative effects, especially in the western Mediterranean in Italy, France and Tunisia (Rifi *et al.,* 2023). Global climate change and increased carbon pollution in the seas and oceans will certainly lead to excessive growth of the skeleton of these crabs and thus they will become larger, more aggressive and predatory (Azra *et al.,* 2019).

Experimental studies of the thermal tolerance of blue crabs showed a significant increase in respiration rate values at 32°C before the death of the organisms at 40°C and the thermal performance curve showed that the optimal performance was at 24°C (Azra *et al.,* 2018).

The measures and actions required for the early management of these and other invasive species in new receiving areas do not take into account the increasing number of invasive individuals, their rapid geographical expansion, their ecological characteristics, as well as the difficulties in monitoring mass invasions, which limits the implementation of effective adaptation and mitigation policies. Economically, the invasive species BSC has become a high-value commodity in fisheries and is exported to the international market, and its exports currently rank third and fourth after tuna, shrimp and seaweed (BPBAP, 2013). It encourages overfishing, and affects the environment and non-target organisms. Fishermen use traps, gill nets, and small trawl nets to target crabs. Fishing gears have different levels of selectivity, and most of them have small eyes that do not allow small individuals to escape. Analysis of morphometric data of BSC samples is useful in adopting standards for fishing this species in the future in Syria, and providing basic information for the proper exploitation and management of this species. It also serves to evaluate the impact of fishing gear used on the sizes caught and stocks, and to recommend the use of nets with larger meshes. The results of such a study showed that 3-inch holes are most suitable for the escape of small individuals from the BSC (Nurdin *et al.,* 2022). The BSC catch criteria for the individuals collected include carapace width, weight, sex, and gonadal maturation stage (GMS). The relationship between carapace width and weight of male and female crabs was also studied (Nabila *et al.,*, 2023). In some previous global genetic studies of BSC populations, a new genetic sequence was detected at the level of cytochrome c oxidase subunit 1 (COI) sequences (Sienes *et al.,*, 2014), which led to the name P. segnis as a representative of P. pelagicus (Lai *et al.,* 2010). This has complicated the assessment of its genetic diversity, and has necessitated further molecular analyses and studies at the group level, especially in the Mediterranean (Hatira *et al.,*, 2020). In Syria, the genetic characteristics of two groups of BSC from the south and north of the Syrian coast have recently been studied (Alo, 2024). The results of the genetic sample analysis showed that the samples belong to two unique individual patterns and indicated a close relationship between the alien individuals collected from Syria and some local individuals in India. This similarity is attributed to the similarity of feeding habitats and geographical features of the site. This is important in developing any

plan for effective and feasible management of this species. On the other hand, the increased demand for blue crab meat leads to the depletion of its stocks in the natural environment, which leads to a decline in genetic diversity and consequently a decline in the quality of the meat. To address this, farming is one of the possible alternative solutions. *P. pelagicus* is a highly sought-after species for culture in a number of countries, especially in its native habitat such as Indonesia, and contributes significantly to the national income of a number of countries and is an important export commodity in the fisheries sector (Sri Wiyono & Ihsan 2018). Due to its rapid growth rates compared to the sizes available in the market (Josileen, & Menon, 2005) and the relative ease of hatchery production (Walker, 2006), this species is cultured in a type of culture called composite culture, where it is cultured with finfish species and seaweeds (Tavares *et al.,* 2017). One of the proposed methods for managing this species is to culture it in submerged net cages, which allows for increased production, ease of control, efficiency and rapid monitoring. It is recommended for culture of crabs with high-quality genes (Hidayani *et al.*, 2023).

Recommendations

-Benefiting from the waste of this species to obtain effective biological materials in the fields of medicine, nutrition and cosmetics, especially chitosan and chitin.
-Using the different groups of this species found on the Syrian coast in developing marine biotechnology research and its applications in the field of genetic resources.
-The data obtained during this research serve in future work within any regional program to confront the risks resulting from this species, protect marine biodiversity and evaluate the impact of its accumulation in the Mediterranean Sea.

References

ABDALLAH M. H, HASANIN G.D.I, ELSAYED H. E, ELAIATT A.A.O. 2022, *LENGTH-WEIGHT RELATIONSHIP, SEX RATIO AND CONDITION FACTOR OF BLUE SWIMMER CRAB (PORTUNUS PELAGICUS) IN BARDAWIL LAGOON*. Egypt SINAI Journal of Applied Sciences,v0l. 11, N. 4, pp739-754.

ABDEL RAZEK FA, TAHA SM, AMERAN AA. 2006, *POPULATION BIOLOGY OF THE EDIBLE CRAB PORTUNUS PELAGICUS (LINNAEUS) FROM THE BARDAWIL LAGOON, NORTHERN SINAI, EGYPT*. Egypt J Aquat Res, v0l. 32, N.1, pp 401–418.

ALO A. 2024, *STUDY OF ZOOBENTHIC COMMUNITIES IN RAS-ALBASIT AND AL-AHLAM BEACH, DETERMINATION OF GENETIC STRUCTURE OF TOW INVASIVE SPECIES BRACHIDONTES PHARAONIS AND PORTONUS PELAGICUS*. MSc, thesis, High Institute of marine research, Tishreen univ, 160p.

AMMAR I, ARABIA I, DIB F. 2019, *NEW DATA ABOUT THE DECAPODS CRUSTACEANS IN THE SYRIAN MARINE WATER (SOUTH OF LATAKIA)*. Damascus university journal for basic science, vol.35, N.1,pp 15-44. [in arabic]

AMMAR I, ARRAJ H, DIB F, ARABIA I. 2023, *ASSESSMENT OF THE STATE OF INVASIVE ALIEN SPECIES IN SYRIA.* Syrian journal of agricultur researches,vol. 10, N.1,pp 101-116. [in arabic]

AMMAR I, HASAN M, ARABIA I, DIB F.2013, *ASSESSMENT OF THE ACTUAL STATE OF ZOOBENTHOS IN THE SUBLITTORAL AREA ON THE NORTH OF LATTAKIA*. Technical Report. High Agency of Scientific Research, 62 p. [in arabic]

AMMAR I, LAYKA H, FADEL S. 2022, *THE MORPHPLOGY AND MORPHOMETRIC CHARACTERISTICS OF THE SWIMMING CRAB PORTUNUS PELAGICUS FROM THE SYRIAN COASTAL WATER*, Albaath journal,vol. 44, N.17,pp 51-64. [in arabic]

AMMAR I, LAYKA H, FADEL S. 2024, *THE CULTURE OF SWIMMING BLUE CRAB PORTUNUS PELAGICUS (LINNAEUS, 1758) LABORATORY AND DETERMINE ITS NUTRITIONAL VALUE*, Lattakia university. [in arabic]

AMMAR I. 2023, *CLIMATE CHANGES IN THE EASTERN MEDITERRANEAN SEA AND THEIR POTENTIAL IMPACTS ON THE BENTHIC FAUNA IN SYRIA.* Journal of King Abdulaziz University: Marine Sciences,vol. 33, N.1,pp 75-91. [in arabic]

AMMAR I. 2016, *MACROBENTHIC INVERTEBRATE COMMUNITIES STRUCTURE IN THE SYRIAN DEEP SEAWATER*. Albaath Magazine,vol. 38 , N.16,pp 11-38.

AMMAR I. 2017, *SPECIFIC COMPOSITION AND DISTRIBUTION OF ZOOBENTHOS ON THE SYRIAN COAST IN RELATION TO THE ENVIRONMENTAL FACTORS.* Mu,tah Lil-Buuhuoth wad - Deraasaat, Natural and Applied science series,vol. 32, N.1,pp 1-36.

AMMAR I. 2002, *STUDY OF ZOOBENTHOS IN BANIAS COAST AND EFFECT OF PETROLEUM HYDROCARBON ON THERE.* Doctoral thesis, Tishreen University, Lattakia, Syria, 336 p.

AMMAR I. 2019 *UPDATED LIST OF ALIEN MACROZOOBENTHIC SPECIES ALONG THE SYRIAN COAST*. International Journal of Aquatic Biology,vol. 7, N. 4,pp 180-194.

AZRA M.N, AAQILLAH-AMR M.A, IKHWANUDDIN M, M.A.H, WAIHO K, OSTRENSKY A, TAVARES CP, ABOL-MUNAFI AB.2019, *EFFECTS OF CLIMATE-INDUCED WATER TEMPERATURE CHANGES ON THE LIFE HISTORY OF BRACHYURAN CRABS.* Reviews in Aquaculture, pp1–6.

AZRA M.N, CHEN J.C, IKHWANUDDIN M, ABOL-MUNAFI A.B.2018, *THERMAL TOLERANCE AND LOCOMOTOR ACTIVITY OF BLUE SWIMMER CRAB PORTUNUS PELAGICUS INSTAR REARED AT DIFFERENT TEMPERATURES.* Journal of Thermal Biology, vol. 74,pp 234–240.

BEJAOUI S, GHRIBI F. HATIRA S, CHETOUI I, REBAH I, CAFSI M.E. 2017, *FIRST INVESTIGATION IN THE BIOCHEMICAL ANALYSIS OF THE INVASIVE CRAB PORTUNUSSEGNIS FROM TUNISIAN WATERS*. J Am Oil ChemSoc, 94,pp 673-682. https://doi.org/10.1007/s11746-017-2987-x

BPBAP (Balai Perikanan Budidaya Air Payau). 2013, *TEKNOLOGI PEMBENIHAN RAJUNGAN (PORTUNUS PELAGICUS LINNAEUS, 1758) [SEED HATCHING TECHNOLOGY (PORTUNUS PELAGIUS LINNAEUS, 1758)],* (Kementrian dan Perikanan Direktorat Jenderal Perikanan Bididaya, Takalar,pp190-199. [Bahasa Indonesia]

CASTRIOTA L, FALAUTANO M, MAGGIO T, PERZIAP. 2022, *THE BLUE SWIMMING CRAB PORTUNUS SEGNIS IN THE MEDITERRANEAN SEA: INVASION PATHS, IMPACTS AND MANAGEMENT MEASURES*. Biology (Basel). Oct 8;11(10):1473. doi: 10.3390/biology11101473. PMID: 36290376; PMCID: PMC9598175.

COSTELLO K, LYNCH SA, MCALLEN R, O'RIORDAN RM, CULLOTY SC. 2022, *ASSESSING THE POTENTIAL FOR INVASIVE SPECIES INTRODUCTIONS AND SECONDARY SPREAD USING VESSEL MOVEMENTS IN MARITIME PORTS.* Marine Pollution Bulletin, 177: 113496, https://doi.org/10.1016/j.marpolbul.2022.113496.

CROCETTA F, AGIUS D, BALISTRERI, P, BARICHE M, BAYHAN Y.K, ÇAKIR S, CIRIACO S, CORSINI–FOKA M, DEIDUN A, EL ZRELLI R.2015, *NEW MEDITERRANEAN BIODIVERSITY RECORDS* (october 2015). Mediterr. Mar.Sci,16, 682–702. https://doi.org/10.12681/mms.1477.

CROCETTA F. 2006, *FIRST RECORD OF PORTUNUS PELAGICUS (LINNAEUS, 1758) (DECAPODA, BRACHYURA, PORTUNIDAE) IN THE NORTHERN TYRRHENIAN SEA.* Crustaceana,vol. 79,N.9,pp1145-1148.

DE CARVALHO-SOUZA GF, CUESTA JA, ARANA D, LOBATO C., GONZÁLEZ-ORTEGÓN E. 2023, *WESTWARD RANGE EXPANSION OF THE BLUE SWIMMER CRAB PORTUNUS SEGNIS (FORSKÅL, 1775) (CRUSTACEA, DECAPODA, PORTUNIDAE) INTO ATLANTIC EUROPEAN WATERS*. BioInvasions Records, 12 (in press)

DEIDUN A, SCIBERRAS A. 2016, *A FURTHER RECORD OF THE BLUE SWIMMER CRAB PORTUNUS SEGNIS FORSKAL, 1775 (DECAPODA BRACHYURA PORTUNIDAE) FROM THE MALTESE ISLANDS* (Central Mediterranean) Aquatic invasions,vol.5,N. 1.

EIONET. 2023, Marine non-indigenous species in Europe's seas Eionet European Environment Information and Observation Network (Eionet) M.

ENNOURI R, ZARROUK T, FATNASSI M, MILI S. 2021, *DEVELOPMENT OF THE FISHING AND COMMERCIALIZATION OF THE BLUE CRABS IN BIZERTA AND GHAR EL MELH LAGOONS: A CASE STUDY OF PROMOTION OPPORTUNITIES OF BLUE GROWTH IN TUNISIA.* Journal of Aquaculture & marine Biology,vol. 10,pp66–74. https://doi.org/10.15406/jamb.2021.10.00308

FADEL S. 2024, *CULTURE OF BLUE SWIMMER CRABS, PORTUNUS PELAGICUS AND DETERMINATION OF ITS NUTRITIONAL VALUE*. Ph.D, thesis, High Institute of marine research, Tishreen univ.; (74)p.

FAO. 2023, Fisheries Depatment,Fisheries Information, Data and Statistic Unit Fishstat Plusdatabase, Version2.3. https://www.fao.org/fao stories/article/en/c/1443166/#:~:text

FAO.2020, The State of World Fisheries and Aquaculture 2020. Sustainability in action. Rome. https://doi.org/10.4060/ ca9229en.

Fox H.M.1924, The migration of a Red Sea crab through the Suez Canal. Nature, voll.113,pp 714–715. https://doi.org/10.1038/113714b0 .

GALANIDI M, AISSI M, ALI M, ALI B.2023, *VALIDATED INVENTORIES OF NON-INDIGENOUS SPECIES (NIS) FOR THE MEDITERRANEAN SEA AS TOOLS FOR REGIONAL POLICY AND PATTERNS OF NIS SPREAD. DIVERSITY*. 962. 10.3390/d15090962.

GALIL B, FROGLIA C, NOEL P.Y.2002, *CRUSTACEAN DECAPODS AND STOMATOPODS. IN CIESM ATLAS OF EXOTIC SPECIES IN THE MEDITERRANEAN*; Briand, F., Ed.; CIESM Publishers: Monaco, vol.2,pp 1–192.

GALIL BS, MARCHINI A, OCCHIPINTI-AMBROGI A.2018, *EAST IS EAST AND WEST IS WEST? MANAGEMENT OF MARINE BIOINVASIONS IN THE MEDITERRANEAN SEA*. Estuarine, Coastal and Shelf Science, vol. 201,pp 7–16.

GALIL BS.2007, *ALIEN CRUSTACEAN DECAPODS FROM THE AEGEAN COAST OF TURKEY*. Biol Invas. Vol. 2,pp162–168.

GALIL BS.2011, The Alien Crustaceans in the Mediterranean Sea: An Historical Review. In: Galil B, Clark P, Carlton J (eds), In the Wrong Place - Alien Marine Crustaceans: Distribution, Biology and Impacts. Invading Nature - Springer Series in Invasion Ecology,vol.6,pp 377–401.

GHISOTTI F.1966, *CALLINECTES SAPIDUS RATHBUN NEL MEDITERRANEO (CRUSTACEA, DECAPODA)*.Natura, Milano, vol. 57 ,N.3,pp 177-180.

GRATI F, FROGLIA C, SOUISSI JB, BOLOGNINI L, AZZURRO E.2023, *THE BLUE SWIMMING CRAB PORTUNUS SEGNIS (FORSKÅL, 1775) REACHES THE ADRIATIC SEA: A DISTANT AND DISJOINTED OCCURRENCE*. BioInvasions Records, 12, https://doi.org/10.3391/ bir.2023.12.4.15

HAL D, LEE S.Y, MEZIANE T.2006, *FATTY ACIDS AS TROPHIC TRACER IN AN EXPERIMENTAL ESTUARINE FOOD CHAIN: TRACER TRANSFER.* Journal of Experimental Marine Biology and Ecology, vol. 336,pp 42-53.

HASAN H.2018, *THE CURRENT STATE OF EXOTIC CRUSTACEAN DECAPOD FAUNA IN SYRIAN MARINE WATERS (UPDATE AND REVIEW)*, Tishreen University journal for research and studies- biological sciences series, vol. 40,N.2, pp131- 146.

HASAN H., ZEINI, A., NOËL, P.Y.2008, *THE MARINE DECAPOD CRUSTACEA OF THE AREA OF LATTAKIA SYRIA*. Crustaceana, vol.81,N.5.pp 513-536.

HATIRA S, FASSATOUI C, ROMDHANE M.S.2020, *FINE–SCALE MORPHOLOGICAL AND GENETIC VARIABILITY OF THE INVASIVE SPECIES OF BLUE SWIMMING CRAB PORTUNUS SEGNIS (FORSKÅL, 1775) IN THE GULF OF GABES (SOUTHEASTERN TUNISIA)*. Cah. Biol. Mar.vol. 60,pp207–218.

HATOUM B.2010, *SURVEY OF CRUSTACEANS DECAPODA AND FERTILITY EFFICIENCY OF PENAEIDAE IN THE WATERS OF JIBLA BEACH.* Master degree in Water Environment, Tishreen University, Lattakia, Syria,pp 24-58.

HIDAYANI A A, TRIJUNO D D, FUJAYA I Y, TAUHID UMAR A M.2018, *THE MORPHOLOGY AND MORPHOMETRIC CHARACTERISTICS OF THE MALE*

SWIMMING CRAB (PORTUNUS PELAGICUS) FROM THE EAST SAHUL SHELF, Indonesia. AACLBioflux,vol. 11,N.6,pp1724-1736. http://www.bioflux.com.ro/aac

HUSEYINOGLU M.F, ARDA Y, JIMÉNEZ C.2023, *MANUAL OF INVASIVE ALIEN SPECIES IN THE EASTERN MEDITERRANEAN.* Gland, Switzerland: IUCN.

IBRAHIM A, AMMAR A, ALHANON K.2005, *MARINE BIODIVERSITY IN THE SYRIAN AND LEBANESE COAST AND ITS RELATIONSHIP TO THE CONDITIONS OF THE MIDDLE WITH A FOCUS ON MIGRATORY SPECIES.* Technical Report. Higher Council for Science, Ministry of Higher Education,110 p .

JOSILEEN J, MENON N. G. *CRUSTACEANA*, 2005; 78(1), 1–18.

LAI J.C.Y, NG P.K.L, DAVIE P.J.F.2010, *A REVISION OF THE PORTUNUS PELAGICUS (LINNAEUS, 1758) SPECIES COMPLEX (CRUSTACEA: BRACHYURA: PORTUNIDAE), WITH THE RECOGNITION OF FOUR SPECIES.* Raffles Bull. Zool,vol. 58, pp199–237.

LU Y-M, SHIH C-H, CHEN P-C, KAO W-C, LEE Y-C, HAN Y-S, TZENG T-D.2022, *GENETIC VARIATIONS AND EXPANSION OF THE BLUE SWIMMER CRAB (PORTUNUS PELAGICUS) IN SOUTHEAST ASIA.* J. Mar. Sci. Eng.10, 1071. https://doi.org/10.3390/jmse10081071

MANTELATTO F.L, ROBLES R, FELDER D.L.2007, *MOLECULAR PHYLOGENY OF THE WESTERN ATLANTIC SPECIES OF THE GENUS PORTUNUS (CRUSTACEA, BRACHYURA, PORTUNIDAE) ZOOL*. J. Linn. Soc,vol. 150,pp211–220. doi: 10.1111/j.1096-3642.2007.00298.x.

MARCHESSAUX G, CHEVALIER C, MANGANO MC, SARÀ G.2023, *LARVAL CONNECTIVITY OF THE INVASIVE BLUE CRABS CALLINECTES SAPIDUS AND PORTUNUS SEGNIS IN THE MEDITERRANEAN SEA: A STEP TOWARD IMPROVED CROSS BORDER MANAGEMENT*. Mar Pollut Bull. 2023 Sep;194(Pt A):115272. doi: 10.1016/j.marpolbul. 115272. Epub 2023 Jul 11. PMID: 37442052.

MEHANNA S.F, HAGGAG H.M.2007, *FISHERIES MANAGEMENT OF THE BLUE SWIMMER CRAB PORTUNUS PELAGICUS (LINNAEUS, 1766) FROM PORT SAID AT THE MEDITERRANEAN COAST OF EGYPT.* The International Arab African Fish Resources Conf. Sustainable use and management of aquatic resources, 28-30 June.

MONOD T.1931, *CRUSTACÉS DE SYRIE. IN: GRUVEL A, LES ƃTATS DE SYRIE. RICHESSES MARINES ET FLUVIALES.* Exploitation actuelle – Avenir. Bibl Faune Colon Franç, Paris,vol. 3,pp397–435.

NABILA A N, TAURUSMAN A A, WIRYAWAN B, RIYANTO M.2023, *FISHING IMPACT OF BLUE SWIMMING CRAB (PORTUNUS PELAGICUS) FISHERY ON TARGET IN LAMONGAN WATER, NORTHERN COAST OF EASTERN JAVA PROVINCE*. IOP Conference Series: Earth and Environmental Science journal, 1137(1). doi = {10.1088/1755-1315/1137/1/012021

NURDIN H S, SUSANTO A, SAPUTRA D Y A.2022, *EFFECTIVENESS OF DIFFERENT MESH SIZE TO RELEASE SMALL BLUE SWIMMING CRAB ON TRAP FISHING*. IOP Conference Series: Earth and Environmental Science, 978(1) DO - 10.1088/1755-1315/978/1/012045.

ÖZCAN T, KATAGAN T, KOCATAS, A.2005, *BRACHYURAN CRABS FROM ISKENDERUN BAY (SOUTHEASTERN TURKEY)*. Crustaceana,vol. 78,pp237–243.

ÖZGÜL A, AKYOL O.2019, *OCCURRENCE OF A LESSEPSIAN SWIMMING CRAB, PORTUNUS SEGNIS (CRUSTACEA: DECAPODA), IN SOUTHERN AEGEAN SEA*, turkey. DOI 10.19233/ASHN.

PERLMUTTER A. *SEA FISHERIES*. Report to the government of Israel. Technical Assistance program USOM Agricultural Report, vol.13,pp1–58.

PISANO A, MARULLO S, ARTALE V, FALCINI F, YANG C, LEONELLI FE, SANTOLERI R, BUONGIORNO NARDELLI, B.2020, *NEW EVIDENCE OF MEDITERRANEAN CLIMATE CHANGE AND VARIABILITY FROM SEA SURFACE TEMPERATURE OBSERVATIONS*. Remote Sensing,vol.12, 132, https://doi.org/10.3390/ rs12010132.

PREMACHANDRA HKA, BECKER A, MILLARD K, JOHNSTON D, SUBRAMANIAN S. KUMAR M, TAYLOR M, KNIBB W.2023, *GENOMIC ANALYSES INDICATE TWO BLUE SWIMMER CRAB SPECIES IN AUSTRALIA, EVIDENCE FOR NATURAL INTERSPECIFIC HYBRIDIZATION AND GENETIC STRUCTURE WITHIN SPECIES WITH IMPLICATIONS FOR FISHERIES MANAGEMENT AND STOCK ENHANCEMENT*. Fisheries Research,; 265.https://doi.org/10.1016/j.fishres.106757.

PYŠEK P, HULME P.E, SIMBERLOFF D, BACHER S, BLACKBURN T.M, CARLTON J.T, DAWSON W, ESSL F, FOXCROFT L.C, GENOVESI P. 2020, *SCIENTISTS' WARNING ON INVASIVE ALIEN SPECIES*. Biol. Rev. 95, 1511–1534. https://doi.org/10.1111/brv.12627.

RAGKOUSIS M. 2023, *UNPUBLISHED MEDITERRANEAN AND BLACK SEA RECORDS OF MARINE ALIEN, CRYPTOGENIC, AND NEONATIVE SPECIES.* BioInvasions Records, 12(2):339–369, https://doi.org/10.3391/bir. 2023.12.2.01

RIFI M, BASTI L, RIZZO L, TANDUO V, RADULOVICI A, JAZIRI S, UYSAL I. SOUISSI N, MEKKI Z, CROCETTA F. 2023, *TACKLING BIOINVASIONS IN COMMERCIALLY EXPLOITABLE SPECIES THROUGH INTERDISCIPLINARY APPROACHES - A CASE STUDY ON BLUE CRABS IN AFRICA'S MEDITERRANEAN COAST (BIZERTE LAGOON, TUNISIA*) , suppl. 2.pdf

RJIBA BAHRI W, CHAFFAI A, GHANEM R, BEN SOUISSI J.2022, *EAT ALIEN INVASIVE BLUE CRABS: YES BUT WITHOUT RUNNING HEALTH RISKS!* In: Bouafif C, Ouerghi A (eds), UNEP/MAP - SPA/RAC, Proceedings of the 2nd Mediterranean Symposium on the non-indigenous Species (Genova, Italy, 22-23 September 2022). SPA/RAC publi., Tunis, pp 68–73.

ROMANO N, ZENG C.2008, *BLUE SWIMMER CRABS, EMERGING SPECIES IN ASIA*. Global Aquaculture Advocate, 11 (3), 34-36.

SAFAIE M.2016, *FEEDING HABITS OF BLUE SWIMMING CRAB PORTUNUS SEGNIS (FORSKAL, 1775) IN THE NORTHERN COASTAL WATERS OF IRAN*. Mar Biodivers Rec. 9, 68 (2016). https://doi.org/10.1186/s41200-016-0073-y

SAKER F, FARAH S.1994, *DATA ON THE SPECIFIC COMPOSITION OF CRUSTACEA AND THEIR ECOSYSTEM IN THE WATERS OF LATTAKIA*. (The Arab Congress of Biological Sciences, Amman-1994) (In Arabic)

SAKTHIVEL D, VIJAYAKUMAR N, ANANDAN V.2014, *BIOCHEMICAL COMPOSITION OF MANGROVE CRAB SESARMA BROCKII FROM PONDICHERRY SOUTHEAST OF INDIA*. Inter. J. Sci. Inven. Tod. Vol. 3,N.3,pp 187-202.

SANCHEZ-PAZ A, GARCIA-CARRENO FL, MUHLIA-ALMAZAN A, PEREGRINO-URIARTE AB. HERNANDEZ-LOPEZ JY, YEPIZ-PLASCENCIA G.2006, *USAGE OF ENERGY RESERVES IN CRUSTACEANS DURING STARVATION: STATUS AND FUTURE DIRECTIONS.* Insect Biochem Mol Biol. 36,pp241–9.

SHAIEK M, EL ZRELLI R, CROCETT F, MANSOUR L, RABAOUI L.2021, *ON THE OCCURRENCE OF THREE EXOTIC DECAPODS, CALLINECTES SAPIDUS (PORTUNIDAE), PORTUNUS SEGNIS (PORTUNIDAE), AND TRACHYSALAMBRIA PALAESTINENSIS (PENAEIDAE), IN NORTHERN TUNISIA, WITH UPDATES ON THE DISTRIBUTION OF THE TWO INVASIVE PORTUNIDS IN THE MEDITERRANEAN SEA.* BioInvasions Records,vol.10,pp 158–169, https://doi.org/10.3391/bir.2021.10.1.17.

SHAKMAN E.2017, *NATIONAL MONITORING PROGRAMME FOR BIODIVERSITY IN LIBYA.* Contract n° 09_EcAp MED II SPA/RAC_2016, SPA/RAC, Tunis, 60 p.

SHREKY R.2014, *BIOLOGICAL FECUNDITY STUDIES ON PORTUNIDAE CRABS AND DETERMINATION CRUSTACEA ASSEMBLAGES THEIR ASSOCIATION AT LATTAKIA COAST*. Master Tissue, faculty of science, Tishreen university.

SIENES P. M. Q, WILLETTE D. A, ROMENA L. R, ALVIOR C. G, ESTACION J. S.2014, *GENETIC DIVERSITY AND THE DISCOVERY OF A PUTATIVE CRYPTIC SPECIES WITHIN A VALUED CRAB FISHERY PORTUNUS PELAGICUS (LINNAEUS 1758), IN THE PHILIPPINES.* Philippine Science Letters, vol. 7,N.2,pp317-323.

SRI WIYONO E, IHSAN. 2018, *ABUNDANCE, FISHING SEASON AND MANAGEMENT STRATEGY FOR BLUE SWIMMING CRAB (PORTUNUS PELAGICUS) IN PANGKAJENE KEPULAUAN, SOUTH SULAWESI, INDONESIA*. Tropical Life Sciences Research,vol. 29,N.1,pp 1–15.

TAVARES C, SILVA U, ANGELO PEREIRA L, OSTRENSKY A. 2017, *SYSTEMS AND TECHNIQUES USED IN THE CULTURE OF SOFT-SHELL SWIMMING CRABS,* Reviews in Aquaculture, 10. DO - 10.1111/raq.12207.

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.* Aquatic Invasions, vol. 17,pp 308–352, https://doi.org/10.3391/ai

TURELI C, YESILYURT I.N.2017, *REPRODUCTIVE BIOLOGY OF BLUE SWIMMING CRAB, PORTUNUS SEGNIS (FORSKAL, 1775) IN YUMURTALIK COVE, NORTHEASTERN MEDITERRANEAN, TURKEY*. Mediterr. Mar. Sci,vol.18,pp 424–432.

VINAGRE AS, NUNES DO AMARAL AP, RIBARCKI FP, FRAGA DA SILVEIRA E, PERICO E.2007, *SEASONAL VARIATION OF ENERGY METABOLISM IN GHOST CRAB O. QUADRATA AT SIRIU BEACH (BRAZIL).* Comp Biochem Physiol, 146:514–9.

WILSON J.W, PRIMACK R. 2019, *PULLUTION, OVERHARVESTING,INVASIVE SPECIES, AND DISEASE*. (Africa), pp 203-256.

WALKER T.2006, Austasia Aquac.; 3–5.

WoRMS. Editorial Board. World Register of Marine Species. Available from https://www.marinespecies.org at VLIZ. Accessed 2023-11-04. doi:10.14284/170.

YOKES MB, KARHAN SU, OKUS E, YÜKSEK A, ASLAN-YILMAZ A, YILMAZ N, DEMIREL N, DEMIR V, GALIL BS. 2007, *ALIEN CRUSTACEAN DECAPODS FROM THE AEGEAN COAST OF TURKEY*. Biol Invas,vol. 2,pp162–168.

ZENETOS A, ALBANO P.G, LOPEZ GARCIA E, STERN N, TSIAMIS K, GALANIDI M. 2022, *ESTABLISHED NON–INDIGENOUS SPECIES INCREASED BY 40% IN 11 YEARS IN THE MEDITERRANEAN SEA.* Mediterranean Marine Science,vol. 23,n.1. https://doi.org/10.12681/mms.29106.

ZIBROWIUS H, BITAR G. 2003, *INVERTEBRES MARINS EXOTIQUES SUR LA COTE DU LIBAN*. Leb Sci J,vol. 4,pp 67–74.