UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA/RAC

POST-2020 SAP BIO

SYRIA
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

SYRIA
CONSERVATION OF MEDITERRANEAN MARINE AND COASTAL BIODIVERSITY BY 2030 AND BEYOND

Ecological Status, Pressures, Impacts, their Drivers and Priority Response Fields

POST-2020 SAPBIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

United Nations Environment Programme
Mediterranean Action Plan
Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafat
B.P.337 - 1080 Tunis Cedex - TUNISIA
car-asp@spa-rac.org

The original version of this document was prepared for the Specially Protected Areas Regional Activity Centre (SPA/RAC) in the framework of the Post-2020 SAPBIO elaboration by Dr. Mouinah Mahmoud Badran as national consultant for Syria.

For bibliographic purposes, this document may be cited as
UNEP/MAP-SPA/RAC, 2021. Syria Conservation of Mediterranean marine and coastal biodiversity by 2030 and beyond. By M. Mahmoud Badran. Ed. SPA/RAC, Tunis: 115 pp + Annexes.

Cover photo
© Anas Refai

This publication has been prepared with the financial support of the MAVA foundation

For more information
www-spa-rac.org

List of Acronyms

Acronyms	Arabic	English
ACCOBAMS	الاتفاقية الدولية لحماية الحوتيات في البحر المتوسط والبحر الأسود والمناطق المتاخمة من الأطلسي	Agreement on the Conservation of Cetacean of the Black Sea, Mediterranean Sea and Contiguous Atlantic Areas.
AF	صندوق التكيف	Adaptation Fund
AL	نوع غريب	Alien Species
ASI	مبادرة مسح الحوتيات المنبثقة عن الاتفاقية الدولية لحماية الحوتيات في البحر المتوسط والبحر الأسود والمناطق المتاخمة من الأطلسي	ACCOBAMS Survey Initiative
BC	اتفاقية برشلونة	Barcelona Convention
CBD	اتفاقية التّنوع البيولوجيّ	Convention on Biological Diversity
CBD/COP	مؤتمر الأطراف للاتفاقية الدولية للتنوع البيولوجيّ	Conference of the Parties to the Convention on Biological Diversity
CPUE	محصول الصيد لكل وحدة جهد	Catch Per Unit Effort
CR	أنوع مهددة بشدة	Critically Endangered Species
EIB	بنك الاستثمار الأوربي	European Investment Bank
EN	أنواع مهددة	Endangered Species
FAO	منظمة الأغذية والزراعة للأمم المتحدة	Food and Agriculture Organization of the United Nation
FE	جهد الصيد	Fishing Effort
GCF	صندوق المناخ الأخضر	Green Climate Fund
GFCM	الهيئة العامة لمصائد أسماك البحر المتوسط	General Fisheries Commission of Mediterranean
IFAD	الصندوق الدولي للتنمية الزراعية	United Nations Industrial Development Organization
IPBES	المنبر الحكومي الدولي للعلوم والسياسات في مجال التنوع البيولوجيّ وخدمات النظم الإيكولوجية	Conference of the Parties to the Convention on Biological Diversity
ITPGRFA	المعاهدة الدولية بشأن الموارد الوراثية النباتية للأغذية والزراعة	International Treaty on Plant Genetic Resources for Food and Agriculture
IUCN	الاتحاد الدولي لصون الطبيعة	International Union for Conservation of nature
LC	أنواع غير مهددة	Least concern
MPAs	محميات بحرية	Marine Protected Areas
N	نوع محلي	Native species
NT	أنواع قريبة من خطر الانقراض	Near threatened

SPA/RAC	المركز الإقليمي للمناطق ذات الحماية الخاصة	Regional Activity Center for Specially Protected Areas
RAMSAR	اتفاقية الحفاظ على الأراضي الرطبة	The convention of Wetland
SPA BD	بروتوكول يتعلق بالمناطق ذات الحماية الخاصةوالتنوع البيولوجيّ	Protocol concerning specially protected areas and biological diversity
SAP/BIO	برنامج العمل الاستراتيجي لحفظ التّنوع البيولوجيّ	Strategic Action Programme for the Conservation of Biodiversity
SCF	صندوق حماية أسماك القرش	Shark Conservation Fund
SSAEP	الجمعية السوريّة لحماية البيئة المائيّة	Syrian Society for Aquatic Environment Protection
SSCW	الجمعية السوريّة لحماية الحياة البريّة (الفطرية)	Syrian Society of Conservation of Wildlife
UNEP	البرنامج البيئي للأمم المتحدة	United Nation Environmental Program
UNIDO	الصندوق الدولي للتنمية الزراعية	International Fund of Agricultural Development
VU	أنواع حساسة	Vulnerable Species
WCS	جمعية حماية الحياة البرية	Wildlife Conservation Society

List of Figures & Tables

Executive Summary

The Arab Syrian Republic paid a paramount attention to the environmental aspect, through bodies concerned with environmental affairs in general and the marine environment in particular: the Ministry of Local Governance and Environment, the Ministry of Agriculture and Agricultural Reform, the General Directorate of Ports, the Public Authority for Fishery Resources, the Directorate of Water Resources and academic institutions (Colleges of Agriculture and Science , The Higher Institute for Marine Research, the Higher Institute for Environmental Research at Tishreen University and other universities in Syria), and non-governmental organizations concerned with environmental issues, such as the Syrian Society for the Conservation of Wildlife (SSCW), the Syrian Society for Aquatic Environment Protection, SSAEP, the Al Sahel Society... etc. Each of these bodies has much and very useful information about marine and coastal biodiversity. However, this information is fragmented and scattered, and there is an urgent need to collect it, to form a single basic database on which to rely.

Many decrees and decisions were issued by the relevant authorities, including: the Environmental Law No. 12 as of 2012, Law of the Sea No. 28 as of 2003 and its amendments, the National Strategy for the Protection of Biodiversity as of 2002, the Law on Aquatic Life Protection promulgated by the Legislative Decree No. 30 as of 1964 and other laws or individual temporary decisions issued by each of the ministries concerned with environmental issues.

The Syrian coast (183 km long) is characterized, thanks to its geographical location in the eastern Mediterranean, by the great diversity of marine life, and it contains a number of unique biological compounds. There are 1713 living species in the Syrian marine environment including 686 plant species and 1,027 animal species distributed from plankton to marine mammals. As for the fish stocks that have been classified and some samples of them were preserved, the number of fish bone species have reached so far 267 species, belonging to 189 species, which in turn belong to 87 species in Syrian waters, distributed at depths between 0-700 m in the national waters, and there may be fish at greater depths, but they have not yet been recorded. In addition, there are 44 species of cartilaginous fish belonging to 31 types, which in turn belong to 24 species. The marine biodiversity is affected In Syria by several factors, which can be summarized as follows (and will be discussed in the whole report):

1 _ Pollution of all kinds: The Syrian marine and coastal waters face the threat of pollution from multiple sources (surface sewers and urban sewage, solid waste, industrial flows including oil treatment, the shift to urbanization witnessed by the coastline, the abundance of nutrients, sand erosion, maritime transport, Harmful algal blooms), which made it an urgent problem that must

be addressed as quickly as possible, and which require the mobilization of all capabilities and interests to curb the increase of this dangerous phenomenon, in addition to noise pollution resulting from the heavy movement of commercial and military ships, especially during the war that Syria has been going through since 2011 to date.

2 _ Habitat threat and loss: It is considered the main danger, and this is mainly a result of the growing human activities, such as agricultural, industrial, tourism, and urban activities, and the development of infrastructure that affects the most important sensitive environments. This threat impacted the sensitivity of habitats, which helped in creating the appropriate conditions for alien species to invade the Syrian marine and coastal waters.

3 _ Invasion of alien species: The Syrian marine waters witnessed a flow of alien species, most of them coming from the Red Sea through the Suez Canal. This flow had an impact on biodiversity and the ecosystem. This impact increased with the terrorist war waged against Syria. Thus, the violations of the marine environment increased and the number of related research studies decreased, too, due to the lack of adequate funding, the state's preoccupation with securing the essential needs and living priorities of the population and combating terrorism, in addition to the reluctance of international organizations to finance and support activities related to marine biodiversity, and all other activities due to the sanctions imposed by other countries on Syria during the war period until now. This had its repercussions on:

- Syria's inability to update national strategies related to terrestrial and marine biodiversity.
- Failure to prepare national reports related to international environmental agreements, especially those related to biodiversity.
- Weak national capacity building for technical personnel working in protecting biodiversity.
- The inability of Syrian researchers to keep up with everything new about research, conferences, and seminars, due to their inability to travel.

The preparation of the Syrian Arab Republic's first national report on sustainable development as a voluntary commitment to achieving sustainable development goals requires the availability of technical and material support in order to update all national studies and strategies, and work to increase the area of marine reserves to reach 30% in 2030, and link marine reserves to the global network of reserves.

4 _ Unsustainable overfishing: The great demand on marine resources in Syria has resulted in an increase in the intensity of fishing operations, and an increase in the number and the capacity of fishing boats, which put pressure on fish stocks and depleted many of them in most of the fisheries, as well as the extension of fishing to deeper areas to make the problem become worse. In addition, there is accidental fishing of untargeted species. This issue is considered as a major concern threatening sharks, pythons, dolphins and sea turtles.

5 _ Climate change: the climate changes that occurred in the past decades have resulted in significant impacts on ecosystems, and these effects are expected to be exacerbated by expected climate changes (the continuing rise of temperatures, continuing rise in salinity of marine waters, rising sea levels, increasing the frequency of rainstorms and changes in precipitation amounts...).

1.

Reference documents and information consulted

© SPARAC, Simone Modugno

The SPA/RAC is playing an important role in the implementation of the SPA/BD protocol as a main tool in the implementation of the Barcelona Convention regarding the protection of marine and coastal biodiversity, in addition to this aspect, its role is not limited to what is related to the Mediterranean. It can serve more than one country in the region by contributing to the preparation of the SAPBIO Plan Post 2020. In the 21st meeting of the Conference of the Parties of the Barcelona Convention held in December 2019, the Secretariat was requested to prepare a Post 2020 SAPBIO, through a participatory initiative at the national level (the relevant stakeholders - the relevant authorities) and at the regional and sub-regional levels. This plan should be in harmony with the Mediterranean plans and with other global strategies. The preparation of this report comes in the context of the role assigned to the SPA/RAC to prepare a SAPBIO plan Post-2020. Below are the documents and decisions that were taken into consideration while drafting this report:

1-1. Documents provided by SPA /RAC and its international consultants:

- State Parties, including Syria, have adopted the consultative process to prepare and develop a structure and an action plan to protect biodiversity post 2020 in accordance with paragraph 1 of the Decision 14/34 of the CBD / COP of the Fourteenth Conference of Parties to the Convention -on Biodiversity, which was held in Sharm El-Sheikh - Egypt from 17 to 29 November, 2018.

- The 2020 biodiversity protection plan should have inspiring and motivating tasks for Vision 2030 and be a cornerstone to reach the 2050 vision (Living in harmony with nature), which will be supported through a comprehensive communication strategy, in accordance with paragraph 5 of CBD / COP Resolution 14/34.

- Invite all the secretariats of the biodiversity-related conventions to synergize and participate in developing the post-2020 global biodiversity framework in accordance with paragraph A 7 of CBD / COP resolution 14/30.

- Enhance cooperation and synergies among biodiversity-related conventions, in line with its CBD / COP decision 14/24, in accordance with Resolution 11-10 (Rev.COP12) of the Conference of the Parties to the Convention on the Conservation of Migratory Species of Wild Animals (CMS), adopted at its twelfth meeting; and Resolutions 9/2017 and 12/2017 of the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and adopted at its seventh session; Resolutions 7/13 and 13/20 of the Conference of Contracting Parties to the Convention on Wetlands (RAMSAR) of international importance, especially as a habitat for waterbirds, adopted at its thirteenth meeting.

- Meetings of the Open Working Group on Establishing a Post-2020 Global Biodiversity Framework established by CBD / COP Decision 14/34 to hold meetings for discussions between Parties to the various biodiversity-related conventions to explore ways in

which the conventions can contribute to the preparation of the Post-2020 global biodiversity framework, in which two meetings were held, the first during the period 27-30 August 2019 in Nairobi, Kenya, and the second meeting during the period 24-29 February 2020, in accordance with paragraph 12 of the CBD / COP resolution 14/30.

- At the sixth meeting of the Intergovernmental Science-Policy Platform in the field of Biodiversity and Ecosystem Services (IPBES), the State Parties called for the development of a draft strategic framework until the year 2030 and the presentation of proposals on the draft strategic framework and what it might include regarding the protection of biodiversity based on IPBES Resolution 6/2.

- The ACCOBAMS Executive Secretary called for the mobilization of the necessary resources to contribute to addressing the cetacean shortage by supporting the Global Framework Plan for the Protection of Biodiversity 2020, in accordance with ACCOBAMS-MOP7 Resolution 2019 / 7.10, Paragraph 183 of the Seventh Meeting of State Parties to the ACCOBAMS Convention on the Conservation of Cetaceans in the Black Sea, the Mediterranean and the Atlantic.

- The 2030 Sustainable Development Goals affirmed the protection of terrestrial and marine ecosystems, and the fourteenth goal emphasized, in particular, underwater life, which provides for the conservation of the oceans, seas and marine resources and their sustainable use to achieve sustainable development.

1.2. National documents and publications identified and available

Biodiversity has had and still has a great deal of interest in the Syrian Arab Republic, which has been demonstrated locally since 1989 with the creation of the first ministry concerned with environmental affairs, a department was established within the ministry concerned with protecting biodiversity, which in turn designed several national studies and strategies that supervise the work, tasks and goals related to the protection of biodiversity, in addition to raising awareness about the importance of biodiversity and its role in the ecosystem. The following are the most important national studies and publications in the field of biodiversity upon which we relied in drafting this report:

Published studies, strategies and documents:

1. Preparing the national study of biodiversity in the Syrian Arab Republic in both Arabic in 1999 and English in 2000;
2. National Strategy and Action Plan for Biodiversity 2002;
3. Terms and conditions of natural reserves 2003;
4. The National Strategy and Action Plan for the Protection of Marine Biodiversity SAP-BIO 2002-2003;
5. Waterbird Protection Action Plan 2010;
6. Action Plan for the Protection of Monk Seals 2010;
7. Action Plan for the Protection of Sea Turtles 2010;
8. Action Plan for Environmental Awareness on Marine Biodiversity 2010;
9. Endangered Marine Species Management Action Plan 2010;
10. Coastal Protection Action Plan 2010;
11. Marine Invasive Species Managementt Plan 2010;
12. Field Guide to Birds in Syria 2008;
13. First National Report for Sustainable Development 2019;
14. The National Report on Neutralizing the Effects of Land Degradation in Syria 2018;
15. National Reports of the Convention on Biodiversity (first - second - third - fourth - fifth);
16. Different educational publications about the components of biodiversity;

Reports, periodicals, monthly and annual publications, and research results collected from several theses that we cannot all include in this report due to their size. They were presented in successively in Syrian universities and colleges, such as the Faculties of Science, Colleges of Agriculture, the Higher Institute for Marine Research, the Higher Institute for Environmental Research and other colleges concerned with environmental issues and other reports from other ministries, such as the Ministry of Agriculture and Agrarian Reform: the General Authority for Fishery Resources, the Ministry of Tourism, the Ministry of Transport: the General Directorate of Ports, and others.

1.3. Other documents identified

Despite all previous studies, information and national strategies, the protection of biodiversity requires continuity and updating of these strategies and studies at the national level in line with global goals and harmony with global efforts to preserve biodiversity as it is considered a cross-border issue, so the following is required:

- Update the National Biodiversity Strategy to keep pace with the 2030 Sustainable Development Goals.

- Prepare the sixth national report on biodiversity, to keep pace with global plans for biodiversity conservation.

- Prepare the National Report on Plant and Animal Genetic Resources in accordance with the Nagoya Protocol.

- Update the four national plans (seabirds - sea turtles - environmental awareness about biodiversity - invasive species management).

- Continue capacity building to raise the efficiency of technicians working in the field of protecting biodiversity.

- Carry out studies and research related to biodiversity, especially marine biodiversity.
- Collect the many scattered information available in several bodies concerned with environmental affairs.
- The serious and effective implementation on the ground of all protection laws.
- Finding adequate funding from national and international agreements, organizations, and institutions, especially during this critical period in the Syrian Arab Republic (the period of war and the interruption of funding from most international bodies that were active before).
- Dispatch researchers to conduct training courses on stranding incidents for cetaceans and other marine species.

2.

Marine and coastal ecosystem status

© SPA/RAC, Simone Modugno

2.1. Biological characteristics:

2.1.1. Description of water column biological communities (phytoplankton and zooplankton) species, seasonal and geographical changes:

Phytoplankton

Phytoplankton is the basic rule in the study of the marine food chain, as it is the base of the food pyramid and is responsible for the production of primary organic matter in aquatic ecosystems.

The waters of the eastern Mediterranean are generally characterized by their poverty in phytoplankton, and the results of studies conducted in different regions of the Syrian coast have shown a weak abundance of phytoplankton cells, yet the abundance of these phytoplankton has shown important temporal and spatial differences. In studies during which only cells with a size greater than 20 microns were identified, the number of cells did not exceed 6500 cells / m^3, and the abundance showed two maximum values, the highest value was recorded in April, and this is consistent with the results of various researchers on the spring flowering time of phytoplankton in the Mediterranean, and it was around 34,000 cells / m^3. The winter period (November and February) was characterized by its weak abundance, and the minimum values were recorded during the month of December. The coastal waters of Latakia were also characterized by their general poverty with chlorophyll dyes, and thus by primary production calculated starting from the concentration of chlorophyll (a), and from the average exponential growth factor of phytoplankton. Whereas, the concentrations of chlorophyll dyes did not exceed 3.73 mg / m3 and the highest value calculated for the primary production was 196.13 mg C / m3 d, and the concentrations of these dyes did not exceed the value 1 mg / m3 except in 10% of the total studied samples due to their distinctive environmental nature, and two peaks of phytoplankton in the coastal waters of the city of Tartous were also observed. The first in spring during the month of May, during which the abundance reached its highest value of 312,402 individuals / l, and the second in autumn during the month of October, and the abundance recorded its lowest value of 4220 individuals / l in the month of August, and this corresponds to former studies (Hammoud and Moussa, 2002). The spring and autumn peaks are explained by the availability of suitable environmental conditions such as heat, lighting, etc., in addition to the high abundance of nutrients. The total abundance was observed in the coastal waters of Tartous compared to the beaches of Baniyas and Latakia (Hammoud et al., 2015).

Specific composition of phytoplankton:

Several studies were conducted to determine the specific composition of phytoplankton in the Syrian coast. In a study (Hammoud et al., 2014), 194 species of phytoplankton were identified in the Latakia coast, belonging to five phyla distributed as follows: 95 species belong to the Chrysophyta branch, all of which are Diatomophyceae. And 46 types of green algae Chlorophyta, 18 types of Cyanophyta, 31 types of Pyrrhophyta, and 4 types of Euglenophyta (Hammoud et al., 2014).

As for the coast of Tartous, 160 species of phytoplankton were recorded, distributed as follows: 91 types of golden algae, 50 types of fire algae, 11 types of green algae, and 8 types of blue algae (Hammoud et al., 2015).

As for the annual cycle of phytoplankton abundance in the Syrian shore, two growth peaks were observed: the first is important in spring, and the second is less important in autumn. Dichotomies are prevalent during the winter season, at the beginning and in the middle of spring. The dominance of the dichotomies retracts in the second half of May to be replaced by the dichotomies that remain prevalent throughout summer months and then decline in the fall, while the dichotomies return to sovereignty until the end of the year (Hammoud, 2002; Hammoud and Moussa 2002) .

Among the most important species prevalent during the spring peak are: *Chaetoceros compressus, Chaetoceros atlanticus, Coscinodiscus concinnus, Thalassiosira decipiens, Thalassiosira rotula, Chaetoceros curvisetus, Chaetoceros didymus, Laud annulata,* (Darwish and Hassan, 2014).

The construction of dams and the phenomenon of eutrophication are responsible for the decrease in the supply of silicates to coastal waters, which leads to changes in the concentrations and ratios of nutrients in those areas. These human activities led to a decrease in the predominance of species requiring silicates (diatomaceous earth), and an increase in the abundance of non-silicate species (dichotomies), and this had a serious impact on the specific composition of phytoplankton (Solomon, 2014).

Red tide phenomenon: Red tide is an environmental natural phenomenon that occurs as a result of the intensive reproduction of marine phytoplankton, and the flowering of one or more types of unicellular phytoplankton reaching millions of cells in one millimeter of water, which makes sea water appear red, light green, dark or brown, It is affected by all environmental factors such as light, temperature, salinity and nutrients. The red tide lasts for days, weeks or months. The winds and the movements of the tides and the water currents determine the location of the tide and the period of its stay, as the land winds bring it closer to the shore, and the marine winds push it to the sea. The rise in the amount of nutrients above the optimal limits required for the growth of phytoplankton, and the richness in organic matter and human nutrients are the main reason for the emergence of tides (Choice and Dergham, 2019).

The first record of the toxic algae species Heterosigma akashiwo (Raphidophyceae) was recorded on the Syrian coast near the port of Latakia in 2012, with a low abundance that did not exceed 150.4 individuals / liter (Durgham & Ikhtiyar, 2012), and the phenomenon of red tides was also observed in the fishing port and the marina (Fig. 1, site 6) resulting from a significant increase in the abundance of Heterosigma akashiwo (Chromophyta: Raphidophyceae) and Chattonella spp. From May 15 to May 30, 2018. Figure 1 shows the various important areas on the Syrian coast.

Zooplankton:

The biodiversity of zooplankton in some areas of the Syrian coast showed its richness in species, where about 300 species belonging to 10 animal phyla were identified, and about 13 rows and 21 ranks. The Arthropods Division was the most diverse division studied, as 182 species were identified, 118 of which belong to the row of copepods (Dergham, 1998).

The study of zooplankton in the Syrian coast received great attention due to its important role in its biological reserve. These studies dealt with the total abundance, the biodiversity of groups of zooplankton, and biomass (Ikhtiar et al. 1997; Dergham, 1998; Ikhtiar, 1999; Dargham, 2004; Lahlah et al. 2012; Dergham et al. 2013; Mameesh 2013; Hamama, 2014; Dergham et al., 2015; Dergham et al., 2019). The marine animal protozoa were also studied in the coast of Latakia (Deeb, 2013), in addition to studying the biodiversity and abundance of jellyfish in the Syrian coast (Mamish, 2013; Ibrahim, 2018).

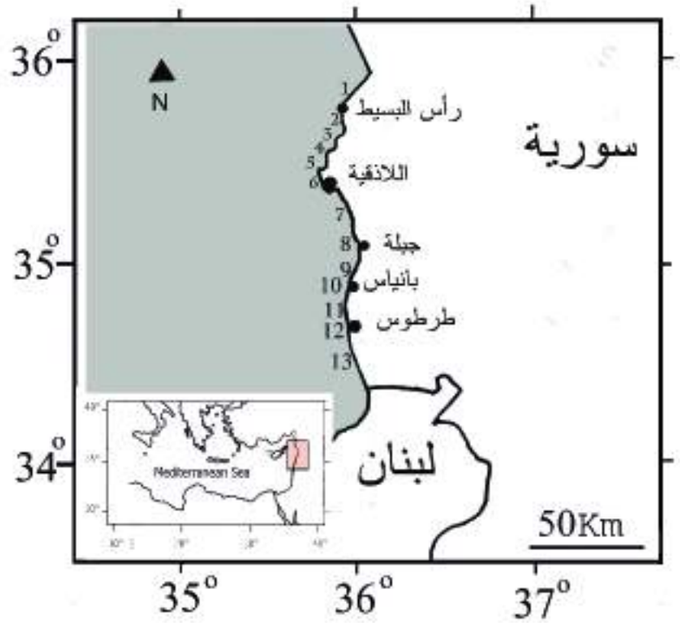


Figure (1)

Map of the Syrian coast, indicating the locations of the most important areas, indicated by numbers: 1- Al-Badrousiya, 2- Umm al-Toyour 3- Wadi Qandil 4- Borj Islam, 5- Ras Ibn Hani Reserve, 6- The Fishing port and marina, 7 - Al-Shaqifat, 8- Jableh Port, 9- Arab Al-Malek, 10- Banias Refinery, 12- Tartous Port, 13- Al-Hamidiya.

Temporal and spatial changes of the total abundance of zooplankton on the Syrian coast:

The total abundance of zooplankton changed clearly on the Syrian coast throughout the year, and the average total abundance of zooplankton on the Syrian coast was 840 individuals / m3, with two clear seasonal peaks being recorded, the first in spring, which is the most important and clear, where the highest value of abundance was recorded. It reached 2324, 1945, 1236, and 1678 individuals / m^3 in each of Tartous, Banias, Burj Islam and Al-Basit respectively, with an average total abundance of 1796 individuals / m^3, and the second in the fall, which is less important than spring, where the highest abundance was

recorded in October in Tartous and Baniyas, and in December in both Burj Islam and Al-Basit (Figure 1), with an average total abundance of 1050 individuals / m^3 (Mamish, 2013).

Temporal and spatial changes of zooplankton biomass:

The total biomass of zooplankton changed significantly on the Syrian coast during the different months of the year, and ranged between 1.66 and 28.11 mg dry weight / m^3, and the annual average of dry biomass on the Syrian coast was 6.89 mg dry weight / m^3. Several clear peaks were recorded on the Syrian coast, the most important of which was in the spring season, where the highest dry biomass value was recorded in April and reached 28.11, 24.63, 17.98 and 19.79 mg dry weight / m^3 in Tartous, Baniyas, Burj Islam and Al-Basit respectively, with an average total of 22.63 mg dry weight / m^3. The second most important peak was recorded in August, with the highest being 12.55 mg dry weight / m^3 in Baniyas, and the lowest in Burj Islam, 6.81 mg dry weight / m^3. The autumn peak was the least important, as the highest dry biomass value was recorded in October in Tartous and Baniyas, which was 7.21 and 9.53 mg dry weight / m^3, respectively, and in December in Burj Islam and Al-Basit, it reached 7.97 and 9.02 mg dry weight / m^3, respectively. The winter period was characterized by a decrease in its biological mass at all sites, reaching 1.66 mg dry weight / m^3 in January (Mamish, 2013).

Biodiversity and temporal and spatial changes of the abundance of zooplankton groups:

A- Holoplankton:

1 _ Copepoda: Copepoda are the most abundant group of zooplankton, and are found in all seasons of the year. The abundance of this group ranged between 1 and 63 individuals / m^3, with two seasonal peaks being more pronounced in spring, and the second less clear in summer and autumn.

2 _ Cladocera: This group ranked second in terms of relative abundance, and the abundance of this group ranged between 0 and 193 individuals / m^3, and it constitutes from 0 to 93% of the total abundance of zooplankton in general, the emergence of this group with a significant abundance (an average of 16-70 individuals / m^3) during the summer season, while this abundance did not exceed 1 induvudual / m^3 during the remaining seasons.

3 _ Chaetognatha: This group ranked third in terms of relative abundance, and its contribution was less than 5% of the total abundance of zooplankton, with a clear increase in the abundance in spring. In all, their abundance did not exceed 4 individuals / m^3.

4 _ Thaliacea: the abundance of this group did not exceed 1 individual / m^3. This group ranked fourth in terms of relative abundance.

5 _ Siphonophora and Medusae ranked fifth and sixth respectively in terms of relative abundance.

6 _ Appendiculata group: ranked seventh in terms of relative abundance, and the abundance of this group ranged between 0-2.5 individuals / m^3.

7 _ Amphipoda: studied significantly in Syrian waters (Alnesser, 2009) and it was found that the maximum values of quantitative abundance in time was at the end of spring and beginning of summer, because these organisms multiply in spring and summer and because of the diversity of algae in terms of quantity and quality in these two seasons. The following six species have the highest abundance values. They are by order: *Hyale schmidtii, Elasmopus pectenicrus, Elasmopus rapax, Amphithoe ramondi, Elasmopus pocillimanus, Amphithoe riedli,* while the following are **rare**: *Talorchestia deshayesii, Leucothoeeta gibbty, ocassty ocassty Jibbtya Jibbtya, Amorchestia deshayesii, Leucothoeeta venetlusiarum Jibbita, Amorchestia deshayesii.* Distinct species were found in relatively contaminated areas and **were considered biomarkers of organic pollution,** which are the following types: *Orchestia stephenseni, Orchestia platensis, Corophium acutum, Elasmopus pocillimanus, Amphitho ramondi, Hyale schmidtii,* and other species indicating water purity. They are: *Amphithoe riedli, Amphitho ferox,* and *Ischyrocerus inexpectatus.*

8 _ Pteropoda: the abundance of this group did not exceed 0.8 individuals / m^3, and its appearance was concentrated mainly in autumn and winter.

9 _ The two groups Euphausida and Ostracoda: the relative abundance was 0.27 and 0.25% of the total abundance of perennial zooplankton respectively, and the first group appeared during May with an abundance of 2.13 individuals / m^3, and the second group during January with an abundance of 0.2 individuals / m^3.

B- Meroplankton:

1 _ Decapoda abundance: This group consists mainly of benthic larvae species, its abundance was weak and did not exceed 12 individuals / m^3, with two peaks, one of which is major during the month of November (average abundance is 8.2 individuals / m^3), and the second is small with an average of 2.1 individuals. / m^3 at the end of June. This group ranked first in terms of the relative abundance of temporary zooplankton, reaching 40.8%, and ranked third in terms of relative abundance, reaching 11% of the total abundance of zooplankton.

2 _ Gastropoda and Bivalvia: the abundance of these two groups fluctuated between 0-16 individuals / m^3 for the gastropod group and 0-4 individuals / m^3 for the bivalve group, their appearance concentrated during the summer season with abundance ranging from 0.04-16 individuals / m^3 for the ventral group, and between 0.02-10 individuals / m3 for the Gastropoda group.

3 _ Polycheata abundance: It reached 6.5% of the total abundance of temporary zooplankton, and two peaks were recorded for the abundance of this group: the first during summer with an abundance of 0.6 individuals / m^3, and the second during January 1 individuals / m^3.

Marine animal protozoa in the Syrian coastal waters:

A total of 178 species of marine protozoa were identified, of which 173 species were identified for the first time in Syria, and the group of fistulas was the dominant one, with 132 species, followed by foraminifera 26, and 20 rays. The great abundance of fistulas and rays reached 125 and 33 individuals / m^3, respectively, in the month of April, while the foraminifera recorded their greatest abundance in February of 16 individuals / m^3. In general, the abundance of the protozoa was low compared to other areas of the Mediterranean, because of the nutrient-poor Syrian waters (Deeb, 2013).

Jellyfish in the Syrian coastline:

The jellyfish belong to the Cnidaria branch, which are invertebrates, which form part of the huge jellyfish plankton. From the end of the last century to the present day, the Syrian coast has been exposed to attacks from jellyfish that appear in very large numbers, and cause many problems and physical harm to tourists and vacationers along the Syrian coastline. It also affects marine fishing by tearing nets and devouring zooplankton, which is the main food for fish, in addition to being feeding on fish eggs and larvae, which greatly affects fish stocks, in addition to the problems and damages that these jellyfish cause to coastal industrial facilities, especially to the thermal plant in Baniyas, where the entry of jellyfish into the cooling water pipes leads to blockage and suspension of the plant for some time (Mamish, 2013).

Several jellyfish species were recorded on the Syrian coastline, and were classified up to the species level, the most important of which are:

- *Rhopilema nomadica,* which dominated significantly the rest of the species, in terms of abundance and spread, unusual large concentrations of it were recorded at the beginning of spring 2020, the average spring abundance was 5551 individuals / km^2 (Mamish et al., 2020).

- Only a few individuals of *Aurelia aurita* were observed in Baniyas and Latakia in December, and the total average abundance was 55 individuals / km^2. The average weight of a wet jellyfish was 299.5 g.

- *Aequrea forskalea* appeared with varying abundance in spring, summer and autumn in the coast of Lattakia in 2019, and disappeared completely in the winter season, the average abundance was 33, 21 and 3 individuals / 100 m^3 respectively (Mamish et al., 2020).

- *Pelagia noctiluca* was recorded for the first time in the Syrian coastline, about 3 km northwest of the port of Latakia, on June 14, 2014 (Durgham et al., 2016). An exceptionally high abundance in the form of a pandemic of this type was monitored and recorded in several locations in the Syrian waters, including the areas of Ras Ibn Hani, Ras Al-Basit, and Jableh, during the period between 2 and 12 May 2019. The average surface abundance was 5000 individuals / km2) Mamish et al., 2019).

- As for *Phyllorhiza punctata, Aequrea globosa* and *Aequorea forskalea,* they were found only in Baniyas, and with one individual of each species except for the *G. proboscidalis*, from which three individuals were collected, and the *A. globosa* was recorded for the first time on the Syrian coastline (Mamish et al., 2012).

- *Marivagia stellata* was recorded for the first time in the Syrian waters in June 2015, near the port of Latakia, where only one individual was collected at a depth of 7 m, and it is one of the members of a swarm of about 60 adults (Mamish et al., 2016) .

Information on invertebrate bottom fauna, macro-algae and angiosperms including species composition, biomass and annual/seasonal variability

Macroalgae benthic marine algae:

Emphasis was placed on the importance of the geographical location of the Syrian coastline, which is ecologically suitable for the growth and stability of many different biogeographic origins since the 1970s (Mayhoob, 1976), as it provides the appropriate conditions for receiving the newly migrated tropical and subtropical elements, whether their source is the Atlantic Ocean, the Red Sea, and the Indian Ocean, which are elements that have significantly increased in number over the past few decades (Mayhoob, 2004).

Studies of algae in the Syrian waters have begun since 1976, and 400 species have been identified, and (Mayhoob, 1989) indicated the presence of Styppopodium, which is of tropical origin, on the Syrian shores, alerting to the danger it poses to future ecosystems, and Padina tetrastromatica, known to be present in tropical seas, and which is currently present in the Syrian coastline (Mayhoub, 2004). However, studies were few and remote in time between on benthic algae. The whole Syrian coastline and Syrian marine waters were not studied in this regard. They were limited to some taxonomic research at times, having extracts of algae, carrageenan and agar-producing algae, and studying some algae of medicinal and pharmaceutical importance (Abbas, 1992, Abbas, 2014) at other times, But we can generalize our results to all regions. In addition, algae in the southern part of the Syrian coastline were not studied, as well as algae present in great depths. So, we will present in Appendix 1 the species present in the studied areas only, which shows the qualitative composition of marine flora in coastal areas, up to a depth of 12 m, for the cities of Latakia and Jableh (Araj, 2016).

The habitats in Bustan Al-Basha, located between Latakia and Jableh (south of Site 6, Figure 1) are considered to have a great diversity of marine flora due to their diversity, which varies from shallow water with little movement, with a bottom covered with sediments, and with a slight inclination, to sloping rocks exposed to severe wave strikes, deep or shallow ponds, partially isolated from the sea, or indirectly connected to it, so the water movement is good in addition to the mouth of a river carrying nutrients. On the contrary, the Sports City area in the city of Latakia is less diverse - due to the lack of the diversity of habitats. It has species near areas of organic pollution with high ammonia ions and is characterized by the presence of Enteromorpha linza and Ulva fasciata. The abundance of most of the species was in spring and autumn, and in big numbers in spring, due to the availability of the appropriate conditions, while it decreased in winter and summer, and there are few species found throughout the year.

Biomass: There are no studies on the biomass of all algae species, but only on brown algae, in the years 2014 and 2015 when they appeared on the beaches of the cities of Latakia and Jableh. No similar studies were conducted for any type of algae on the beach of Tartous. Here, we list the biomass of brown algae in several locations in the cities of Latakia and Jableh:

First - February 2015: The highest percentage of biomass dominance was for *Cystoseira barbata* (47%) of total biomass at the site of *Dirassat chalets* (16 km north of Latakia), and for *Sargassum vulgare* (27%) and *Colpomenia periegna* (20%). At the Ibn Hani site (9 km north of Latakia), and *C. caespitosa* (35%) in the Sokas site (5 km south of Jableh).

Second - April 2015: *Colpomenia sinousa* (15%) recorded the highest percentage of dominance, followed by *C. barbata* (14%) at the site of Dirassat chalets in Latakia, and the dominance of *S. vulgare* (22%) and (27%) was observed in the two sites. Ibn Hani and Sokas respectively.

Third - July 2015: The highest percentage of dominance was recorded in the Dirassat chalets site for *Padina pavonica* and *Padina tetrastromatica* (48%) and (44%) respectively. And in the Ibn Hani site, *Padina itristromatica* recorded the highest percentage (48%), followed by *P.pavonica* (44%). In the Socas site, *P.pavonica* achieved the highest percentage (56%).W

In the following tables, we review the biomass parameters for each type of brown algae, Phaeophyceae, in three regions on the Syrian coastline: the Dirassat chalets area (north of Latakia), the Ibn Hani site, and Socas. Charts (1, 2, 3).

Table 1

Biomass coefficient for all types of brown algae in the coastal areas up to a depth of 10 m for three areas in the Dirassat chalets site. Less than 1 g per square meter (+). 1-10g per square meter (1). From 10-100g per square meter (2). From 100-1000g per square meter (3). From 1-10 kg per square meter (1). More than 10 kg per square meter (5). (Araj, 2016).

Studies chalets and site number	Area 1 studies				Area 2 studies				Area 3 studies			
The classroom	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter	Spring	Summer	Autumn	Winter
Plant species												
1 *Feldmannia caespitosa*	-	-	-	-	+	-	-	-	-	-	-	-
2 *Cystosiera compressa*	4	3	-	2	3	1	-	-	-	-	-	-
3 *Cystoseira crinita*	3	1	-	1	3	1	-	-	-	-	-	-
4 *C.amentacea*	3	2	-	1	3	1	-	1	-	-	-	-
5 *Stypopodium schimperi*	4	3	-	1	3	2	-	1	-	-	-	-
6 *Colpomenia sinousa*	4	1	3	1	3	1	3	1	3	1	1	1
7 *Hydroclathrus clathratus*	4	1	-	-	3	1	-	-	3	1	-	-
8 *Dictyota dichotoma*	3	-	-	-	-	-	-	-	-	-	-	-
9 *Dictyota linearis*	3	-	-	-	-	-	-	-	-	-	-	-
10 *Dilophus fasciola*	4	-	-	-	3	-	-	-	-	-	-	-
11 *Dilophus Spiralis*	3	-	-	-	-	-	-	-	-	-	-	-
12 *Padina pavonica*	3	3	-	3	-	-	-	-	3	3	-	-
13 *Padina tetrasomatica*	-	-	-	-	3	3	-	-	-	-	-	-
14 *Sargassum vulgare*	4	3	-	1	2	3	-	-	-	-	-	-
15 *Scytosiphone lomentaria*	-	-	-	-	2	-	-	-	-	-	-	-

Table 2

Biomass coefficient for each type of brown algae Phaeophyceae in coastal areas up to a depth of 10 m for three areas at Ibn Hani site. Less than 1 g per square meter (+). 1-10g per square meter (1). From 10-100g per square meter (2). From 100-1000g per square meter (3). From 1-10 kg per square meter (4). More than 10 kg per square meter (5). (Araj, 2016)

Ibn Hani and the site number	District 1 Ibn Hani				District 2 Ibn Hani				District 3 Ibn Hani			
The season	Winter	Autumn	Summer	Spring	Winter	Autumn	Summer	Spring	Winter	Autumn	Summer	Spring
Plant species												
1 *Zanardinia prototypus*	-	-	-	2	-	1	-	-	-	-	-	-
2 *Sargassum vulgare*	-	-	-	-	1	-	2	3	1	-	1	4
3 *Sargassum acinarum*	-	-	-	-	-	-	-	-	-	-	1	2
4 *Feldmannia caespitosa*	-	-	-	-	-	-	-	-	-	-	-	1
5 *Sphacelaria fureigera*	1	-	-	1	-	-	-	-	-	-	-	1
6 *Colpomenia pergeina*	1	1	2	4	1	1	1	1	-	-	-	-
7 *Cystosiera amentacea*	-	-	-	-	-	-	1	3	-	-	3	3
8 *Cystosiera barbata*	-	-	-	-	-	-	1	3	-	-	2	4
9 *Cystosiera compressa*	-	-	-	-	-	-	2	2	-	-	2	4
10 *Cystosiera elegans*	-	-	-	-	-	-	-	-	-	-	2	4
11 *Cystosiera barbatula*	-	-	-	-	-	-	-	-	-	-	2	4
12 *Cystoseira spinosa*	-	-	-	-	-	-	-	-	-	-	2	4
13 *Cystoseira crinita*	-	-	-	-	-	-	-	-	-	-	2	4
14 *Ectocarpus confervoides*	+	-	-	1	1	-	-	+	-	-	-	-

Ibn Hani and the site number	District 1 Ibn Hani				District 2 Ibn Hani				District 3 Ibn Hani			
The season	Winter	Autumn	Summer	Spring	Winter	Autumn	Summer	Spring	Winter	Autumn	Summer	Spring
15 Dictyopteris membrancea	-	-	-	-	-	-	-	-	-	+	1	1
16 Stypocaulon scoparium	-	-	2	1	-	-	-	-	-	-	-	-
17 Padina pavonica	-	-	4	4	-	-	4	4	-	-	-	-
18 P.ditristromatica	-	-	4	4	-	-	-	-	-	-	-	-
19 Dilophus fasciola	-	-	-	2	-	-	-	2	-	-	-	-

Table 3

Biomass parameter for each type of Phaeophyceae in coastal areas up to a depth of 10 m for two areas of the Sokas site in the city of Jableh (Araj, 2016). Less than 1 g per square meter (+). 1-10g per square meter (1). From 10-100g per square meter (2). From 100-1000g per square meter (3). From 1-10 kg per square meter (4). More than 10 kg per square meter (5). (Araj, 2016)

Opposite to Sokas Hill and site number		Sokas Zone 1				Sokas Zone 2			
The season		Winter	Autumn	Smmer	Spring	Winter	Autumn	Smmer	Spring
Plant species									
1	*Ectocarpus confervoides*	1	-	-	1	-	-	-	-
2	*Sargassum vulgare*	-	-	-	-	2	-	-	4
3	*Sphacelaria fureigera*	-	-	-	1	-	-	-	-
4	*Colpomenia sinuosa*	1	1	1	3	1	1	1	1
5	*Cystosiera barbata*	-	-	-	-	-	-	-	4
6	*Cystosiera compressa*	-	-	-	-	-	-	2	2
7	*Cystosiera caespito-sae*	2	2	2	4	2	1	1	3
8	*Dictyota linearis*	-	-	-	1	-	-	-	1
9	*Padina pavonia*	-	-	3	4	-	-	+	2
10	*Padina boryana*	-	-	1	1	-	-	-	-
11	*Dilophus spiralis*	-	-	-	2	-	-	-	-

In Syria, there is no clear importance of algae in nutrition or in commerce, but recently some restaurants have started to offer some types and on a small scale, such as: *Sargassum vulgare, Padina pavonica, Hypnea musciformis, Laurencia pappilosa, Colpomenia sinusa.* There is a recent scientific interest in the nutritional value of these species, and it has been shown that they are rich in protein and minerals, and for the extraction of valuable materials such as alginate and carrageenan.

Benthic invertebrates (animal benthic) in the Syrian coastline:

Research and studies related to benthic species in the Syrian waters have begun since the mid-seventies, in the coastal and sub-coastal areas of the Syrian coastline (Krom et al. 1989; Saqr and Ammar, 1996; Arabiya, 2011), such as Umm al-Tayyar beach (29 km north of Latakia) (Nehme et al., 1997). ; Saqr et al., 2002), the coast of Latakia and Baniyas (Saleh, 2009, Sabha, 2013) and in deep Syrian territorial waters (Kuznetsov and Saker, 1992). These studies confirmed the richness of the qualitative composition and the poverty of biomass, as well as showed significant changes in the qualitative composition of the animal benthic from year to year. Species have disappeared and other migratory species have appeared from the Red Sea, the Black Sea, the Indian, Pacific, and the Atlantic Oceans (Ammar and Fadel, 2017; Ammar and Maarouf, 2016). Since 1996, 420 species have been identified belonging to 16 large taxonomic units, the most important of which is Cnidaria. Bryozoa, Sipunculida, Polychaeta, Gastropoda, Bivalvia, Crustacea, Echinodermata, Brachiopoda, Ascidiacea, and 19 species belong to small taxonomic units (Arabia, 2011), and in 2011, 241 species and 13 genera belonging to 13 taxonomic units were identified, of which 30 were migratory species. From these last ones, 18 species were recorded for the first time in the Syrian waters (13 types of gastropods, 1 of bivalves, 3 types of polychaetes and 1 type of crustaceans) and we shall mention them in clause 4.1.2 related to migratory species.

Through studies, it was found that the Al-Hotatia muddy bottoms such as Al-Basit (40 km north of Latakia) and Al-Hamidiyah (18 km south of Tartous) were the most diverse, and Al-Basit is considered one of the richest areas in animal benthic, where 202 species were recorded in 2011. The maximum value of the total abundance is 12,467.83 individuals / m^2, while the Tartous and Baniyas regions suffer a significant deterioration, for example, the total abundance in Al-Hamidiyah area reached 1760,166 individuals / m^2. In another study (Hassan, 2010) it was found that the highest biomass value of *Barchiodonta variabilis* (migratory from the Red Sea) was in the Basha region, reaching 13140.67 g / m^2, and the number of individuals 9228 individuals / m^2. It was found that the *Pinctada radiata* species, its biomass reached 1728.56 g / m^2, and its number is 2108 individuals / m^2. It was also found that *Monodonta turbinata* had the highest value of biomass and abundance in Al-Basit area, and the lowest value in the Banias area. Gastropoda had the highest value of biomass and abundance in the region Al-Basit, Rumaila and the fishing port of Jableh.

It turns out that the southern region of Latakia (Al-Bassa) is very rich in gastropoda, where 113 species have been identified, of which 73 are recorded for the first time in Syrian waters (Sabha et al., 2013), and most of them are of Indian-Pacific oceans origin, and to a lesser extent western Mediterranean-Atlantic.161 species of gastropods were recorded in Syrian waters in the regions of Al-Bassa (south of Latakia), Al-Sen, Al-Buhais and Al-Muwailih (south of Jableh).

The Littoral and Sub littoral area in the beach of the city of Baniyas is characterized by the abundance of species. We noticed the abundance of Brachidonta variabilis and its dominance on bedrocks in the Littoral, in addition to the abundance of conches on the beach in the following species: *Glycymeris glycymeris, Malleus regula, Glycymeris bimaculate, Donax trunculus, Acanthocardia echinata, Tuberculata Acanthocardia,* and the following conch species, especially on soft sandy bedrocks, *Chamella gallina, Glycymeris bimaculata, Glycymeris glycymeris, Tellina planata, Donax trunculus, Mactra corallina,* (Sakr et al. 2008). For deep waters, the presence of the following species in

deep waters is rare, *Plesionika edwards, Metapenaeopsis aegyptia, Penaeus semisulcatus, Parapenaeus longirostris,* while *Metapenaeus Monoceros* and *Marsupenaeus japonicas* were recorded in abundance, and a clear dominance of Aristeomorpha folarea was recorded.

Studies carried out on the Syrian marine waters have recorded the existence of 88 species of decapods (Hasan et al., 2008). This number is relatively small compared to the number of species recorded in the neighboring coasts (152 species on the coast of Cyprus, 168 species in Palestinian waters). There are no details on the abundance and the spread of these species and their places of fishing.

In the framework of a study on Decapoda in Syrian waters that was conducted from 2004 to 2006, fishermen collected only one sample of Aristeus antennatus from a muddy bed off the city of Latakia at depths ranging from 200-225 m in August 2005 (Hasan et al., 2008). This was the first record of this type in Syrian waters. Previous records reported the presence of *Aristaeomorpha foliacea* in the same area. No further information is available on the quantitative composition and abundance of red shrimp in the Syrian waters or adjacent ones (Figure 2).

Figure 2

Red shrimp from Syrian deep waters (Photo by Dr. Malik Ali)

Red shrimp is considered as one of the species of great economic importance, and its exploitation has started on a large extent in the western and central Mediterranean since 2005, while its exploitation in Syrian waters was delayed until 2015. Currently, five ships are being used to fish, they are equipped with bottom trawl nets that target it over a period of 225 days. In general, at depths ranging from 200-700 m, away from the main land about 6 nautical miles, and the bottom shelf (and thus its fishing) is prohibited each year from April 15 until August 31. During working days, bottom shelf ships cannot leave the port before dawn, and they must come back to the harbor before sunset. The average catch is 20.4 kg / ship / hour, and the specific catch is 52% of crustaceans (Fig. 2), and 48% of fish (mostly whiting).

The dominance of crustaceans, decapods, and other predatory species, on the benthic fauna at depths of 600 m, was also observed, especially exotic species such as Marsupennaeus japonicas and Metapenaeus Monoceros (Ammar, 2016). Recently, the following species have been recorded for the first time in deep Syrian waters: Parapandalus narval prawns, Polycheles typhlops lobsters and Brachioteuthis riisei between the cities of Jableh and Latakia (Ammar, 2016).

Medorippe lanata, a rare local type of crabs, was recorded, while the two migratory species *Myra subgranulata* and *Charybdis longicollis* dominated the muddy bottom in most areas of the Syrian coastline, in addition to samples from gastropods, the most important of which is the endangered Mediterranean type *Tonna galea*, which is on the red list of IUCN and the alien species *Conus fumigates, Cerithium scabridum* and the invasive *Rhinoclavis kochi, Murex forskoehli* that dominated in deep and shallow waters (Ammar, 2016).

With regard to cephalopods, there is *Brachioteuthis riisei,* in addition to the presence of *Ommastrephaes bartramii* squid for the first time locally in Al-Basit and Jableh during spring (Ammar and Maarouf, 2016), which is an exotic squid species on the Syrian shore, and the type *Agelas linnaei* from sponges in northern Latakia (Ammar and Fadel, 2017). *Hippospongia communis,* is an endangered sponge according to Annex 3 of the SAP / BD Protocol.

Eleven species of Cnidaria and 12 Echinodermata were recorded in three distant regions of Latakia, namely: Ibn Hani, Burj Islam, and Al Basit. It was found that the sub-coastal area in Burj Islam is rich in the types of hydrates that spread there in the form of colonies and were represented by the following types: *Eudendrium rameum, Eudendrium ramosum, Antenella elongata, Ventromma halecioides, Lytocarpia myriophyllum, Halecium halecinum, Sertularella mediterranea. Dendrophyllia cornigera* individuals also spread over a wide area of the bottom, forming colonies that are suitable habitats for many demersal fish that resort to for feeding and sometimes for reproduction and protection. We recorded a limited spread of individuals of the *Pennatula phosphorea* species in the northern sector of the city of Latakia, with an increase in the number of individuals collected from the Al Basit region and its remarkable appearance in spring, and the presence of *Echinocyamus pusillus* sea urchins and three types of Luida ciliaris, *Echinaster sepositus astropectenulosus* sea stars, which are all predatory types, in addition to *Pennatula phosphorea,* which is a coral of a special importance, (Ammar, 2016). Burj Islam is characterized by the remarkable diversity of sea star species: *Amphiura chiajei, Leptasterias hexactis, Ophiura ophiura, Ophiura texturata,* and *Amphiura chiajei,* which is endangered.

The abundance of the following echinoderms: *Arbacia lixula, Holothoria tubulosa, Psammechinus miliars, Paracentrotus lividus* in the coastal area of Basit and Ibn Hani is high, and on the contrary, none of the echinoderms types were recorded in the coastal area of Burj Islam (Souid, 2010). (*Ashtoret lunaris,* Forskål, 1775) called lunar crab for the first time in the mouth of the great northern river (Ammar and Arbiya, 2018) in addition to *Brachynotus atlanticus* Forest species, 1957 from the beach of Chouqifat (Ammar and Khalifeh, 2018). Other taxonomic groups include:

From Scaphopoda only *Dentalium (Antalis) agile* (Sars M. in Sars GO, 1872) and *Dentalium (Antalis) panormum* (Chenu, 1842) d, and Born, 1778) were recorded by Gryphus vitreus and from Cephalochordata register *Branchiostoma lanceolatum* (Pallas, 1774), From Gastrotricha, a record of samnoderes armiger, (Appendix 2 and 3) illustrates the specific composition of benthic fauna in Syrian waters). As for the rest of the areas, they have not been studied, so we do not have any information about them.

Biomass was studied for some species of benthic fauna in 2011 and *Alvania cimex, Alvania dorbignyi, Bittium arenarium, Bittium tarentinum, Cerithiopsis tubercularis, Nassarius*

louisi, Raphitoma reticulata Rhinoclavis kochi during spring, and decreases during other seasons. *Alvania reticulate* and *Cantharus dorbignyi* achieved the greatest biomass value in summer, while *Bulla ampulla* recorded the largest biomass value in autumn and *Bulla striata* in spring and autumn seasons, while the *Cerithium scabridum* had the largest biomass value in summer and autumn.

For bivalves, *Astarte sulcata, Nucula nucleus* and *Axinulus croulinensis* recorded the greatest biomass value in spring and *Digitaria digitaria* in summer, and for many algae: *Mesochaetopterus xerecus, Capitella capitata, Capitella jones* recorded the greatest biomass value in spring and *Flabelligra diplochaitus, Aricidea fragilis* in summer whereas *Glycera rouxii* recorded the greatest biomass value in spring and summer.

3.1.2 Information on vertebrates other than fish:

Marine mammals: Cetaceans are among the most adapted mammals to the aquatic environment, as they have many characteristics that enable them to live there, and they are found in all seas and oceans of the world and nearly a quarter of them have been seen in the Mediterranean at least once. There is a weakness in the information we have about cetaceans in Syrian waters and this information depends only on:

- Observations of fishermen and local people, the news that we receive from observers, and researchers' follow-up of stranding incidents, bycatches and intentional fishing, and so far no kind of scientific research has been carried out on the gatherings and abundance of cetaceans.
- Activities and initiatives issued by ACCOBAMS, which Syria signed in 2002, and other related agreements.

There is no law in Syria for the protection of cetaceans. Rather, there is the Law of Protection of Aquatic Living that was passed in the year 1964, which aims to protect the organisms that live in the aquatic environment by regulating their fishing in accordance with the requirements of their protection. The law defines the permitted and prohibited fishing methods and their specifications, and prohibits harming eggs of aquatic organisms and their offspring. Leakage of factory waste and chemicals into the aquatic environment, is also prohibited, and it provides that the construction of factories and laboratories and the extension of oil and chemical pipes near public waters shall be subject to permits, which specify measures that prevent damage to the aquatic environment, and thus protection measures are applied to cetaceans and other marine mammals.

Interest in cetaceans in Syria began noticeably after the year 2000, and according to fishermen's observations, we were informed every period about the existence of dolphin populations of up to 50-100 individuals from each of the common dolphin *Tursiops truncatus, Ziphius cavirostris and Delphinus delphis* swimming in flocks, near fishing boats. In 2012, their number decreased gradually to 5-15 dolphins for each flock. This applies to several areas such as Al-Basit, Umm Al-Tayyar, Burj Islam, Al-Badrousiya and Baniyas. The area of Al-Badrousiya (Al Samra) is located north of Latakia on the Syrian Turkish borders and is of a particular importance for the preservation of cetaceans, as flocks of dolphins were seen several times there. As this area is almost protected due to its border situation, this can incite us to convert it into a reserve, and some of the habitats located south of the city of Banias (Al Kharab) are considered natural habitats for dolphin to live in (Ibrahim, 2011).

In 2004, a series of meetings were held at the Higher Institute for Marine Research,Tishreen University, (given that this university and this institute are located in the coastal region of Syria) between the secretariat of ACCOBAMS agreement and the university representatives, to discuss the establishment of a committee concerned with stranded cetaceans, but it has not yet been adopted by competent authorities. In 2006, a team from IUCN, ACCOBAMS and SPA RAC approved the existence of 7 species of cetaceans living in Syrian waters based on a series of meetings and visits to fishermen and the crosschecking of information and observations.

In 2008, the Higher Institute for Marine Research in Syria hosted the working group to develop a plan for the conservation of cetaceans in Syria with the help of SPA RAC, ACCOBAMS and representatives from the Ministry of Local Governance and Environment, the General Directorate of Ports, and the relevant environmental associations, but because of the start of the war in Syria, the plan was not adopted. Also, in 2008, Syria participated in the Syrian-Lebanese-Turkish research that was carried out on the Turkish research ship YUNUS. The study resulted in recording several observations, including in the Syrian waters, 13 striped dolphins and 3 bottle-nose dolphins ***(Tursiops tuncatus)***. It was found through this study, that the rate of cetacean sightings in the Syrian marine waters is less than those in Lebanese and Turkish waters (Dede et al., 2012).

Stranded cetaceans in Syrian waters:

The species *Pseudorca crassidens* was registered in 1991 by Kasparek in the Syrian waters. Later, in 2003, the Higher Institute for Marine Research and the Faculty of Agriculture at Tishreen University, and the relevant environmental associations: SSCW and SSAEP, continued to monitor and count stranded cetaceans until 2009. Their number reached about 20 individuals, of which 11 individuals were classified, belonging to four endangered species, according to Appendix No. 2, List of Endangered Species (UNEP, MAP, SPA RAC, 2013) (Table 4). After the discovery, it became clear that there were several reasons for their death, including: 1- Multiple scratches caused by striking of ship propellers or attempted predation. 2- Deliberate killing by fishermen due to dolphin attacking fishing nets to loot theem. 3- Devouring plastic bags and floating fishing nets that led to suffocation.

Table 4

Stranded cetaceans species from 2003 to 2009

The scientific name	Local name	Year
Megaptera novaeangliae	humpback whale	March 2003
Ziphius cavirostris	Beaked cofiere	March 2005
Physeter macrocephalus	Sperm whale	April 2005
Ziphius cavirostris	Beaked cofiere	May 2005
Tursiops truncatus	Dolphin clam (bottle nose)	July 2006
Tursiops truncatus	Dolphin clam (bottle nose)	October 2006
Tursiops truncatus	Dolphin clam (bottle nose)	April 2007
Tursiops truncatus	Dolphin clam (bottle nose)	April 2007
Tursiops truncatus	Dolphin clam (bottle nose)	May 2007
Ziphius cavirostris	Beaked cofiere	May 2008
Megaptera novaeanglia	humpback whale	March 2009

After the start of the war on Syria in 2011 and the state's preoccupation with ensuring security, safety, food and medicine, we were informed of several cases of deliberate killing of dolphins by some weak-minded fishermen, as a result of the hostile relationship between them and the dolphins that pursue fishing nets to feed on the caught fish, and some of them were sold before we reach them to classify them, and determine their types. Two stranding incidents of *Tursiops truncatus* were recorded at Amrit Beach and Ishtar Beach in Tartous in 2013.

In 2019, Syria had the opportunity to participate in the project of the Cetacean Survey in the Mediterranean (ASI), which was organized by the ACCOBAMS agreement in the period between 7-28-2019 and 8-8-2019 in the Syrian marine waters. During the implementation of this project the following observations were documented (Table 5 (Ministry of Local Governance and Environment, 2019):

Table 5

Cetaceans species recorded during the ASI project

Type	The number of individuals	History	Region
Megaptera novaeangliae (Humpback whale) 2.97 km away from the beach	1	08/01/2019	Tartous 3988676071, 66932N; 4.792678883300781E
Tursiops truncatus (Bottlenose dolphin)	8	08/06/2019	Ras Ibn Hani area35 ° 36 201 ˝ N, 35 ° 45 ¢ 850 ˝ E
delphinus delphis (Common dolphin) 6.3 km away from the beach	3	08/06/2019	Borj Islam area 35 ° 42 ¢ 349 "N, 35 ° 44 ¢ 122 ˝ E

We were then informed that a *Delphinus delphis* (common dolphin) had approached the shore in August 2019. It was, then, brought back to the sea thanks to the awareness of the fishermen. On 2-9-2019, a dead dolphin was classified as *Tursiops truncatus* in Ras Ibn Hani, and it was found that there were deep scratches caused by strikes by fishermen after falling into fishing nets (Figure 3). On 3/8/2020, we were informed of the sight of a dead whale in the deserted beach area in the Al-Kharab area in the city of Baniyas, and it was classified as a Minke whale *(Balaenoptera acutorostrata)*. It was the first time it was spotted in Syria and it is one of the creatures that colonize cold water and it is a whale (Figure 4). Also, on 5-20-2020, a whale, *Balaenoptera physalus*, was seen alive with its tail fin cut off. It was swimming off Jabelah coast, at a depth of about 180m and from 5 miles from the beach. The Secretariat of ACCOBAMS has monitoring it for 6 months. Later, on June 11-2020, the animal moved from the coast of Calabria, southern Italy, towards the north of the Mediterranean, along the Ligurian and Tuscan coasts, according to the latest information. It is reported that this whale was photographed several times and was weak after losing its tail fin in the fall of 2019 (Figure 5).

Figure 3

Tursiops truncatus, Ras Ibn Hani, Higher Institute for Marine Research – monitored by Dr. Malik Ali

Figure 4

Minkwhale (Minke) *Balaenoptera acutorostrata* monitored by Dr. Ala Sheikh Ahmed

Figure 5

The Balaenoptera whale with tail-fin cut in the waters of Jabelah, monitored by Dr. Meena Badran

The stranded cases are those that were reported to us, and it is possible that there are other stranded cases that were not detected.

Mediterranean Monk Seal, *Monachus monachus*: (Hermann, 1779)

There is a big gap in the knowledge of the historical sequence of the presence of the Mediterranean seal in Syrian waters, and most of the information we receive is from observations of fishermen and local residents. The sightings of Monk seals have been documented several times by fishermen in several areas in Syrian waters, Al-Basit, Burj Islam, Wadi Qandil and in the Reserve of Fanar Ibn Hani (the only marine reserve in Syria), and traces of seals (such as Al Shaar) were seen in caves located between Burj Islam and Al Basit. Several sightings of Mediterranean seals swimming in Fanar Ibn Hani reserve were reported in 2011, and in 2012 in Wadi Qandil. In 2013, a killed Mediterranean seal was recorded at 230 m near the port of Latakia. It was a female carrying a fetus (Figure 6), which is the first time when a pregnant seal is seen in Syrian waters, which is a positive indication of the possibility of its breeding in Syrian waters (Ibrahim et al., 2015). It is worth noting that the Mediterranean monk seal is included in Appendix No. 2 of the list of endangered species (UNEP, MAP, SPA RAC, 2013).

A preliminary mission was carried out within the framework of UNEP-MAP's MedMPA project in the period between 3-6 October 2002, beginning with an assessment of the presence of the monk seals in Syria. According to fishermen's observations (Mo et al., 2003), there are several natural caves in which seals can hide, in addition to the Umm al-Tayyar area, which is now a forest and beach reserve. Therefore, it is encouraging to consider it a marine reserve to preserve Monk seals. Cetaceans are found, so protection is double.

Figure 6
Mediterranean Monk Seal and its embryo

Sea turtles: There are three types of sea turtles in the Syrian marine waters:

Dermochelys coriacea (Vandelli, 1761), Chelonia mydas (Linnaeus, 1758), and Caretta caretta (Linnaeus, 1758). There are only these three species found in the eastern Mediterranean basin.

Oceanic Leatherback Turtle *(Dermochelys coriacea)*: This species is absent or exceptional in the Mediterranean. It was seen less in the eastern basin of the Mediterranean, it was recorded in the Syrian waters in 2004 for the first time (Rees et al, 2004; Rees and Saad, 2004) through the capture of a sample that accidentally occurred in the fishermen's nets (2.5 km in front of the city of Jableh) and it was returned alive to the water after being photographed. It is one of the species included as a sensitive species (VU) in the IUCN Red List of Species (Figure 7).

Figure 7
The leatherback ocean turtle, recorded off the Syrian coast for the first time in 2004, photographed by Engineer Muhammad Jouni

- The green turtle *(Chelonia mydas)* and the huge turtle *(Caretta caretta)*, these two species are seen more frequently than the previous type, they appear frequently, and have major nesting sites in Syrian waters as in other areas of the eastern Mediterranean basin in general (Greece, Turkey, Cyprus, Palestine, Egypt). The green turtle is an endangered species (EN), while the loggerhead turtle is listed as a sensitive species (VU) in the Red List of Species issued by the International Union for Conservation of Nature.

The main nesting site is located on the Syrian coast between Latkia and Jableh (the Shuqifat region) and is about 9 km long. It has characteristics suitable for nesting turtles and is one of the ten most important areas in the Mediterranean region in terms of the maximum number of green turtle nests (Rees et al., 2008). The area was the subject of an environmental monitoring campaign for sea turtles in July and August 2004 by a Syrian-Greek team. The results showed that a total of 104 nests of the green turtle were recorded, and many nests and small births were reported at the site (Kasparek, 1991; Rees et al., 2005, 2008), but this site is facing today several threats, especially in its northern part due to its proximity to : Al-Bassa landfill, the estuary of the great northern river that carries a lot of pollutants, the camp of Al-Talaa ', and the sands of the beach, in addition to the presence of many places where tourism activities are practiced, which made nests concentrated in the southern part of it. There are other, less important nesting sites on the Syrian coast, such as Burj Islam Beach, Wadi Qandil, Umm Al-Tayyar, Ras Al-Basit, the site between Banias and Tartous, and the site between Tartous and the Lebanese border, all of which are considered places with multiple tourism activities and pose a real threat to the nests and young turtles (Figure 8).

Information about nesting sites on the Syrian coast is still incomplete, due to the lack of studies that are limited to several surveys. It is necessary to discover all nesting sites along the Syrian shores, to determine the extent of development or decline of nesting rates in the previously studied sites, to determine the period of peak spawning and to raise awareness among fishermen, tourists and local residents.

Pollution on Syrian beaches and in the sea, in addition to the various human activities, led to the lack of conditions conducive to the reproduction process of the large-headed turtles during the past few years. Green turtles are the only species seen on the Syrian sandy beaches to lay down their eggs, especially in the region of Shuqifat. Some sandy beaches between Al Badrusiya and Ras Al Basit became threatened by the abundance of tourist activities, the abundance of resorts and chalets, the accompanying organic pollutants and plastic waste. In addition, the 30 uninhabited small islands facing the Syrian coast, which constitute important habitats to secure food for them, especially in the tidal areas, face the problem of human activities, and are threatened with complete submersion as a result of the expected rise in the water level. This rise will also threaten marine turtles on the Syrian shores by submerging the sandy beaches that they use to build their nests. Lost fishing equipment at sea and unreported are a source of threat to turtle lives, as many turtle deaths were recorded on Syrian beaches as a result of this reason.

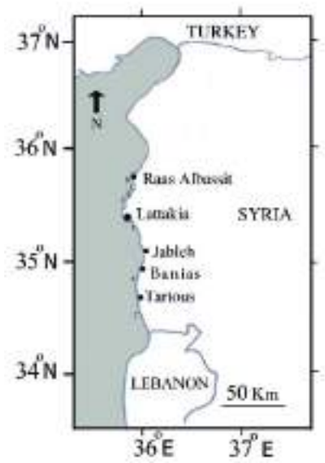


Figure 8

Locations of beach areas of the Syrian coast in which turtle nests have been reported

(1 Shqifat, 2 Burj Islam, 3 Wadi Qandil, 4 Umm al-Tayyar, 5 Ras Al-Basit, 6 between Banias and Tartous, 7 between Tartous and the Lebanese borders)

Seabirds: There is not yet any scientific research on seabirds. (Al-Sheikh, 2013) studied waterfowl in the artificial fresh surfaces in the Syrian coast, and (Dioub, 2015) studied the types of wild birds in the Ferenlak reserve in Latakia governorate. There is a book on Syrian birds published in 2007 by the Syrian Society for the Protection of Wildlife SSCW in cooperation with Birdlife. This book indicated the presence of 394 species of birds, including migrating birds, those in transit, resident and visiting ones, in addition to the stray species or those forced to change their course due to climate change (Eissa Darwish et al., 2008), and the book of Aydak in 2010, which recorded 115 species of birds in Deir Ezzor Governorate, and the record of El-Moghrabi and Hamidan 2011, 172 species in the Sabkhat al-Jabbul located in the city of Aleppo, the Syrian wetland report (Murdoch D. et al, 2004), and a report on important birds' areas (IBAs) in Syria, where there are 25 areas and three other areas are proposed, bringing the number to 28 (Ghazal Asswad, 2014).

Seabirds around the world face many threats, and it is expected that Syrian seabirds share these threats. It has been reported that 11 species of seabirds in Syria face priority threats and require conservation (Al-Omari, 2008) out of 25 species of threatened marine and coastal birds in the Mediterranean. In 2015, Birdlife reported that the number of seabird species in Syria amounted to 22 species (Table 6).

Table 6

Threatened seabirds in Syria according to Amended Annex 2 (2013) of the Barcelona Convention.

Name in English	Scientific name	Type
Yelkouan Shearwater	*Puffinus yelkouan*	Mediterranean shear
European Shag	*Phalacrocorax aristotelis*	European shaggy
Pygmy Cormorant	*Phalacrocorax pygmeus*	Dwarf cormorant
White Pelican	*Pelecanus onocrotalus*	White swans
Dalmatian Pelican	*Pelecanus crispus*	Dalmatian Pelican
Osprey	*Pandion haliaetus*	Eagle Al Nasiriyah (Fish Eagle)
Eleonora's Falcon	*Falco eleonorae*	Eleonora's hawk
Slender-billed Curlew	*Numenius tenuirostris*	Curlew's tapered beak
Audouin's Gull	*Larus audouinii*	Adon gull
Little Tern	*Sternula albifrons*	Little sea tern
Sandwich Tern	*Sterna sandvicensis*	Sandwich Tern

1 _ During the summer of 2019, and within the ACCOBAMS initiative to survey cetaceans (ASI) implemented in the Syrian marine waters by a Syrian scientific team, a number of seabirds were recorded, namely: 1- Calonectris diomedea, it was recorded in two locations: opposite the Tartous cement plant (A group of 20 individuals), near Jableh Beach (a group of 20 individuals).

2 _ *Egretta garzetta*, near the port of Jableh (one individual).

3 _ *Larus cachinnans*, near the port of Jableh (about 50 individuals), was recorded in several locations: Baniyas port (about 20 individuals), near Baniyas (about 50 individuals), and Jableh port (about 20 individuals including young birds); along the beach of the city of Jableh (a few individuals), near the port of Lattakia (10 individuals), in front of the village of Al-Basit, north of Lattakia (one individual).

4 _ Al-Ghashim or the Mediterranean shearl, *Puffinus yelkouan*, near the port of Banias (a few individuals).

5 _ *Marus bassanus,* one individual at sea.

An official report issued by the Food and Agriculture Organization (FAO) in 2018 represented by the GFCM confirmed that seabirds and marine mammals represent the least number of bycatches, but the threat of seabirds in Syria lies in four important points:

- The effect of overfishing, which leads to a shortage of their stocks, and this in turn impacts seabirds, where they become threatened due to lack of food and competition among them to obtain it.

- The impact of oil pollution, sewage and noise that the Syrian coast suffers from (the entire Syrian coast is heavily polluted with plastic waste, which covers the beaches for several kilometers with a layer of waste reaching a height of 0.5 meters (Kasparek, 1995), in addition to the new rise in the level of oil pollution and noise caused by the increasing number of vessel traffic as a result of the exceptional conditions that Syria is going through during the war period since 2011, and of the pollutants with sewage residues (Kayali et al, 2018).

- The use of some species as garden birds for display, as white swans are among the most targeted birds by some citizens, and some hunt seabirds live to trade with and sell them to those interested, noting that there are many agreements and protocols that Syria ratified related to the protection of marine life in general, including birds, which relevant authorities in Syria are actively seeking to implement, but there are some cases that are carried out far from the eyes of the competent authorities.

- The habitats that birds resort to are endangered, for example, off the Syrian coast, there are 31 uninhabited islands due to their small size (with the exception of Arwad Island, opposite Tartous). The surrounding areas are characterized by their biological diversity and abundance of food. These islands are important habitats for local and migratory seabirds in terms of comfort and food security, especially in tidal areas when they are exposed during the receding of the water, but many of these islands are threatened by submersion as a result of the anticipated climate change at the global level and the rise of the sea level, in addition to the threats resulting from pollution and human activities to which these islands and their surroundings are subjected, from poaching, and tourism. In addition to this, the phenomenon of the invasion of sea water to coastal groundwater, and the presence of many coastal areas with relatively low levels that are threatened with submersion because of the expected sea level rise. For example, south of the city of Tartous, near Al-Hamidiyah, there is a coastal sabkha called "Rama Laha" with an estimated area of 50 hectares, relatively lower than the sea surface. It was previously distinguished by its rich biodiversity, especially with migratory seabirds, while today it is being reclaimed for agricultural purposes (Ibrahim, 2011).

2.1.4 Inventory of the temporal occurrence, abundance and spatial distribution of non-indigenous, including invasive, species

Benthic fauna: The crustaceans, decapods, dominated the benthic fauna at depths of 600 m, especially exotic species such as *Marsupennaeus japonicas* and *Metapenaeus Monoceros* (Ammar, 2016). Two migratory species *Myra subgranulata and Charybdis longicollis,* dominated. They are crabs on the muddy bottom in several areas of the Syrian coast, and the exotic species *Conus fumigates and Cerithium scabridum* were recorded in the deep waters of Latakia, and two invasive species *Rhinoclavis kochi* and *Murex forskoeh* in deep and shallow waters dominated the deep waters of the city of Latakia (Ammar, 2016).

With regard to cephalopods, the exotic species *Ommastrephaes bartramii* was recorded for the first time in the beach of Al-Basit region, during spring, and a type of sponge *Agelas linnaei* in northern Latakia (Ammar and Fadel, 2017).

The migratory *Pinctada radiata* (a pearl oyster species) was first recorded in Syria before (Kinzelbach, 1985). It is a bivalvia. This type does not produce good or commercial quality pearls. It came to the Mediterranean via the Suez Canal, it is found in Apamea area in the city of Latakia, at a depth of 1 to 3 meters. Females with the large cod dominate during the laying period, which extends from June to November, with two peaks during the months of August and September, while males with the small cod dominate during rest of the year. It is an invasive species in Eastern Mediterranean Basin (Hassan, 2018).

A number of migratory (exotic) species were recorded and spread in many areas of the Syrian coast, for example a record of gastropods: *Alvania dorbignyi, Cerithium scabridum, Cerithiopsis tenthrenois, Cerithiopsis pulvis, Bulla ampulla Clathrofenella ferruginea, Erosaria turdus, Conathrofenella ferruginea, Erosaria turdus, Conradia fumigates. , Lorioli Zafra selasphora, Pyrunculus fourierii, Sticteulima cf. lentiginosa, and from bivalves: Saccostrea cucullata, Ruditapes philippinarum, and from polychaetes: Hesione pantherina, Notomastus latericeus, Hesione pantherina, Notomastus latericeus Spirobranchus tetraceros, Odontosyllis fulgurans, Ashandia crytracerosa, Odontosyllis fulgurans, Ashandia chirrunis,* and *Ashandia chirrunis fulgurans (2011).* , 2018), and *Brachynotus atlanticus* Forest (Ammar and Khalifa, 2019). Among those species were invasive species that dominated marine habitats and competed with local species for food and habitat. *Pupoides spp, Rhinoclavis kochi, Strombus persicus,* and bivalves: *Ruditapes philippinaru, and polymorphs: Hesione pantherina, Notomastus latericeus.*

Algae: 19 species of exotic marine algae were recorded on the Syrian coast (Araj, 2016), and they are:

Stypopodium schimperi, a brown alga, it was first recorded on Syrian shores in 1989 (Mihoub, 1989). Its widespread was confirmed in *Sokas, Muwailih*, and Arab al-Malek in the city of Jableh (Abbas, 1992).

Caulerpa taxifolia was recorded in Bustan Al Basha. It grows on rocky bottoms or wrecks in calm water sites at depths of 0.2-2 m. It is associated with indigenous species and does not yet indicate its tendency to dominate, unlike what happens in the western Mediterranean.

Galaxaura lapidescence; G. rugosa, red alga of tropical origin, was first recorded on the Syrian coast in 1990 (Mayhoub, 1990), when it was considered as migratory from the Red Sea. It was found in Baniyas and Latakia.

Padina tetrastromatica, a tropical brown moss, first recorded in 1989 (Mihope, 1989). It was found in Latakia and Jableh.

Ganonema farinosum is a tropical red moss.It arrived to the Mediterranean decades ago, found in Jableh and Latakia and it is uncontrolled.

Lophocladia lallemandii is a tropical red alga, first recorded in the Mediterranean in 1918 and placed on the list of 100 worst invasive species in the Mediterranean. It is common in Syrian waters in general, but it cannot be considered as invasive. It was found in the city of Gabala.

Asparagopsis taxiformis, a red alga, scientists disagreed about its origin. It was found in Bustan Al-Basha in Jableh at a depth of 50 m. It cannot be declared invasive in Syria until 2020.

There are other exotic species: *Colpomenia pergiena; Codium parvulum; Cystoseira elgan; Punctaria latifolia; Padina boryana; Caulerpa racemosa; Codium arabicum; Codium taylorii; Padina ditristromstica; Spatoglossum shroederie*

Among them were the following invasive species, *Galaxaura oblongata, Galaxaura lapidescence, Galaxaura rogusa Stypopodium Schimperi and Colpomenia pergeina,* which dominated the entire coast and had a great impact on altering ecosystems, meaning that the environmental conditions on the Syrian coast became more favorable to them (Abbas, 2014, Araj, 2012, 2016).

The sensitive and endangered species on the Syrian coast according to (UNEP, 2013), are namely: *Cystoseira* genus except *C.compressa* and *Sargassum acinarum* from the *Heterokonophyta* Division; *Lithophyllum byssoides* from the *Rhodophyta* red algae division; *Cymodocea nodosa* from the *Magnoliophyta* phylum

Fish:

Fish received the largest amount of studies and research in Syria. The number of fish species recorded in the Syrian marine waters until the date of drafting this report reached 311 species (44 chondrocytes and 267 bone species) Ali, 2018; Alshawy et al, 2019a, b; Hussein et al, 2019; Ibrahim et al., 2020). This number is much less than the numbers recorded in neighboring countries: Turkey 441 species, Egypt 364 species, and Palestine 402 species, and this can be attributed to several reasons, the most important of which is that the taxonomic studies in Syria have not yet been completed, and that the efficiency of fishing equipment are less than those in neighboring countries. In addition to the fact that many non-economic species are thrown into the sea by fishermen; so, researchers cannot see and record them. This leads us to a hypothesis: that there are many species present in the Syrian marine environment, but they have not yet been documented.

In view of the limited scope, we will focus in our report on exotic fish species, with some important points about local or widespread species.

The number of alien species in the Syrian waters reached 61 (fifty-nine bone species, and two cartilaginous types), and the two exotic types of cartilaginous fish recorded in Syria are:

- Type 1821, *Torpedo sinuspersici* Olfers: It was recorded once in Syria (Ali, 2003) and was not repeated, as it appeared in a catch on May 19, 2002. The sample was preserved in one of the laboratories of the Faculty of Agriculture at Tishreen University, and no other sample was found after that date (Fig. 9, a).

- Type (Gmelin 1789) *Himantura uarnak* first appeared in Syria in 2008 and other sightings were reported on April 15, 2012 (Ali et al., 2013b), and a third time on April 20, 2015 (Figures 9, b).

A B

Figure 9

Two samples of the two exotic cartilaginous types in Syrian waters: A-. sinuspersic, B- H . uarnak (Ali, 2003; Ali et al., 2010)

Seven species of cartilaginous fish recorded in Syrian waters are severely threatened (CR): *Oxynotus centrina (Linnaeus, 1758); Centrophorus granulosus (Bloch & Schneider, 1801; Squatina aculeata (Cuvier, 1829); Squatina oculata (Bonaparte, 1840); Squatina squatina (Linnaeus, 1758); Gymnura altavela (Linnaeus, 1758); (Aetomylaeus bovinus, Geoffroy, Saint-1717 species) Other Threatened (EN): Cetorhinus maximus (Gunnerus, 1765); Alopias superciliosus (Lowe, 1841); Carcharhinus plumbeus (Nardo, 1827); Rhinobatos rhinobatos (Linnaeus, 1758); Glaucostegus cemiculus (Geoffroy Saint-Hilaire, 1817) , 1809; Mobula mobular (Bonnaterre, 1788), and five sensitive species (VU): Isurus oxyrinchus (Rafinesque, 1810); Mustelus mustelus (Linnaeus, 1758); Dalatias licha (Bonnaterre, 1788); Dasyatis pastinaca (Linaeus, 1758); Dasyatis tortonesei. (Capapé, 1975),* and these species status were validated according to the IUCN report (Otero et al., 2019).

Between 2000 and 2017, 15 cartilaginous fish species were identified off the coast of Syria at depths> 200 m: *Centrophorus moluccensis, Centrophorus uyato, Chimaera monstrosa, Dalatias licha, Etmopterus spinax, Galeus melastomus, Heptranchias perlo, Hexanchus griseus, Hydrolagus mirabilis, Oxynotus centrina, Scyliorhinus canicula, Somniosus rostratus, Squalus blainvillei, Squalus megalops, Torpedo sinuspersici* (Ali, 2003; Ali, Personal data).

As for the recorded exotic bone species, and due to their large number, and the details of their distribution, groupings and abundance, we listed them in Appendix 4, which

shows the types of exotic bone fish in the Syrian waters with their prevalence, economic importance, their first discovery, and their first documentation.

2.1.5. Information on species of commercial interest for fishing (fish, mollusk and shellfish):

Fish are mainly targeted for fishing, while mollusks and shellfish are targeted much less in Syria. A number of cartilaginous fish species are targeted in fisheries due to their commercial importance, with the two main ones being: *Carcharhinus plumbeus; Hexanchus griseus* in abundance in Syrian waters (Fig. 12), followed by: *Glaucostegus cemiculus, Rhinobatos rhinobatos, Heptranchias perlo, Mustelus mustelus*. In addition to the family *Dasyatidae* in general, from the family of primates. It should be noted that C. *plumbeus;* G. *cemiculus*; R. *rhinobatos* are threatened species based on the IUCN report (Otero et al., 2019), some of which are mentioned in Annex 3 of the SAP / BD Protocol: *Carcharhinus plumbeus, Heptranchias perlo*.

As for bony fish, many of them have commercial importance, either because of their abundance in catches: *Sardinella aurita; Sardinella maderensis; Chlorophthalmus Agassiz; Euthynnus alletteratus; Scomber scomberus, Dicentrarchus punctatus, Trachurus mediterraneus,* or because it is favored by domestic consumers and thus relatively their prices are high: *Merluccius merluccius, Mullus barbatus barbatus, Mullus surmuletus, pinephelus aeneus, Epinephelus costae*. None of the *abovementioned* species are included in annex 2 f the endangered species. It is worth noting that there are desirable but few species in catches, such as *Dicentrachus labrax*, and there are *Mulluska* and Shellfish which have an economic importance in Syria, but on a very small scale such as: *Strompus pursicus,* Patella *cairolia, Pinctada* radiate, *Pecten jacobaeus, Acanthacardia echinata,* and *Acanthacardia spinose,* which are palatable to a small number of domestic consumers and thus have little commercial importance. It may sometimes be fished at the request of specific consumers.

2.2. Main Habitat types:

There is no classification of habitats in Syria, but we will describe in this paragraph some habitats that are important from several aspects, and we will talk about the continental shelf known to be narrow in general and its area is only 915.8 km^2. The sector has a depth of 0-20 m and takes the largest area of the continental shelf, followed by the sector 20-50 m, then the sector 100-200 m and finally the sector 50-100 m. The small area of the last sector, 50-100 m, indicates the rapid inclination of the Syrian continental shelf towards a depth of 200 m (Ibrahim and others, 2015). The rocky bottom dominates in the northern sector of the Syrian coastal strip compared to the southern one, and in general the continental shelf is of the mixed type between sandy and rocky.

There are purely sandy areas on the coastal strip, such as the Al-Badrousiya, Al-Basit and Wadi Qandil in the city of Latakia (the northern sector of the Syrian coastal strip), the shuqifat in the city of Jableh and the golden sands in the city of Tartous, to the rocky sandy areas in the Fanar Ibn Hani reserve, where some chalets for holidays and swimming are concentrated on the sandy side, in addition to the Sports City in Latakia, and the entire rocky areas such as the northern area of Ibn Hani (Figure 10).

The northern estuary area of Al-Kabeer River between the cities of Latakia and Jableh

Burj Islam area in the city of Latakia

Bustan Al-Basha area

The area opposite Arwad Island

Al-Badrusiyyah, next to the Syrian-Turkish

Al-Hamidiyah area, close to the Syrian-Lebanese border

Figure 10
Several areas of the Syrian coastline

It is widely observed in the sandy beaches the presence of green sea turtles and a smaller number of loggerhead sea turtles in the sandy beaches extending from the estuary of the great northern river through the Shuqifat area to the end of the sandy area north of Saqiet Al Bustan, and the presence of a large *Ocypode curso* in the sandy beaches In Al Shuqifat.

There are Vermetid terraces in the Mediolitoral area, up to 20-30 cm above the average level of the sea surface, and in abundance in the northern sector of the Syrian coast. There are important terraces in the area next to the Fanar Ibn Hani Marine Reserve, and fishermen use it to obtain sea salt. Thus, the number of terraces decrease in the Southern sector.

There is a low abundance of living beings up to a depth of only 2 meters from the coastal area, in general and in particular in areas such as Al-Kharab in Banias, Bustan Al-Basha, and Wadi Qandil north of Latakia, while the abundance was better in Al-Muntar areas in the city of Tartous and opposite to Fanar Ibn Hani Marine Reserve and Jableh Beach. It was noticed that the rows most present at this depth in terms of abundance or diversity were Gastropoda in the first place, followed by Bivalvia, then Polychaeta and Pryozoa in greater depths.

At a depth of 32-134 m, there is an abundant presence of Gastropoda, Bivalvia, Polychaeta, Echinodermata, Bryozoa observed in the Muntar area south of Tartous city. This is due to the expansion of the continental shelf in this region and its distance from land influences. This makes it a relatively acceptable environment for many classes, especially echinoderms, which are known to be found only in relatively clean environments. However, the site opposite the thermal station in Baniyas was one of the poorest sites. The Dirassat chalets area in the city of Latakia was also one of the richest areas with Bivalvia at a depth of 13-30 m. At the sandy clay bottom, the presence of monocots and a few green algae was noted, as it is the case at the Sports City area, and the following algae were observed: *Phymatolithon lenormandii,* a *Gelidiella panos, Ralfsia verrucosa* on the non-sloping rocks forming a crust cover at the Sports City site and Bustan Al Basha site, abundantly, and associated with green and red algae. There was also an elevated coverage of *Enteromorpha compressa* and *E. Linza, Enteromorpha linza*, and *Corallina elongatat elonga and Ulva fasciata* near areas contaminated with sewage associated with several types of red and green algae.

Bays scattered on the coastline represent places for marine fish suitable for fish farming, such as the Mugilidae family, and *Siganus luridus* and *Siganus rivulatus* (two migratory species from the Red Sea and belonging to the Siganidae family). These bays are also suitable for fish farming in cages. Some of these bays such as those located in the south of the city of Baniyas are natural habitats for specific species of dolphins living in the region. 18 sites were identified in the Syrian coast suitable for caged aquaculture (Ibrahim et al., 2015).

What distinguishes most of the rocky places on the Syrian coast is the presence of *Brachidontes pharaonis,* which is widely found in the Supralittoral area along the whole Syrian coast. Young individuals of some types of Mugilidae such as *Liza aurata* and *Mugil cephalus* and the alien sandy type *Siganus rivulatus* belonging to Siganida especies live close to estuaries in the form of flocks, especially near the estuaries of large rivers such as the northern estuary of the Al-Kabeer River. Therefore, we can benefit from the gathering of these fingerlings from their natural source to to grow in ponds or in cages.

2.3. Singular habitats in the country:

We will mention the distinctive and unique areas on the Syrian coast in the spatial sequence, starting from Al Badrousiya area near the Syrian-Turkish border, and ending with the Hamidiyeh area near the Lebanese-Syrian border:

1 _ The Al-Badrusiyya area (Al Samra) because of its special importance for the presence of dolphins and Mediterranean seals.

2 _ Al-Basit area because of its special importance for the presence of cetaceans.

3 _ Umm al-Touyour area because of its special importance for the presence of seals and some turtle nests.

4 _ Burj Islam area in terms of natural landscapes and coral reefs with very beautiful rocky cavities, and the presence of the dolphin Delphinus delphis.

5 _ Fanar Ibn Hani reserve and Ras Ibn Hani area to record several observations of the Mediterranean seals and their current nature as a place of protection, and recently multiple observations were recorded almost daily of turtles as they shared swimming places with tourists.

6 _ The Shuqifat area near the city of Jableh has a special importance as it is the largest sandy site on the Syrian coast where turtles lay their nests annually.

7 _ The ruins in the city of Baniyas to document the sighting of the dolphin *Tursiops truncatus* several times in this area.

8 _ Arwad Island, as it is the only inhabited island in Syria.

9 _ Al-Hamidiyah area near the Syrian- Lebanese border due to the presence of distinctive rock cavities.

2.4. Transboundary issues:

Ecosystems are distinguished by the fact that they do not recognize geographical borders, so most plant and animal species spread and take a vital area that does not stop at the borders of countries. So, its protection requires the establishment of a transboundary natural reserve, and joint action plans between more than one country to protect these species from the dangers facing them.

The same applies to marine and coastal biodiversity as an ecosystem, as it applies to other ecosystems, as in addition to the spread of marine species in the Mediterranean, the process of tracking the status of transboundary species of mammals, fish, birds and

others requires that indicators be developed at a time when the creation of transboundary indicators, or across borders represents a particular challenge, however defining it, is extremely important because it promotes the establishment of a common understanding of the priorities for transboundary ecosystem functioning and monitoring.

There will be different plans and / or policies related to maritime governance across political boundaries and physical interfaces, each with different sets of objectives, and at the same time, proposing different sets of actions (management measures). "Then, so that the assessment has an impact, it must carry clear, high-level messages about the issues raised, and refer to interventions in governance that can help mediate the relationship between people and the oceans, improve it and achieve human well-being and the 2030 Sustainable Development Goals.

Because of the various negative effects on marine and coastal biodiversity such as climate change, all types of pollution, plastic waste, undersea noise and many other negative effects on this important part of biodiversity, we have to declare transboundary reserves one of the first priorities of neighboring or riparian countries to preserve biodiversity. We have common maritime borders in Syria with two countries, Turkey on the northern side and Lebanon on the southern side, but to have there cross-border reserves, these borders must be safe, but, currently, it is difficult to think about this issue. We hope that the situation will improve in the future.

2.5. Identification of the country's marine and coastal biodiversity gaps needed for scientifically sound based conservation:

- Biodiversity in the Syrian marine environment is facing a great shortage of data and information despite great efforts made by the Ministry of Environment and Local Governance, academic institutions (Tishreen University) and Syrian NGOs to reduce this gap, and to develop strategies to preserve biodiversity and the sustainability of resources. This lack of information is evidenced by the big difference between the number of species of marine organisms discovered in the Syrian waters, and the number of species recorded in the waters of *neighbouring* countries (cartilaginous fish, bony fish, benthic fauna, plankton ...). This difference results from the lack of adequate studies, and the inefficiency of fishing equipment and sampling methods. We find that this is reflected in the available information on biodiversity in deep marine waters, where there is no information except chance data, which is insufficient. In addition, the discovered and recorded species in the Syrian waters are incomplete and should be made available (distribution, abundance, risks).

There is a lack of data on the number of turtles visiting the Syrian shores, a lack of discovery of all nesting areas, the number of nests, and the lack of data on the development or deterioration of the numbers of these nests annually. This also applies to seabirds and cetaceans. Despite the development of action plans for the conservation of seabirds and cetaceans in Syria, we find that specialized studies dealing with seabirds and cetaceans in Syria are very rare if not non-existent. Consequently, sufficient data are not available on the types of local, resident and migratory birds, their paths, and the types of birds that breed on Syrian shores.

An important gap is the lack of monitoring and management data for fishing activities in general to protect fragile ecosystems and vulnerable species. It is preferable to provide fishing boats, especially large ones, with tracking devices that enable knowing the movements and activities of these vessels and their working hours. Specific management measures are needed for newly exploited red shrimp stocks and to protect endangered species and ecosystems, especially cartilaginous fishes (crustaceans and pythons), in the context of conserving biodiversity.

Among the important gaps that prevent the success of conservation operations of biodiversity are the dangers threatening habitats, especially coastal ones, resulting from intensive human activities (tourism, agriculture, industries ...), in addition to the gap of not defining environmentally-sensitive coastal habitats.

On the other hand, there is a gap in conservation plan-implementing mechanisms and monitoring their implications on biodiversity. The failure to implement national plans that were prepared to protect the components of marine biodiversity, especially those that were prepared in 2010 as a result of the start of the war on Syria nearly 10 years ago, in addition to the severe lack of human and technical capabilities that guarantee the implementation of these plans, and the lack of the necessary financial funding to implement the national plans related to the protection of marine biological diversity.

The very limited number of officially declared marine reserves (Fanar Ibn Hani Reserve only) despite the extreme necessity to declare other sites as marine reserves.

3.

Pressures and impacts

© SPA/RAC, University of Sevilla

The Syrian marine and coastal environment is exposed to a set of pressures, foremost of which are stresses resulting from human activities. The Syrian coast, which does not constitute more than 2% of the total area of the country. It is inhabited by more than 11% of the population. Most of them are in four main cities, which are from south to north: Tartous, Banias, Jableh, and Latakia, all of which lack wastewater treatment units. Consequently, all the pressures of their activities (agriculture, industry, tourism, sanitation) are reflected in the environment and marine habitats, for example the city of Latakia (the largest city on the Syrian coast) is lacking a wastewater treatment plant, and it disposes of this water by collecting it in a large network that operates in a mixed drainage system (civil, industrial, and rainwater), which flows directly into the sea at the shore through 13 sewage drainage, the most important and largest of these are Apamea, the harbour, and the South Koresh estuary (Kayali et al., 2018a). The phenomenon of nutritional enrichment is the most important environmental impact resulting from pollution of marine waters in the fishing port and the marina in Latakia, and it contributes to a change in species.

3.1. Biological disturbance: Fish farming

There is not yet any type of marine farming activities in Syria, for fish or other species, neither in ponds nor in cages, as marine farms have not yet flourished, and remained within the scope of research experiments held by students and researchers of some colleges at Tishreen university, such as the Higher Institute for Marine Research, the College of Agriculture, and the College of Science. Hydroponics in Syria is limited to farming freshwater fish in several farms belonging to the Public Authority for Fish Resources, and on several farms of the private sector (Badran, 2013). As a result of all this, there was no observed effect of hydroponics on marine biodiversity.

There are clear indications that the shoreline has retreated in most of its areas on the Syrian coast due to coastal erosion, which strips the coastline of its sand, increases its slope rate and increases the accumulation of silt on the adjacent sea floor, causing an increase in rocky areas in some regions, a large number of marine sediment areas and a lack of stability in the bottom in other regions (Ibrahim et al., 2011). The nutrient concentration in the eastern part of the Mediterranean (including Syria) is very low and the primary production rates are low compared to the western part (Krom et al., 1991). The level of nutrient concentrations in the western and the eastern Mediterranean bassin on the concentrations of nutrients coming through the Strait of Gibraltar and the Strait of Sicily, in addition to flows from the atmosphere and the continent, (Bethoux et al., 1998).

The nutrient-related studies on the Syrian coasts are considered to be sporadic studies that were carried out during separate periods of time, which began with intensity since the year 2000, and showed that the relatively important peaks of chlorophyll pigments were limited to spring and autumn peaks in locations not exposed to pollution, while the rest of the sites were characterized by multiple peaks. As a result of its waters being affected by external tributaries. Estuaries are affected by tidal movements, sediments transported from the river, sewage, agricultural and industrial activities and their waste, and the

construction of dams along riverbeds, **which are the most productive ecosystems in the world** and are at the same time among the most degraded systems (Wild-Allen et al., 2013; Sheaves et al., 2015. They are a habitat which gathers many fish species in abundance, and a distinctive environmental milieu, where the unique biophysiochemical characteristics of these areas lead to biogeochemical processes that may lead to negative or positive consequences for the seas receiving these waters and the nature of the biodiversity in those waters in that region (Suzal et al., 2008). There are several major Syrian rivers flowing into the Mediterranean, which are Al Dafla, Al Qandil, Al Kabir Shamali, the Rouss, Al Hassine, Al Sen, Al Abrash, and Al Kabir Al Janoubi. We will talk about the northern estuary of Al-Kabeer River, because it is the most prolific Syrian river that flows into the Mediterranean, and what applies to it applies to all Syrian estuaries. It is supported by many rivers during its course and is a major source of nutrients reaching the sea, as the two sides of the river are characterized by the density of vegetation and fertility of agricultural lands, as the river embraces on the sides of many factories and small establishments, and it is also subject to a great influence of wastewater, and this estuary is rich in silicates, phosphates and nitrates, nitrite and ammonium, especially during the winter season, due to the decrease in the biological consumption rate on the one hand and the increase in the flow of river water on the other hand, which leads to the washing of agricultural soil on the shore banks rich in fertilizers and nitrogenous agricultural wastes in addition to the load of rainwater (Yin et al., 2000).

As for the physical and chemical factors such as temperature, dissolved oxygen concentration, salinity and PH degree in the Syrian estuaries region, it is the same unless there are special characteristics for each estuary such as increased pollution or increased river flow. It is known that the salinity of water at estuaries decreases in winter due to the abundance of the river and increases in summer due to lack of abundance and evaporation (Lopes et al., 2007, for example, it ranges between 0-38.7 at the northern mouth of Al Kabeer river, and as for the dissolved oxygen concentration, it ranges between 7.21 and 3.55 mg / L. As we know, the dissolved oxygen concentration in water gradually decreases from the mouth of the river towards the marine waters. It rises during winter and decreases during summer because water temperature rises in summer, oxygen concentration decreases due to the decrease in the solubility of atmospheric oxygen in the water, in addition to the activity of microorganisms that consume quantities of dissolved oxygen in the decomposition of organic matter. The pH rises when moving from river to marine water, i.e., with high salinity, and also rises in summer due to high temperature and consequently evaporation and a decrease in the amount of water coming to downstream. In contrast, it decreases in winter, while there is a relative increase during May and October due to the growth of phytoplankton that consume carbon dioxide in the process of photosynthesis, which leads to an increase in the degree of pH, and in general the degree of pH is between 7-8. There is an increase in the months of May October as the result of the increased photosynthesis processes during these two months (Goulak, 2020).

A decrease in the concentration of oxygen is observed every year in the northern mouth of Al Kabir river and in other estuaries in Syria in the months of October, November and December due to the seasonal output of olive presses that are thrown into the riverbed without treatment, and consequently large quantities of oxygen are consumed by bacteria which disintegrates organic materials, which leads to the death of many young individuals of the fish species that exist in this period, especially the sandy alien fish *Siganus rivulatus*, the rocky alien *Siganus luridus* and the Mugilidae species. Annually in summer, there is a large rate of death of the aforementioned exotic fish and mullet fish when restaurant and hotel trucks come and dump their loads of waste in several areas of the sea (Figure 11).

Figure 11

The death of *Siganus rivulatus* fish due to unloading of truckloads coming from restaurants in the sea, 2014 - Al-Azhari region, Latakia. Photo by Dr. Meena Badran

As for water temperatures, they differ slightly every year according to the seasonal climate cycle known for each region, for example, the water temperature in the northern mouth of Nahr al-Kabir ranges between 14 and 31, and this is also related to the abundance of the river in the winter season and its lack of abundance in summer.

Microbial pollution on the Syrian coastline is one of the threats to marine biodiversity and thus to human health. Pathogenic and non-pathogenic microorganisms enter the marine environment mainly through the disposal of sewage, especially the untreated one, mainly and partially resulting from partially- treated wastewater in the coastal area. River load adds a quantity of microbial pollution, mainly from the wastewater loads it carries. Wastewater discharges to the marine environment greatly affect biological diversity due to pumping huge quantities which leads to a change in the characteristics of marine waters and their inability to reproduce living organisms, and an increase in the amount of nutrients and the increase in bacterial activity. All these factors are available in the Syrian waters, so the alarm was sounded at the beginning of the twenty-first century about the seriousness of the situation. But, the interest in the subject remained within the scope of the few research conducted in the absence of treatment of water reaching the sea. The activities of harbors and maritime traffic (ballast water) contribute to carrying several bacterial species from one region to another such as Vibrio, which is considered a threat to human health (WMU, 2013). In addition, wastewater affects whale and dolphin populations by inhibiting the growth of coral algae, increasing rates of biological erosion, reducing species richness and density, eliminating some taxonomic groups, and increasing the abundance of highly tolerant species (Ballesteros, 2006)

Among the most important pathogenic bacterial species recorded in Syrian waters are:

Salmonella spp., Clostridium perfringens, Staphylococcus aureus, Campylobacter spp., Escherichia coli, Shigella spp., Pseudomonas aeruginosa, Vibrio cholera, Aeromonas hydrophila. It is known and certain that there are other species, but not yet registered, and there is insufficient research in this field. The large number of pollutants reaching the

sea, and the Syrian rivers that flow directly into the sea are exposed to multiple sources of pollution with solid and liquid wastes and sanitation from factories, olive presses and fuel stations.

A study by (Zainab, 2004) showed the sources of bacterial contamination in the waters of the Al Kabeer Al Janoubi river near the Lebanese- Syrian border, and Al Kabeer Al Shamali in the city of Latakia. It showed that the number of faecal coliform germs reaching 10 cells / 100 ml. Shahine and Wazen showed unacceptable pollution rates of 85% and 66% in the north and south of the port of Latakia. Previous studies indicated that the beaches of the cities of Jableh and Baniyas are no less dangerous than those in Latakia. During a study carried out on estimating the microbial quality of the waters of the Syrian coast, it was found that the number of microbial indicators increased in the waters of nearby rivers. From the mouths of sewage sewers and estuaries, and upon the application of international standards to determine water quality, **most of the sites on the Syrian coast are not recommended and unacceptable,** and that the sources of pollution are predominantly anthropogenic. The results showed that there is a strong correlation between the bacterium coliform nephron and faecalis and the fecal streptococcus in all regions of the Syrian coast. It was also found that these sites are not suitable for recreation and swimming (Halloul, 2015; Zainab, 2010; Ajeeb, 2019).

In his study on different marine fish in the Mediterranean waters, Mustafa and his colleagues (2010) were able to isolate a number of pathogenic bacteria: *Aeromonas hydrophila, Aeromonas sobria, Pseudomonas fluorescens, Vibrio anguillarum, Vibrio alginolyticus, Pastella piscicida and Streptococcus, Aureus.*

These organisms cause many diseases to marine organisms such as fish and marine mollusks, and this consequently affects marine biodiversity by contributing to changing the characteristics of marine waters in the marine environment and habitats or marine habitats through the deposition of organic matter and the micro-organisms they carry that contribute to changing habitats, in addition to other sources, such as the atmosphere through winds and continental storms, as well as tourism density and the pollution of recreational waters with bacteria, viruses and fungi (Al-Ali and Ajeeb, 2018).

As long as the species are related to each other in all ecosystems through chains and the food chain, and given the importance of the microbial link in the marine ecosystem, any change in the abundance of one species can have a significant impact on other species and this effect may not be reversed.

There are some researches conducted in Syrian universities and research centers on the effect of microbes on fish, especially during the four seasons, and their infection to the internal organs such as gills, liver and intestines ... etc. The total number of germs was greater during summer and even greater than the other seasons. The number of bacteria was greater than the external organs of fish, such as gills, because of their direct contact with the marine environment. There are many recent studies dealing with the issue of bacterial pollution of water surfaces and estuaries that reach the sea, but very few of them deal with the impact of this pollution on fish resources.

Impact of fisheries on habitats and species:

During the 43rd session held recently in Greece, the GFCM approved several binding measures to manage major and deep-water fisheries for red shrimp, after 78 percent of the estimated fish stocks became exploited in a way that obliges countries to continue their efforts to reduce overfishing in the region, leading to the long-term sustainability of fish stocks. It was agreed to intensify combating illegal, unreported and unregulated fishing.

The FAO declared that 85% of the stocks in the Mediterranean are caught outside biologically sustainable limits (FAO, 2016). The GFCM confirmed that marine fisheries in the Mediterranean and Black Seas are under threat in the long term due to the effects of increasing pollution from human activities, habitat degradation, and the introduction of non-indigenous species, overfishing, and impacts of climate change (FAO, 2018).

Fisheries affect the Syrian marine environment and put pressure on exploited resources. The number of fishing boats and their manpower is greater than the ability of the Syrian marine environment to endure, and the increasing demand for fish and other marine products imposed excessive pressure that resulted in overfishing, with the accompanying habitat sabotage, environmental pollution and threat to targeted commercial species, the results of which were reflected in the decline of CPUE. The increase in fishing effort (FE), the weakness and disturbance of fish species' populations, cause some of them to be scarce and absent from the catch, and make room for exotic species to establish their own populations and spread in the Syrian waters.

Fishing is practiced by different fishing methods in general at a depth of less than 300 meters, and the actual catch is much higher in most cases than those reported in official statistics. Most of the stocks in the Syrian waters, especially in deep waters, have not been evaluated.

Coastal fishing was prohibited by Ministerial Decree 54 / T / of March 31, 2003, but many violations occur without the knowledge of the competent authorities, and thus habitats are destroyed in shallow waters. In addition to the forbidden fish ing, which had harmful repercussions on biodiversity, it was evident in the destruction of habitats, and the absence of marine organisms, such as the absence of some types of algae from many habitats as a result of the use of dynamite and toxic substances in fishing operations in violation of the laws and regulations in force.

Fisheries in Syrian waters target in an excessively commercial manner many fish species: such as some cartilaginous fish species; e.g. *Carcharhinus plumbeus; Hexanchus griseus (fig. 12).* As a result of stress in fishing operations, some species began to be missing from catches until they are rare today *(Squatina aculeata (Cuvier, 1829); Squatina oculata (Bonaparte, 1840); Squatina squatina (Linnaeus, 1758); Alopias superciliosus (Lowe, 1841); Mobula mobular (Bonnaterre, 1788).* We also found that some endangered species *Carcharhinus plumbeus (Nardo, 1827); Rhinobatos rhinobatos (Linnaeus, 1758); Glaucostegus cemiculus (Geoffroy Saint-Hilaire, 1817)* have been overfished for more than ten years.

A

B

Figure 12

A - Targeting *Carcharhinus plumbeus*. B- Targeting *Hexanchus griseus* in fishing, Fish market in Latakia 2013 and 2014

Fishing has recently started for some of the benthic species that live in the deep Syrian waters, *Aristaeomorpha foliacea and Aristeus antennatus,* the rockfish *Helicolenus dactylopterus and Merluccius merluccius.* These species are vulnerable to the impacts of fisheries, with the accompanying negative impacts of fisheries on marine habitats because of the increasing pressure of fishing equipment on the bottom of these habitats and its sabotage under the influence of stressful dredging processes. Also, fishing operations in shallow waters have harmful effects on the habitat, and the severity of the damage varies according to the fishing method and the size of the stresses. The absence of many plant species has been recorded in areas where forbidden fishing methods are used (such as dynamite).

Sea turtles are the least diverse among marine vertebrates, and their accidental catch poses a danger to them despite their scarcity (the catch has decreased thanks to the efforts made by the authorities concerned with the implementation of laws that prohibit turtle fishing, and as a result of the increasing awareness among fishermen and beachgoers). But fishing equipment lost at sea and unreported is a real danger facing turtles.

Seabirds are the least visible in poaching, but they are indirectly affected by the overfishing of fish, which reduces the availability of their food, and thus increases competition of these birds for food.

Some species of dolphins (such as *Tursiops truncatus*) are at risk of falling into the fishermen's nets as a result of trying to feed on the fish in those nets, and thus they are exposed to wrong fishing, in addition to the incorrect relationship that arises between fishermen and dolphins as a result of cutting fishing nets, and feeding on the caught fish.

3.2. Vulnerable marine ecosystems:

There are insufficient studies to determine the state of the marine and coastal systems in Syria, but there are preliminary data indicating the threats facing many coastal habitats. The overpopulation that has made coastal cities polluted hotspots (European Environment Report 2006), is making pressures on other sites, to make them sensitive (Figure 13). We can say that as long as there are no sewage treatment plants, agricultural and industrial drainage, all sites or habitats will remain weak and threatened.

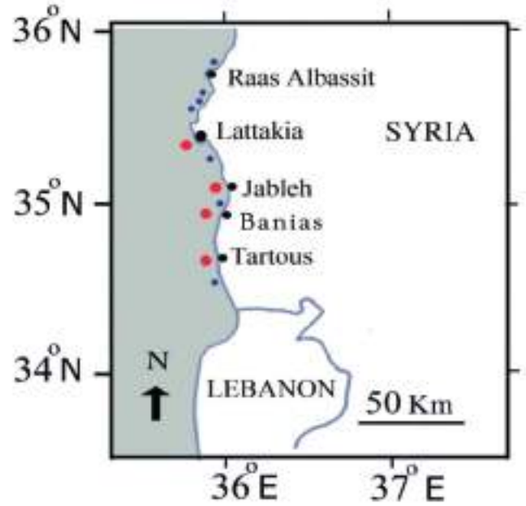


Figure 13

shows the areas that are considered hotspots of pollution (red color) on the Syrian coastline (according to the European Environment Agency report, 2006), and the areas that are considered threatened by pollution and other factors (blue color).

- Fanar Ibn Hani Marine Reserve is the only marine reserve in Syria, one of the most important areas currently weak due to the daily encroachments by fishing with explosives and the depletion of fish stocks by fishing with very small nets. The solution is to apply the maximum penalties for those who violate the laws of the reserve, in addition to leaving the reserve for a period of three years without catches to allow it to recover a little.

- The 30 uninhabited islands in Syria are small, some of them are subject to flooding. They are currently a habitat for seabirds, noting that there is only one inhabited island in Syria.

- Beach areas with a level close to sea level rise, especially in the Shuqifat region, where sea turtle nests are located, knowing that this site (Shuqifat) is one of the ten most important sites in the Mediterranean for turtle nesting in terms of the maximum number of nests.

- (Ramah Lahha) area: 25 km south of Tartous, which used to be a coastal lake and a haven for a large number of migratory birds (Marduk and colleagues 2005, Ibrahim, 2011). Today, it is just a waterlogging site, and it is considered one of the most threatened sites

on the Syrian coast due to pollution and dehydration factors linked to climate change on the one hand, and to agricultural reclamation processes on the other hand, until the features of this region were close to disappear due to the incomplete reclamation of its lands for agriculture. The area is now being reclaimed to convert it into agricultural lands for a local agricultural company.

3.3. Emerging issues such as climatic change effects and open sea including deep-sea ecosystem concerns:

The Syrian marine waters are distinguished, like the rest of the eastern basin of the Mediterranean, due to climate changes, high salinity and high temperature. The salinity increases on average as we head east from about 37.5 degrees in the west to 39.5 degrees in the east. Temperature increases from west to east from 15 to 26 degrees Celsius (Skliris, 2014), and this applies to the Syrian marine waters, where the salinity increased gradually over the past decades. It reached 37-39.8 (Ibrahim, 2011), due to the loss of water balance of the Syrian territorial waters in general (this loss amounted to 3.2 km3 in 2015) despite the limited water surplus in January and February due to the great evaporation throughout the year (Tarboush et al., 2018). In addition to the increase in temperatures and other climate changes, the construction of dams on rivers plays an important role in reducing the supply of fresh water to the sea.

- Significant gaps remain related to the impacts of climate change on species, habitats and ecosystems and their resilience and adaptation. The reason is due to the lack of implemented studies and the absence of regular and systematic monitoring of marine and coastal biodiversity. Despite the absence of any studies at the national level on the issue of the effects of climate change on marine and coastal biodiversity in Syria, and the lack of maps of vulnerable coastal habitats, we demonstrate that many events in the Syrian coastal region related to climate change (high temperatures, increased evaporation processes, and thus a high rate of salinity) were recorded. So, the flow of many alien species to the Syrian waters was recorded, and it is feared that the rate of this flow will increase to a point where it is difficult to confront.

- With the expected sea level rise, neighbouring areas with levels close to sea level will be submerged, and the current sites for nesting turtles (which include one of the ten most important sites in the Mediterranean for nesting green turtles in terms of the maximum number of nests) will be flooded. In addition, there are 30 islands off the Syrian coast that are uninhabited due to their small area, some of which will be subject to flooding (rocky exposures), and thus, very important habitats for local and migratory seabirds will be lost. This flooding process will lead to a decline in the estuary areas and will change their salinity, thus changing their biological components (UNEP-MAP RAC / SPA, 2009).

- The effects of climate change are increased by the growing human activities, and the problem of pollution, as marine litter poses a source of danger to invertebrates, reptiles, fish and marine mammals. The construction of the new branch of the Suez Canal is considered as an important human activity, which will have impacts on the biodiversity in the eastern Mediterranean basin by increasing the number of transport ships that will cross the canal.

The Syrian marine and coastal waters face the threat of pollution from multiple sources (sewage and urban surface drainage, solid waste, industrial flow including oil treatment, transformation to the urban character of the coastline, nutrient abundance, sand erosion, maritime transport, biological invasions, harmful algal blooms), which made it an urgent problem that must be addressed as quickly as possible and put all capabilities and interests into place to curb the increase of this dangerous phenomenon.

Since 1995, Kasparek has reported that the entire Syrian shore has been heavily polluted with plastic debris, which cover the shores over several kilometers with a layer of litter up to 0.5 meter high (Kasparek, 1995), and in preliminary work on marine litter in deep waters (> 350 m) through photography of the litter found in the results of fishing operations carried out in the nets of the bottom shelf in the deep waters of Syria in 2017, the amount of garbage ranged between 81 and 911 pieces / km2, and the highest value of the abundance of garbage (911 pieces / km2) was observed in the open waters west of Jableh. At depths of 400 to 680m (Malik Ali, personal data) the accumulation of marine litter is subject to seasonal differences, as a result of a number of factors that contribute to its distribution, accumulation and density, some of which are related to river inputs, proximity to urban and industrial areas, agriculture, tourist resorts, marine traffic, and fishing effort.

Maritime traffic and fishing effort, in addition to their effects on increasing marine litter, are working hard to pollute marine waters with oil and organic pollutants, and increase noise pollution. These types of pollutants have increased dangerously in Syrian waters during the last five years, with the increase of the great activity of transport ships and war pieces. In the eastern basin of the Mediterranean off the Syrian coast, due to the exceptional circumstances the region is going through.

With the start of the discovery of oil and gas fields in the eastern Mediterranean (and the existence of large reserves of them in the Syrian marine waters), another factor in oil pollution is expected to be added as a result of accidental spills and waste from drilling operations.

There are some special cases from the Syrian coast in which some areas have been exposed to coastal erosion resulting from unusual marine phenomena as a result of the climate change that occurred in the past decades, the drying up of waterways, and the fragmentation of environmental habitats.

With climate change, an increase in the frequency of rainstorms, a higher level of waves, an increase in their strength, higher rates of rain and the emergence of floods, and thus an increase in the rate of coastal erosion with a rise in sea level, loss of more habitats, and an increase in the rate of change of the qualitative composition of marine life, especially most of the areas of the Syrian coastline are located at altitudes below 50 meters above sea level, which makes these areas under the direct influence of current and future marine phenomena resulting from climate changes, especially the rise in sea level and marginal marine phenomena.

Under the pressure of climate changes, high temperatures, and current and expected changes, migration rates have increased and alien species recorded in marine and coastal habitats. It is feared that this rise will continue and may be at higher rates of migration, and it will be difficult to cope with the influx of exotic marine species coming through the Suez Canal.

With the rise in sea level, the flooding of neighboring areas with levels close to sea level rise will occur, and thus will cause a rise in the salinity of these areas, this salinity that may affect the groundwater that the population uses in their activities and daily life, which will push them to search for other sources and increase human pressures. Estuaries of coastal rivers will recede, and new habitats will form with different specifications, inhabited by marine creatures of different qualitative composition, and the current sites for nesting turtles will be flooded with water, in addition to the possibility of submerging small islands and thus losing very important habitats for local and migratory seabirds, in addition to the climate changes and the rise of temperatures, along with the shortage of fresh water coming to the sea, have led to droughts in some habitats, such as the aforementioned Rama Laha site.

4.

Current response measures

© SPA/RAC, Simone Modugno

The sustainable use of coastal resources requires the preservation of the largest possible percentage of beaches and marine waters in their natural state, without any human intervention, or as close to their natural condition as possible. It also requires the protection of fishery environments that suffer from critical degradation conditions.

All scientific studies, surveys and statistics approved by the competent international conventions such as the Convention on Biodiversity indicate that the best way to protect and preserve biodiversity is to establish natural reserves that protect species in their natural habitats. Even if the protection is outside their site or their natural habitat, work is done to simulate the nature where they live and thus, the idea of aquaculture and water basins arose, as for marine reserves, a certain area is defined to be a marine protected area based on one or several reasons (multiple uses):

1 _ An area is the best example of an important ecosystem or a specific type of habitat.

2 _ There is a need for their presence to sustain fishing by creating areas where fishing is not permitted.

3 _ It has great biodiversity.

4 _ It is considered a site of intense biological activity.

5 _ It is considered a wonderful natural site that attracts tourists to practice sustainable tourism.

6 _ It provides a basic habitat for a specific or for several species.

7 _ It carries a special cultural value, such as being a historical, religious or entertainment site.

8 _ It facilitates the necessary research process to determine a baseline of natural conditions.

There is an increasing need to justify the establishment and setting up of reserves, as marine and coastal reserves help to preserve the genetic banks in their original and natural habitats and to preserve the vitality of the species and protect them from decline, loss and thus extinction.

Syria has taken several measures, including:

- Join the international environmental conventions related to the protection of biodiversity (such as the Convention on Biodiversity - the Convention for the Protection of Whales in the Mediterranean, Black Sea and Adjacent Areas of the Atlantic - Memorandum of Understanding for the Protection of Sharks - Protection of Monk Seals, etc.)

- Establishing a directorate specialized in protecting biodiversity in all its forms with the Ministry of Local Governance and Environment, which is based on preparing and implementing national strategies and action plans necessary to protect biodiversity in cooperation and coordination with other national authorities.

- Spreading and adopting the concept of raising fish in marine fish farms to relieve pressure on existing marine species and secure the increasing need for food.

- Preparation of requirements for protected areas in Syria in 2003, and work is now underway to update them in accordance with global developments in the field of protecting biodiversity, the requirements of the International Organization for the Protection of Nature (IUCN) and the global framework for biodiversity Post 2020.

- Join the CITES Agreement to regulate international trade in endangered plant and animal organisms and implement its requirements, such as establishing the administrative authority and the scientific authority that oversee the implementation of this agreement in Syria and implement its legislation, which is expected to be promulgated soon, so that the import and export movement of all species will be controlled.

- Issuing laws and legislations (Environmental Law - Aquatic Biology Protection Law) and guidelines that help protect biodiversity (land - marine).

- Preparing national reports on biodiversity that reflect the state of biodiversity, conservation measures and the needs for its sustainable use.

Based on the importance of protecting and preserving marine biodiversity, work has been done in Syria to declare natural reserves in various habitats. Natural reserves (marine, forest, desert and wetland). The number of natural reserves in Syria has reached 31 natural reserves, including one marine reserve (Fanar Ibn Hani) and two beach reserves (Umm Al-Touyour - Ras Al-Basit), and 59 pastoral reserves spread in the Syrian countryside.

Figures 14 and 15
show the distribution of natural reserves in Syria.

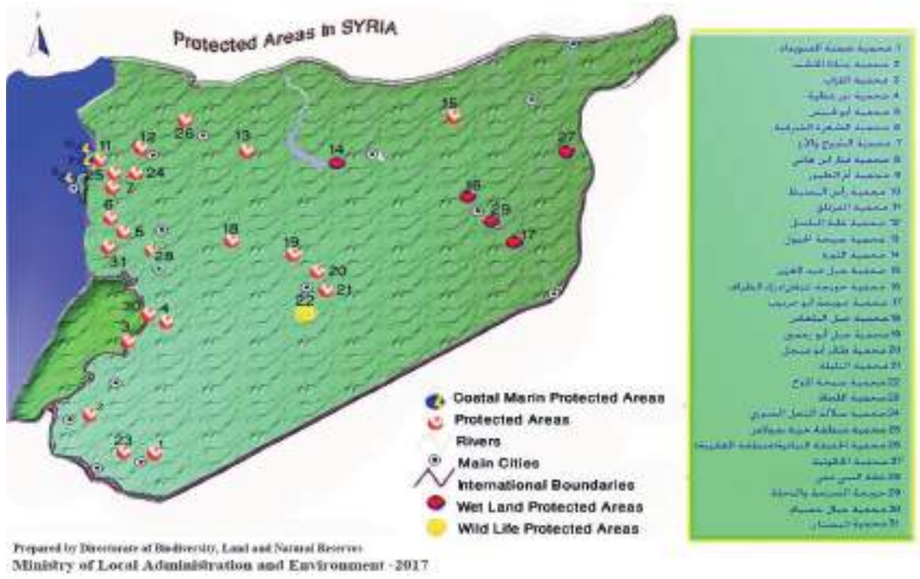


Figure 14
Distribution of natural reserves in Syria

Figure 15
Ras Al-Basit and Umm Al-Touyour
(a beach reserve, deserving to be declared a beach marine reserve)

4.1. Marine protected areas and other area based conservation measures:

There is only one marine reserve in Syria, which is **the Ibn Hani Marine Reserve in Latakia,** anchored on the shoulder of the historic city of Ugarit (mother of the alphabet) in the city of Latakia. It was declared by decree N° 26/C as of 2000 of the Ministry of Agriculture and Agrarian Reform, to be a reservoir for fish larvae and their protection, in addition to other plant and animal life. The reserve was limited at a length of 2.3 km and a depth of 1.5 km towards marine waters, with a total area of about 10 km2, extending from the Higher Institute for Marine Research to Ibn Hani Fanar. It is under the administrative supervision of the General Authority for fish resources and is located at Jableh. The goal of the reserve is to protect marine organisms and secure habitats for their reproduction. It is the only refuge for threatened organisms.

Mediterranean Monk seals were seen several times in the waters of the reserve, and sea turtles were also seen and observed. The reserve is rich in biodiversity, and despite its protection, it is subjected to many encroachments, the most dangerous of which is dynamite fishing and the use of small nets despite the strict protection measures. With the beginning of the war on Syria, these challenges have greatly increased by some weak-minded fishermen, and fish stocks have decreased dramatically in the reserve by 2020. We do not even see fingerlings of alien fish and mullet fish that were available on the shore of the Higher Institute of Marine Research adjacent to the reserve. The reserve contains a building, a watchtower and chase boats. The reserve has no administrative plan. It includes many criteria that qualify it to be on the SPAMI list, and it is next to an ancient archaeological area protected by the Ministry of Culture and devoid of terrestrial human activities.

A study was recently conducted on the analysis of the reality of the fish stocks of *Pagrus caeruleostictus* (unique locally) in the marine reserve (Al-Shawi, 2017), and we can refer the results of this study to all fish stocks now in the reserve because the researcher studied the entire fish stock in the reserve, and found out that the fish stock in the reserve,

is presently exposed and will be severely depleted if the rate of overfishing remains on the current state. We will not be in front of a sea containing fish. He suggested several scenarios, the most important of which are: A permanent cessation of fishing in the reserve for a 3-year period to allow the fish resources to reach the marketing weight to make an acceptable contribution to increasing the biomass for optimum stock utilization and maximum sustainable production. This scenario needs serious measures by decision makers and implementers before it is too late.

In 2005, according to the regional project to develop marine and coastal protected areas in the Mediterranean region, it was proposed to establish several reserves to choose one or two to be declared as a reserve in addition to the existing one (Figure 16).

The first proposal: the northern coast overlooking the As-Samra region and extending from the island of Hammamet in the south and Al Samra to the Syrian-Turkish borders, and by virtue of this position, the area is more protected than others and gives it the priority of a correct marine and coastal surveillance. It is a distinct area as we expect the presence of seals and the great marine biodiversity. It is good for ecotourism, diving, beach exploration, and as a cross-border reserve.

The second suggestion: From the area of Umm Al-Touyour to Ras al-Basit, which is one of the most important sectors in terms of biodiversity, landscapes, rocky cliffs, and water caves, and the wild part of a large part of this area is already protected as a forest reserve. There are implications and observations of the existence of nesting of sea turtles there.

The third proposal: the extension of Fanar Ibn Hani Reserve to the small port of Burj Islam, an area rich in biodiversity, coral reefs and seaweeds, and good for ecotourism.

Fourth proposal: The Shuqifat area, it is a sector in the city of Jableh: a key area for the nesting of sea turtles every year on the Syrian coast, subjected to great human pressures such as swimming, turtle encroachment and sand harvesting as it is a sandy area and is a various landfill as it is a tourist area by excellence.

Fifth proposal: the border area between Syria and Lebanon (the southern coast): as a transboundary reserve. There are observations of nesting sea turtles in addition to the presence of the soft Nile turtle *Trionyx triunguis* included in the second appendix of the SPA agreement on living in medium salinity water near the estuary of the southern Al Kabir river. There are other places suitable for being small reserves, such as the island of Al Naml and the island of Al Habas.

None of the previous proposals have yet been implemented, and one of them was supposed to be implemented before 2011, but after the outbreak of the war on Syria, it was postponed. Through reviewing these proposals, we find that the second, third and fourth proposals are the ones that must be taken into consideration, and they are the best and the easiest to create a reserve in accordance with the requirements of the Strategic Action Plan for the Protection of Marine and Coastal Diversity SAP BIO Post 2020 to 2030 and according to country considerations (Syria).

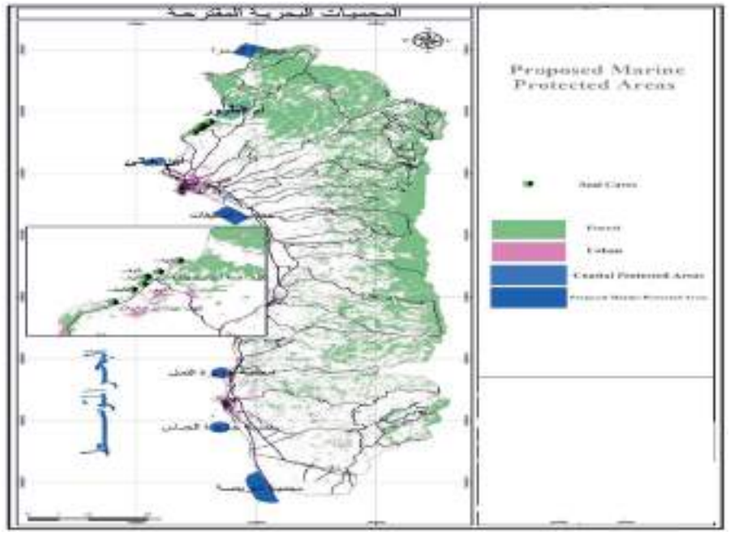


Figure 16
the proposed areas as marine reserves

4-2. Legal and institutional frameworks governing the conservation and sustainable use of marine and coastal biodiversity:

Marine and coastal habitats are protected through national and regional MPA systems, and their success depends on the existence of appropriate legal frameworks and their acceptance by coastal communities, as well as on the existence of an effective and well-supported management system and the delineation of the reserve itself.

All kinds of natural reserves are declared in accordance with the laws in force (such as the Forestry Law - the Environment Protection Law) and in accordance with the requirements of the reserves 2003. After completing the necessary studies for biodiversity, demarcation of borders and conforming to the declaration criteria, the necessary legal instrument to declare the chosen site a natural reserve is issued.

Institutional actors involved in protecting marine and coastal biodiversity:

The coastal strip is administratively attached to the Ministry of Transport - the Public Ports Directorate, which supervises fishing boats and their movements at sea, while the Ministry of Tourism works to supervise its investment in a way that serves the tourism sector. Below is a table showing the institutional actors involved in protecting marine and coastal biodiversity (Table 7):

Table 7

Institutional actors active in protecting terrestrial and coastal biological diversity

Authority	Role assigned
Ministry of Local Governance and Environment	- Preparing national plans and strategies necessary to protect marine biodiversity. - Work on declaring important sites as natural and marine reserves. - Working to protect marine biodiversity from the influence of industrial pollutants and sanitation. - Evaluating the environmental impact of facilities and development projects near the coastal strip.
Ministry of Transport (Ports Directorate)	- It works to implement maritime legislation within ports - Securing the necessary navigational facilities to maintain safe sailing ships. - It works to investigate collisions, ship fires, riots on ships, and marine pollution incidents, whether from a land or marine source - Regulating the movement of navigation within the ports by monitoring the entry and exit of ships. - Survey of Syrian territorial waters and production of object maps.
Ministry of Tourism Ministry of Local Governance and Environment	- The supervision on the coastal strip investment in order to achieve sustainable use.
Public Authority for Fish Resources	- Setting plans and programs to preserve aquatic organisms and develop their resources. - Regulating methods of investing in public waters in breeding and rationalizing fishing in them to ensure the sustainability of fish resources. - Laying down executive plans and programs to develop fish farming in fresh and marine waters to ensure the sustainability of productive activity. - Establishing natural reserves for aquatic organisms and laying down the foundations for their management to ensure the preservation of biodiversity in fresh and marine waters. - Granting licenses to establish fish farms and other aquaculture farms.
Higher Institute of Marine Research	- Preparing national plans and strategies necessary to protect marine biodiversity. - Work on E. Allan important sites of natural reserves and freely. - Working to protect marine biodiversity from the influence of industrial pollutants and sanitation. - Evaluating the environmental impact of facilities and development projects near the coastal strip.
University of Tishreen (City of Latakia)	- Implement researches that will help protect marine biodiversity
Ministry of Water Resources	- It is concerned with protecting water bodies in all their forms.
Planning and International Cooperation Authority	- It is considered as the main body in the process of coordination, compiling the annual plans and preparing the five-year plans in the country in all sectors. It works to attach these plans to the executive programmes for each sector.
Ministry of Finance	- The main government agency that works to allocate the necessary financial resources to support sectors of all kinds, including the protection of marine and coastal biodiversity.

Laws and legislation related to the protection of marine and coastal biological diversity:

Laws and legislation are considered as the main framework to implement national plans and strategies related to protecting the components of terrestrial and marine biodiversity, in addition to the general policy which pays a great importance to protecting marine and coastal biodiversity through the issuance of laws for its protection and the laws and legislations related to the protection of marine and coastal biodiversity:

- Resolution No. 1730 as of 1931: stating the banning of fishing, determining its seasons, granting fishing licenses, and penalties for violators.
- Resolution No. 174 as of 1933: stating the protection of some beneficial bird species by prohibiting hunting them or destroying their nests.
- Aquatic Life Protection Law No. 30 as of 08/25/1964: which defines marine waters in which they are located (10 miles inside the sea), inland waters / rivers, lakes, streams, channels, drains, waterways, ponds, permanent and temporary swamps, the common bays of those waters and what they contain of plant products and animals of economic value: fish, algae and sponge sites.
- Law No. 50 as of 1970: according to which hunting of wild, resident and migratory animals and birds is prohibited, and the violation considered as an economic crime covered by the economic penalties law.
- Law No. 30 as of 07/23/1970: It is the main reference currently available regarding hunting wildlife in Syria. The basic articles of this legislation deal with hunting or dealing with migratory or resident birds.
- Presidential Resolution No. 1239 as of 1985 to form a committee to protect the environment headed by the Minister of State for Environmental Affairs, whose task is to propose anti-pollution legislation, monitor activities related to pollution sources, encourage scientific research to protect the environment, and promote international cooperation in this field.
- Law No. 31 as of 2005: Water Legislation Law to protect water resources and their contents.
- Legislative Decree No. 31 as of 2008 establishing the Public Authority for Fish Resources Protection.
- Environment Protection Law No. 12 as of 2012, which included articles to protect biodiversity with all its components.
- Law No. 24 as of 2012 protecting biodiversity from the effects of genetic engineering and genetic modification.

National strategies and plans and protection of marine and coastal biological diversity:

Syria designed most of the national strategies and plans related to the protection of biodiversity and its natural habitats.

First: Regarding marine and coastal biodiversity:

1 _ Develop the coastal zone management mechanism through estimating the true value of the services provided by the marine ecosystem.

2 _ Introduce the geographic information system and the integration of the field information system in making the right decisions to draw future development plans and programmes.

The following are the most important items included in the national plan for the protection of marine and coastal biological diversity:

Provisions of the Plan	Objectives of the Plan
Assess and mitigate the impact of threats on biodiversity	- Decrease the current rate of depletion of biodiversity - Assess the potential impact of threats on coastal and biodiversity - Support methods of monitoring, control and mitigation of the introduction of alien species.
Prepare a statistical inventory of environmentally sensitive habitats	- Description and mapping of the spatial distribution of sensitive habitats - Preparation of a complete list of species and biological groups
Follow up on threatened and important species	- Determine the geographical distribution in a tight manner. - Assess the dynamics of biological groups - Determine the temporal and spatial distribution
Protect sensitive habitats and species	- Reach absolute protection (safe limit) for endangered species - Establish a Mediterranean network that represents marine and coastal protected areas. - Access to high-value protection from coasts as marine reserves
Coordination and implementation of legislation to protect biodiversity	- Implement the procedures and decisions adopted in international and regional agreements or organizations that participate in the protection of biodiversity and working to include them in national legislations
Establish a national follow-up programme to analyze the social and economic impact of potential changes on biodiversity	- Prepare agreed follow-up protocols to assess the social and economic impacts of changes in biodiversity
An environmental assessment of the impact of direct threats on marine and coastal biodiversity.	- A statistical inventory of the elements that could affect biodiversity (all types of pollution: overfishing and unsustainable fishing, other uses, wild urbanization and tourism infrastructure). - Establish a follow-up network to describe changes at the long term, - Strengthen and establish the legislative tools to monitor tourism construction and protect species
Encourage ecotourism	- Encourage sustainable tourism and ecotourism

Second: Regarding the protection of endangered marine species

The plan included the following issues:

1 _ Inventory of the lists of endangered species, their habitats and the threats

2 _ Preventing the extinction of known endangered species and improving the sustainability of their conservation status, especially for the most degraded species.

3 _ Defining all the main habitats and sites of the endangered species, based on measures related to protection, in order to preserve their quality, integrity, flexibility and function in line with the goals of treaties and agreements aiming at their protection

4 _ Bringing the pressures resulting from (climate change and human activities related to development developments, power lines, underwater disturbances, collision with ships, poisoning, pollution, diseases, invasive species, marine debris, and noise from ships or other human activities such as oil and mineral exploration) to minimum levels to prevent them from being harmful to the preservation and protection of species, especially endangered ones.

5 _ Sustainable management of the use of all fish species, invertebrates, aquatic plants and endangered mammals, in a legal manner and by applying ecosystem-based approaches.

6 _ Respect the knowledge, innovations and practices of local communities related to the protection and sustainable use of endangered species, their habitats, and their sustainable traditional uses of biological resources in accordance with national legislation and relevant international obligations.

7 _ Capacity building is one of the main goals associated with protecting biodiversity.

The international environmental agreements Syria joined and concerned with the protection of marine and coastal biodiversity:

Based on the Syrian interest in protecting biodiversity and the need to protect it on the one hand, and from the need for international cooperation and concerted efforts in protecting biodiversity, Syria joined all the following international environmental agreements:

Name	Date of agreement	N° of law / Decree	Date of global implementation
UN Framework Convention on Climate Change	9/5/1992	Legislative Decree 363	4/3/1996
Convention on Biodiversity	5/6/1992	364	12/29/1993
Cartagena Protocol on Biosafety to the Convention on Biodiversity	1/29/2000	9	2002

Name	Date of agreement	N° of law / Decree	Date of global implementation
CMS Convention for the Conservation of Migratory Species	1/23/1979	65	1979
Agreement on the Conservation of Afro-Eurasian Migratory Waterbirds, AEWA		58	1996
Convention on International Trade in Endangered Species of Animals and Plants, CITES	3/3/1973	Legislative Decree 64	6/1/1975
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	9/10/1998	Legislative Decree 35 as of 7/13/2003	2/24/2004
Convention on the Conservation of Black, Mediterranean, Baltic and Contiguous Regions (ACCOBAMS)	11/24/1996	35	1996
Stockholm Convention on organic materials slow to degrade	22/6/2001	54	10/01/2005
Barcelona Convention for the Protection of the Mediterranean Sea from Pollution	16/2/1976	375	01/25/1979
Amendments to the Barcelona Convention for the Protection of the Mediterranean Sea from Pollution	10/6/1995	24	07/09/2004
Cooperation Protocol to Combat Pollution of the Mediterranean Sea from Oil and Other Hazardous Materials in Cases of Emergency (Dumping Protocol)	16/2/1976		01/25/1979
Amendments to the Dumping Protocol	10/6/1995	5	
Cooperation Protocol for the Prevention and Control of Pollution of the Mediterranean Sea from Ships in Cases of Emergency			01/25/1979
New Emergency Protocol	1/25/2002 signature	4	03/17/2004
Protocol to protect the Mediterranean from pollution from Land-based Sources	17/5/1980	142	12/31/1993
Amendments to the Protocol for Pollution from Land-based Sources		5	05/11/2008
The new protocol for the protected areas, special protection in the Mediterranean RAC / SPA	10/6/1995	32	11/09/2003
Protocol to protect the Mediterranean from pollution from continental investigations and investments, and from the seabed and under the soils (Seabed Exploration Protocol)	10/14/1994	85	09/30/2010
Coastal Domain Integrated Management Protocol		85	09/30/2010
Protocol for the Protection and Disposal of the Mediterranean Sea from Transboundary Hazardous Waste (Protocol on the Transboundary Transport of Hazardous Substances)	1/10/1996	85	01/18/2008

Name	Date of agreement	N° of law / Decree	Date of global implementation
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Basel Convention		Legislative Decree 246	
Amendment to the Basel Convention on the ban decision (1/3)	9/22/1995	Legislative Decree 42	01/05/2005
Basel Protocol on Liability and Compensation for Damage Caused by Transboundary Movements of Hazardous Wastes and Their Disposal	01/12/1999	Legislative Decree 42	01/05/2005

4.3. Transboundary issues and existing, planned or needed coordination / harmonisation at subregional or regional level:

What distinguishes marine biodiversity is that it does not know geographical borders, as it lives in an ecosystem that transcends geographical boundaries. The marine biodiversity in the Mediterranean is similar in the Mediterranean countries in general, and some natural habitats suitable for some species exist on the shores or in the territorial waters of more than one country in the Mediterranean, which makes this habitat environmentally important and requires protection or be declared a transboundary natural reserve.

As for transboundary issues, the Convention on Biodiversity adopted the following:

- The principle of conservation, sustainable use, and benefit-sharing through the inclusion of conservation and sustainable use of biodiversity in all relevant sectors in the management of water resources and river basins.
- Work in cooperation with neighboring State parties to identify protected, transboundary inland water ecosystems, and to reach official recognition and their management.
- Review and distribute relevant information and guidance, including through information-sharing rooms, on national and transboundary experiences and case-studies to assist efforts to establish and sustain protected inland water ecosystems.
- Participation of representatives from countries in managing resources and issuing decisions related to them in the event of cross-border resources.
- Coordination of national measures to address cross-border issues by developing and implementing national standards and creating regional support for risk analysis and regional cooperation mechanisms.
- Consider the nature of the transboundary resources for the distribution of some genetic resources and associated traditional knowledge.

There are no cross-border reserves between Syria and other countries, but there are Syrian beaches and marine waters in Al Hamidiyah which are areas close to the Lebanese-Syrian border, that are environmentally similar to the adjacent Lebanese part, which qualify them to be a shared coastal marine reserve across the border, as well as for Al-Badrusiyya area near the Turkish-Syrian borders, according to the considerations of the two countries in all fields.

5.

Assessment of marine and coastal status and pressures and impacts on the marine and coastal biodiversity

© SPA/RAC, University of Sevilla

5.1. Marine and coastal status and pressures relevant for national marine and coastal areas

The studies conducted on fish resources in the Syrian marine waters indicate the deterioration of the quantitative and qualitative stocks of fish in most times of the year (Ghanem, 2014) and there is a significant deterioration in the outcome of fishing, and several factors affect fish resources in Syria, the most important of which are fishing with dynamite, electric shock and the use of nets. smaller than the permissible limit, which leads to the depletion that we have reached now, in addition to the absence of even one marine reserve along the Syrian coast, which is 183 km long, and most of the decisions taken have no scientific basis and are often canceled within a short period. In addition, the inexistence of farms for marine fish, neither in cages nor in ponds, all this led to the increase in fish prices day after day, and marine fish meals became a luxury.

- The issue of sewage water that flows into the streams of rivers, which in turn flow into the sea without any treatment. We are, here, facing a great challenge unless sewage treatment plants are established. These stations were under construction in 2011 (just before the war on Syria), but with the start of the war, they had not been completed, and since estuaries and shallow coastal waters are biologically rich environments that secure the best flow of energy through food chains and thus the best places for life and growth. The largest human violation lies in these estuaries, and this poses a great danger to the marine and coastal diversity (Sandelle et al., 2011).

- Waste of restaurants and hotels that reach the sea through huge trucks that drop their loads at one time every day. Thus, we are facing the death of very large numbers of fish in the same period and this is repeated every year in the summer period (the tourist season in the months of July, August and early September). In addition to the remnants of olive presses that reach the sea at the time of olive pressing at the end of autumn and early winter. Ultimately, one of the weak-minded fishermen collects the dead fish and sells them to consumers, which causes them health problems.

- The problem of solid waste accumulating on the beach despite the frequent laws to maintain cleanliness, and one of the cases of delinquency and death of cetaceans in Syria was for the sperm whale Physeter macrocephalus caused by the whale swallowing a large plastic bag, which led to its suffocation.

- Baniyas Oil Refinery in Tartous Governorate, one of the hot areas that has been in operation since 1975, and it is one of the sources of thermal pollution of the marine waters adjacent to the refinery and the accompanying decrease in the proportion of dissolved oxygen in the water, which leads to suffocation and death of fish, especially in the summer during the rise Normal temperature (Fig. 17).

Figure 17
Baniyas Oil Refinery

- The Apamea region or what is called the fishing port and the marina in the city of Latakia, which is the area where sewage water of the (tourist) city is discharged, and being a region where ships and boats meet and throw away their waste, which we are not going to mention it now because it needs a long explanation. It is a low regeneration area, which makes it one of Hot spots.

- In the two major regions of the port of Latakia and the port of Tartous, in addition to the solid and large waste, there are wastes of the containers that come to the port daily and that contain many materials that accumulate in this region. There are several other areas which differ in degrees of severity.

6.

Assessment of national priority needs and response actions

© SPARAC, Mathieu FOULQUIE

Despite the great interest that Syria has attached to biodiversity for more than two decades, it has suffered and still suffers from the impact of war and terrorist operations, and therefore the national needs for the protection of biodiversity in general and marine and coastal biological diversity in particular increase.

6.1. Needs

A- At the level of plans and national strategies:

- An action plan for integrated management to mitigate environmental risks and threats to the Syrian coast and its coastal and marine environments.
- Evaluating and rehabilating some endangered marine species, such as Monk seals and sea turtles, and their habitats.
- Combating all kinds of pollution, including biological pollution, resulting from the impact of invasive species on marine biodiversity in Syria.
- Supporting the establishment of a national network for the protection of marine species such as whales and updating the national action plan developed in cooperation with ACCOBAMS.
- Supporting the preparation of the guiding framework for the maritime strategy in Syria.
- Documenting marine biodiversity in Syria in a national database and map.
- Establish criteria to identify areas of critical importance for coastal and marine ecosystem services.
- Completing the steps to establish a national network of wetland reserves and marine and coastal reserves by declaring new protected areas and proposing their integrated management plans. In this regard, we propose to establish at least two marine reserves: the first in the Shuqifat area (Figure 7, Site No. 1), and the second from the Umm al-Toyour area to Ras al-Basit (Fig. 7, sites 4 and 5), noting that the land section opposite to the second zone is already protected. In large part as a forest reserve, it reinforces the justifications to declare the two proposed areas as protected areas: as they are unique habitats that have special importance on the scientific and educational levels (because they are close to many research and educational facilities) and on the aesthetic level (because the two areas possess distinct landscapes, especially the second region), and their ability to play an important role in helping protect the biodiversity in the Syrian waters, for example: the Shuqifat area proposed to be declared a marine reserve, characterized by a special ecosystem, as it is considered as one of the ten most important turtle nest sites on the Mediterranean coast, and

at the same time it is home to some threatened species. Due to pollution problems and various human activities, the conditions conducive to the breeding process of the big-headed turtle have been missing during the past few years.

- Preparing indicators to preserve marine biodiversity in line with the 2030 Sustainable Development Goals.

- Amending all the old decisions on conservation, especially the Aquatic Biology Act of 1964, and setting provisions for all marine life species such as mammals separately, fish separately, and other species, each according to its importance.

B- On the level of capacity building:

Building human capacities and providing tools and equipment that help these human capacities implement the following:

1 _ Ecological or biological description of the important marine areas in the Mediterranean Sea.

2 _ Classification of marine biodiversity for some groups of marine organisms for which we lack specialists.

3 _ How to deal with stranded mammals.

4 _ Establishment of marine reserves and their integrated management.

5 _ Establishing and developing marine aquaculture (marine fish farms).

6 _ Dealing with species invading Syrian shores and marine waters.

7 _ Environmental impact assessment on coastal-marine ecosystem services and biodiversity habitats.

8 _ Setting administrative action plans for marine and coastal-marine reserves (since the foundation stage).

9 _ Preparing the Red List of Marine Biodiversity.

10 _ Implement national legislation related to the protection of marine biodiversity.

C- At the level of research, studies, and legislation:

1 _ Work to bridge the required information gap by implementing more scientific research that provides the data required to develop strategies and protect the ecosystem, and to study biodiversity in deep marine waters (200-800 m) that have not been studied before.

2 _ A study of the direct and indirect impact of the war waged on Syria on marine biodiversity.

3 _ Study the effects of the degradation of marine and coastal habitats on marine biodiversity due to pressure from random and unregulated coastal investment.

4 _ Study the effects of excessive exploitation and violations on the sustainability of marine biodiversity resources in the Syrian territorial waters.

5 _ Study the impact of climate change on the sources and habitats of marine biodiversity.

6 _ The relationship between civil societies and the sources of marine biodiversity and the applicability of the principle of participatory management.

7 _ Support the marine biodiversity research of marine animal and plant groups that were not previously studied and updating research studies related to important marine animal groups such as whales and marine mammals.

8 _ Modernize national legislation for the protection and sustainable management of marine biodiversity and fisheries.

At the level of cooperation with relevant international organizations and conventions:

- Cooperation with international organizations and conventions working in the field of protecting marine and coastal biodiversity is an important and necessary factor to implement national plans and programmes, building technical capacities, implementing research and studies - preparing relevant scientific strategies and reports.

- Signing memoranda of cooperation with national and international centers specialized in protecting marine biodiversity, to effectively achieve national goals and the goals of sustainable development 2030.

- Signing bilateral agreements between neighboring countries and under the auspices of regional and international organizations and agreements to implement and declare joint and transboundary marine reserves, rehabilitate endangered marine species, manage invasive species, and exchange research information and others.

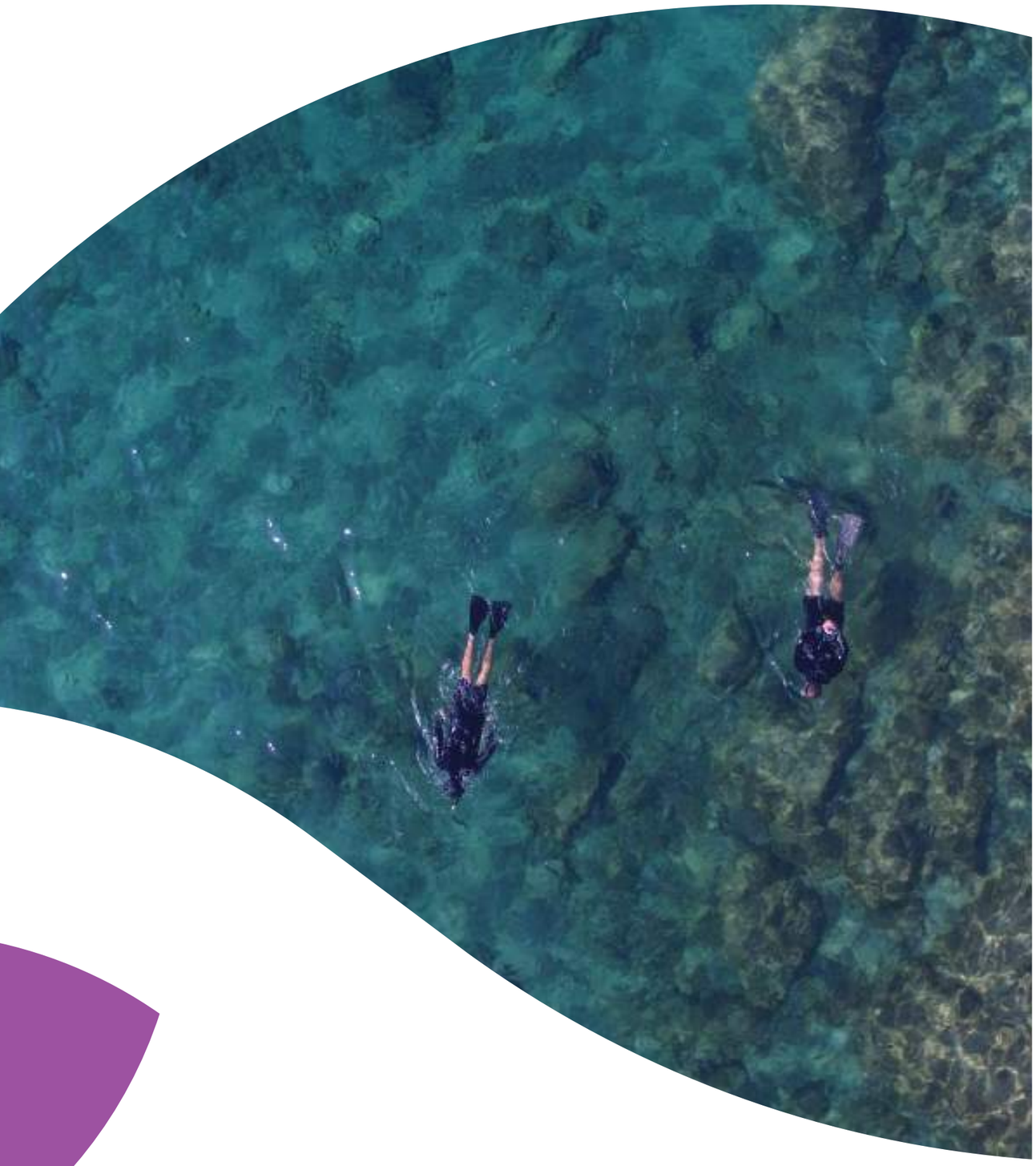
6.2. Urgent actions proposed:

The increasing pressures on marine and coastal biodiversity negatively affect its sustainability and its continuity in providing services and types of services to this unique ecosystem. What made matters worse are the disastrous effects of the terrorist war that Syria was exposed to during the past years 2011-2020, which required that there be priorities and activities of high importance to protect marine biodiversity and rehabilitate its destroyed habitats. These high-priority activities are reflected in the following:

- Defining the ecologically or biologically significant marine areas in Syria.
- Rehabilitating the Fanar Ibn Hani Marine Reserve, prohibiting fishing there for a period of three years, setting up a monitoring programme for the reserve, and re-evaluating it to monitor the abuses that occurred during the war on Syria.
- The immediate declaration of new marine and coastal reserves that contribute to the preservation of marine and coastal biodiversity.
- Work to fill the required information gap through the implementation of more scientific research, especially on biodiversity in deep marine waters (200-800 m).
- Establish an observatory for alien and invasive species and cooperate to monitor the species through the observatory network and the database in the Mediterranean.
- Prepare a strategic plan to manage the coastal strip and address the sources of pollution.
- Prepare a plan for training, qualification and building of national capacities working in the field of protecting marine and coastal biodiversity as a result of the loss of experience due to the impact of the war and terrorist operations, and the high costs.
- Prepare and implement rehabilitation programmes for natural habitats and marine species to preserve the marine biological balance.
- Implement survey and documentation programmes for marine and coastal biodiversity, due to the lack of relevant studies and research.
- Prepare scenarios to respond to the impact of climate changes on marine biodiversity.
- Establish artificial marine reefs in several areas of the Syrian marine waters.

7.

Funding problems and opportunities



© SPA/RAC, Artescienza

Funding and availability of funds are a major and determining factor for the implementation of any program. Achieving the objectives of national strategies and action plans requires the mobilization of the necessary financial resources to implement their projects and executive programs, which requires continuous communication through national authorities and national coordinators with international and national organizations and programmes.

7.1. Regular national sources, potential co-financing for international funding:

When talking about periodic national resources, it is necessary to talk about the impact of war on implementing projects related to the protection of biodiversity:

Syria is a developing country like other countries in the West Asian region, and for ten years it has been suffering from the impact of war and terrorist operations, which led to a change in the definition of national priorities and a difference of opinion among the national parties regarding these priorities, which in turn negatively affected the mobilization of financial resources. The Ministry of Finance is the main source authorized to allocate financial resources according to national programs and priorities, and therefore there has been a significant limitation in the provision of financial resources allocated to the protection of biodiversity, especially since programmes to protect marine and coastal biodiversity require financial resources more than others, as a result of the special requirements of the tasks of maritime biodiversity (providing dedicated boats, diving devices, technical documentation devices, building trained human capacities, costs of technical teams, etc.).

Projects funded by international environmental organizations and programmes able to finance such as the United Nations Environment Programme (UNEP), the Global Environment Facility (GEF), the World Bank, and international centers such as RAC / SPA have played a major role in securing the national needs necessary to support the protection of biodiversity on the one hand, and on the other hand, to build up national capacities in support of its protection, the Syrian Arab Republic during the period 2011-2012 joined the Nagoya Protocol to obtain the benefit from the terrestrial plant and animal genetic resources and the fair and equitable sharing of the benefits arising from them (ABS Protocol and the Nagoya-Kuala Lumpur Protocol Supplementary to the Cartagena Protocol on Biosafety on Liability and Redress for Damage) resulting from genetically modified organisms. Syria, as a State party to the CBD convention and the protocols resulting therefrom, has been committed, while the funding organizations supporting biodiversity abandoned providing support to Syria, even though it is a developing country that meets international standards for material support, in addition to the war and its negative consequences on humans and on nature which led to the increase of its urgent need of financial, technical and logistical support to protect the components of biodiversity from the impact of war and terrorist operations.

During the period 2011-2020, Syria, like other countries, did not receive financial and technical support to implement the following projects:

- Developing and updating the National Biodiversity Strategy in line with the Aichi Global Goals and the 2030 Sustainable Development Goals.
- Preparing the fifth national report like all other State parties.
- The failure to implement the project to achieve the National Biosafety Architecture in Syria despite being signed with the United Nations Environment Program since 2011.

Failure to finance the project of establishing a national network for whale stranding in Syria, until the matter came to a refusal to apply for any support such as the support for the project of preparing national frameworks for the implementation of the ABS protocol. Table 8 lists the projects and programs that need funding during the period 2020-2025.

Table 8

Projects and programmes that need to secure funding during the period 2020-2025 in the field of protecting marine and coastal biodiversity:

The necessary activities for the Syrian Arab Republic to protect marine biodiversity for the period 2020-2025						
N°	Subject	Targets	Implementation mechanism	Results	The outcome	Duration
1	Study of biodiversity in deep marine waters	Identifying all species in deep Syrian waters (200-800 m)	A taxonomic study by a team of national experts, in cooperation with fishermen, to provide fishing equipment and boats	Identifying all species in deep Syrian waters (200-800 m)	Provide a necessary database for developing biodiversity protection strategies	24 months
2	Conducting a study to assess the impact of the Syrian crisis on the marine environment and presenting its results in a national workshop.	Evaluating the impact of the Syrian political crisis on marine biodiversity and proposing corrective actions in the short and medium term.	- Study by national experts. - One-day national workshop.	Evaluating the impact of the Syrian political crisis on marine biodiversity and proposing corrective actions in the short and medium term.	Improving knowledge of the extent of deterioration of the marine environment and taking the necessary measures to rehabilitate it.	8 months
3	Conducting a marine ecological survey of Fanar Bin Hani, the first marine protected area (MPA. It was announced in Syria.	Establishing a biological diversity database in Fener Ras Ibn Hani Reserve	A marine environmental survey by a team of national and international experts	Establishing a biological diversity database in Fener Ras Ibn Hani Reserve	Improving knowledge of ecological features in Fanar Bin Hani Reserve.	16 months
4	Work on declaring the Umm Al-Tayr site a new marine reserve in Syria	The declaration of a new marine protected area on the Syrian coast.	A supplementary marine ecological survey by a team of national and international experts. A supplementary socio-economic study by a national expert. A management plan developed by a team of international national experts. -3 national / local consulting workshops.	The declaration of a new marine protected area on the Syrian coast.	Improving knowledge of the environmental, social and economic characteristics of the Umm Al-Tayr area. -Declaration of the mother of the birds a marine reserve. - Administrative procedures applied in the protected Umm al-Birds reserve	24 months
5	Developing the Syrian national strategy on marine and coastal protected areas .	Providing the Syrian environmental authorities with the national plan for marine and coastal protected areas emanating from the preliminary plan developed within the framework of a project MedMPAnet	The plan was developed by national experts with the support of international experts. - 3 national consultative workshops	Providing the Syrian environmental authorities with the national plan for marine and coastal protected areas emanating from the preliminary plan developed within the framework of a project Med MPA net	A clear understanding of the stages involved in developing a Syrian MPA network - Better integration for issues MPA In the national environmental agenda. Implement the marine and coastal protected areas plan.	12 months
6	Building national capacities to establish and plan MPA management, and to protect threatened species.	Strengthening the Syrian national capacities in the issues of marine and coastal biodiversity conservation.	National training workshops	Strengthening the Syrian national capacities in the issues of marine and coastal biodiversity conservation.	Improving Syrian national experiences in marine and coastal biodiversity conservation issues	conti-nuously

The necessary activities for the Syrian Arab Republic to protect marine biodiversity for the period 2020-2025						
N°	Subject	Targets	Implementation mechanism	Results	The outcome	Duration
7	Allowing Syrian citizens to participate in training courses and capacity-building activities in relation to the preservation of marine and coastal resources (environmental inventory, monitoring of marine species and threatened habitats, establishment and management of marine protected areas, management of alien species, inclusion of threatened marine species, etc.	Strengthening the Syrian national capacities in the issues of preserving marine and coastal biological diversity.	Participation fees for the international / regional training workshops	Strengthening the Syrian national capacities in the issues of preserving marine and coastal biological diversity.	Improving the Syrian national capacities in issues of preserving marine and coastal biological diversity	conti-nuously
8	Examine the declaration of the coastline as being environmentally or biologically important marine areas	Work to conserve the habitats of ***bush*** species	- Holding training workshops to raise the level of national maritime cadres. Establishing and developing marine areas legislation, ecologically or biologically - Numbering the coastline as ecological or biological marine areas	Work to conserve the habitats of ***bush*** species	National codes for EBSA standards. - Training of personnel to advertise marine areas, ecologically or biologically. - Digital maps on marine areas, ecologically or biologically.	12 months
9	Study of biodiversity in deep marine waters		Evaluating old national plans. - Gap detection. Holding national workshops for stakeholders. Introducing the updated national plan.		Updated national plans for the sustainable use of birds, mammals, sea turtles, etc.)	12 months

7.2. International funds, projects, programmes, national eligibility for international programmes/funds (e.g. green funds) identified

International funds financing programs and projects to protect marine and coastal biological diversity:

The protection of biological diversity in general and marine and coastal biodiversity especially in the current and future stage requires:

1 _ Strengthening capacities to provide financial resources.

2 _ Developing a system for partnership between the public and private sectors to mobilize financial resources.

3 _ Development of the multi-source small grants system.

However, international organizations and funds financing global biodiversity programmes play the largest role in assisting developing countries in preparing national strategies, implementation programmes and projects aimed at protecting biodiversity. The following are the most important organizations and funds that support the protection of biodiversity:

1 _ Global Environment Facility (GEF)

2 _ The United Nations Environment Programme (UNEP)

3 _ Specially Protected Areas Regional Activity Centre (SPA/RAC)

4 _ United Nations Development Programme (UNDP)

5 _ United Nations Food and Agriculture (FAO)

6 _ United Nations Industrial Development Organization (UNIDO)

7 _ International Fund for Agricultural Development (IFAD).

8 _ Green Climate Fund (GCF)

9 _ AFD

10 _ European Investment Bank (EIB)

11 _ The World Bank (WB).

International non-governmental organizations:

- International Fund for Animal Welfare (IFAW)
- Wildlife Conservation Society (WCS)
- Shark Conservation Fund (SCF)
- The Pew Charitable Trusts (PEW)

8.

Conclusions and recommendations

© Artescienza

- The first problem facing marine and coastal habitats and biodiversity in the Syrian marine and coastal waters is the problem of pollution (oil, chemicals, sewage water pollution, noise, solid waste), which is an urgent problem that needs to be addressed to limit its effects, and not to exacerbate them, by setting urgent plans to complete the construction of treatment plants in the cities on the Syrian coastline in sufficient numbers and with high efficiency in order to fulfill the purpose, avoid water environment pollution, and develop plans (and strictly implement them) to prevent the transfer of pollutants (agricultural and industrial) through rivers to sea water, as well as setting the necessary plans to reduce oil pollution resulting from fishing and navigation operations, and monitoring ship speeds to reduce the dangers of shocking and killing marine mammals, and complementing this by launching awareness-raising campaigns to reduce the use of single-use plastic waste.

- There is an information and data gap regarding biodiversity in the Syrian marine and coastal waters, despite the presence of many scientific researches, but they are scattered, and do not fall within an integrated plan. There are groups of animals that have not received any scientific research implementation, yet, such as the issue of marine birds and marine mammals. Therefore, it is necessary to develop an integrated research plan, to complete the biological species inventory lists, especially in deep waters (200-800 m), that takes into account the provision of data and information monitoring and analyzing the effects of climate change on biodiversity in Syrian waters and allow for prediction of future changes that will result from climate change and offer the opportunity to develop strategies, conservation plans, and sustainable investment programmes. This gap can be bridged through the formation of a specialized committee of researchers at Tishreen University which is close to the sea, whose mission is to develop and update a list of marine biodiversity and invasive species, and to adopt a research plan that meets the provision of the necessary data to study and analyze the effects of climate change on the ecosystem, with the need to find a source of national and international funding to implement these tasks. We also need awareness-raising programmes and seminars to spread awareness among citizens to preserve marine life in general through local and regional media and through cooperation and coordination between the riparian countries of the Mediterranean, and to include the culture of environmental protection in school curricula.

- Biodiversity in Syria is facing the threat of the flow of alien species in the eastern shores of the Mediterranean, because of climate change and various and growing human activities. In the past few years, the Syrian marine and coastal environment witnessed the recording of many alien species, some of which had the ability to spread and adapt quickly, such as *Pterois miles; Plotosus lineatus; Stypopodium schimperi* species. It is difficult to prevent this flow, but it is necessary to work to limit it as much as possible by preserving the integrity of habitats and increasing the number of marine reserves: establish at least two marine reserves along the Syrian coastline: the first between Latakia and Jableh (note Figure 7, Site No. 1) and considering it a nesting area for sea turtles, the second one in the area from Umm al-Toyour to Ras al-Basit (Figure 7, sites 4 and 5), noting that the land section opposite this area is in large part already protected as a forest reserve. We should pay attention to the protection of the Syrian islands that should provide a source of food and a safe haven for seabirds, and set up policies to manage biodiversity in the Syrian marine

and coastal waters through the legislative regulation of human activities (preventing pollutants from arriving through estuaries, preventing trade with beach sand and seabirds, preventing excessive tourism investment on beaches close to turtle and bird habitats, strict enforcement of laws to prevent fishing by internationally forbidden methods, strict enforcement of laws to prevent fishing by means of coastal cliffs, control and regulate fishing by means of bottom shelf to preserve marine resources and use them sustainably, including deep water resources, reduce habitat stress and sabotage, especially habitats of biological richness, control fishing net openings, and limit the number of fixed fishing cages).

- Fisheries in Syria are facing the problem of overfishing, depletion of stocks, and the use of unauthorized fishing methods such as fishing with dynamite, toxic materials and electric shock, which poses a threat to habitats and biodiversity, the use of fishing nets with small openings to an extent that some fishermen dare use prohibited fishing means such as dynamite in the only marine reserve in Syria, in violation of the instructions in force and away from the eyes of the supervisory authorities, taking advantage of the exceptional circumstances that the country is going through.

- Hold regional training courses under the supervision and support of international organizations to continue building national capabilities, and preparing cadres capable of taking care of the environment and biodiversity in a scientific and technical way, and work to restore international cooperation to ensure the possibility of implementing plans and strategies (capacity building, transfer of the technology of organizing monitoring and its regularity, transfer of regionally approved programmes, and assistance in finding adequate funding after it was stopped throughout the years of the war on Syria).

- There is a lack of data on fisheries management in Syria, and a problem with regular monitoring and control. It is necessary to develop special programmes to discover the populations of sharks and calps in the Syrian marine waters and their types and to develop plans to protect them from overfishing, especially the species of *Carcharhinus plumbeus, Hexanchus griseus, Heptranchias perlo, Mustelus mustelus* that are exposed to overfishing in Syrian waters.

- The relevant official authorities in Syria: the Ministry of Environment and Local Governance, the Ministry of Agriculture (General Authority for Fisheries), in cooperation with academic institutions (the College of Agriculture and the Higher Institute for Marine Research at Tishreen University), and the Syrian NGO to implement the recommendations of the GFCM in general: (Recommendation GFCM / 2012/363 Fisheries Management Measures for the Conservation of Sharks and Rays, Recommendation GFCM / 36/2012/2 on Reducing Bycatch of Cetaceans, and Recommendation GFCM / 35/2011/3 on Reducing Bycatch of Seabirds in Fisheries, and Recommendation GFCM / 35/2011/4 on Bycatch of sea turtles in fisheries). However, the efficiency of fish management is low in Syria, as is the case in the whole Mediterranean region (Coll et al., 2010). It is necessary to establish and develop new approaches and working mechanisms to increase the effectiveness of fisheries management, organize monitoring processes, find ways to implement recommendations regarding the protection of biodiversity in Syria, encourage fishermen to report fishing gear lost in seawater, and work to start using fishing gear that decomposes automatically within a specific period of time. It is desirable to amend the Aquatic Life Protection Act of 1964 in line with the current status of marine and coastal biodiversity, and to establish provisions for the protection of mammals, sea turtles, sharks and calps. Some species that appeared in catches frequently before 2005 are now rare: *Squatina aculeata; Squatina oculata,; Squatina squatina; Alopias superciliosus; Mobula mobular* we also found some endangered species *Carcharhinus plumbeus; Rhinobatos rhinobatos; Glaucostegus cemiculus* have been overfished for more than ten years. In addition, the species *Hexanchus griseus* (which is currently considered non-endangered in the Mediterranean), is exposed to overfishing. It is likely to be threatened in the short term if sufficient measures are not taken to conserve it.

References List

Abbas, Asif. 2014. Three new types of green marine algae recorded on the Syrian shore (Bryopsidales, Chlorophyta). Tishreen University Journal of Scientific Studies and Research, Volume 73 Issue 1. 24-37.

Ajeeb, Mohamed. 2019. A contribution to the study of the effect of microbial pollution of the Rumaila water, caused by human activities, on the marine environment. Master Thesis, Higher Institute for Marine Research, Tishreen University, Syria. 77 pages.

Araj, Hadeel. 2016. Study of the biological diversity of Fucophyceae algae and determine the biomass and biochemical composition of some species of economic and medicinal importance on the coast of Latakia. PhD thesis. October University. 119 pages.

Araj, Hadeel. 2012. Contribution to the study of the biological diversity of marine flora on the coast of Latakia, with special reference to the exotic and economic species. Master Thesis, Tishreen University. 128 pages.

Arbiya, Ezzat. 2011: A study of the changes in the marine benthic agglomeration structures on the Syrian coast, using traditional and advanced benthic indicators. Master Thesis at the Higher Institute for Marine Research - Tishreen University, Syria.

Ali, Malik. 2003. An economic classification study of cartilaginous fishes in the Syrian marine waters, master's thesis, Faculty of Agriculture, Tishreen University, Syria. 184 pages.

Ammar, Izdihar, Ibrahim, Amir, Abbas, Ghayath, 2008. A preliminary study of the distribution of sponges and their associated neighborhoods on the Syrian coast. Tishreen University Journal for Research and Scientific Studies, Biological Sciences Series, Volume 30. Issue 3: 45-64.

Ammar, Izdihar, Ibrahim, Amir, Sweed, Safa, 2010. The biological diversity of prunes, echinoderms, and the associated fish in Burj Islam and Al-Basit (Latakia). Tishreen University Journal for Research and Scientific Studies, Series of Biological Sciences, Volume 32. Issue 1: 209 -226.

Ammar, Izdihar. 2016. "The Structure of Large Invertebrate Benthic Communities in the Deep Syrian Sea Waters. Al-Baath University Journal, Volume 38.

Ammar, Izdihar, Maarouf, Razan, 2016. A new recording of the flying squid Ommastrephaes bartramii Lesueur (1821) in Syrian coastal waters, Tishreen University Journal for Research and Scientific Studies, Volume 38.

Aydek, a. 2010. Guide to Biodiversity in Deir Ezzor Governorate. The Syrian Society for Wildlife Conservation (SSCW), the Society for Middle Eastern, Caucasus and Central Asian Bird Sciences (OSME), and the AviFauna Foundation, Jerusalem House of Science, Damascus, Syria.

Al-Shawi, Firas. 2017. Analytical study of fish stocks of *Pagrus coeruleostictus* in Ibn Hani Reserve - Latakia using mathematical models. Master Dissertation, Higher Institute for Marine Research - Tishreen University, Syria, 87 pages.

Al Sheikh, Bassima. 2013. Contribution to the study of waterfowl in the Syrian coast. Tishreen University Journal for Research and Scientific Studies, Biological Sciences Series. Volume 35-Number 7, 17-29.

Al-Ali, Badr; Ajeeb, Mohamed, 2018. Seasonal changes of the effect of microbial pollution of Rumaila water on coastal marine waters. Tishreen University Journal for Research and Scientific Studies - Biological Sciences Series. Vol. 40, Issue. 2. Pages: 79-98. Syrian.

Ali, M., Saad, A., Ben Amor, M., Capape, C., 2010. First records of the Honeycomb Stingray, *Himantura uarnak* (Forskal, 1775), off the Syrian coast (Eastern Mediterranean), (Chondrichthyes: Dasyatidae). *Zoology in the Middle East*, 49, 104-106.

Ali, M., Saad, A., Reynaud, C. Capape, C., 2013a. First records of Randall's Threadfin Bream *Nemipterus randalli* (Osteichthyes: Nemipteridae) off the Syrian coast (Eastern Mediterranean) off the Syrian coast. A*nnals for Istrian and Mediterranean Studies, Series Historia Naturalis*, (2), 119 -124.

Ali, M.; Saad, A.; Reynaud, C., Capape, C.,2013b. Additional records of honeycomb stingray *Himantura uarnak* (Chondrichthyes: Dasyatidae) off the Syrian coast (Eastern Mediterranean). *Tishreen University Journal for Research and Scientific Studies - Biological Sciences Series*, 35 (4), 216-22.

Ali, M., Saad, A., Soliman, A., 2015. Expansion confirmation of the Indo-Pacific catfish, *Plotosus lineatus* (Thunberg, 1787), (Siluriformes: Plotosidae) into Syrian marine waters. *American Journal of Biology and Life Sciences*, 3 (1), 7-11.

Ali, M., Alkusairy, H., Saad, A., Reynaud, C., Capapé C., 2016a. Confirmed occurrence of common lionfish, Pterois miles (Osteichthyes: Scorpaenidae) in the eastern Mediterranean, with first record off the Syrian coast. Tishreen University Journal for Research and Scientific Studies – Biological Sciences Series, 38(4), 307 -313.

Ali M., Diatta, Y., Alkusairy, H., Saad, A., Capapé, C., 2016b. First Record of Red Sea goatfish *Parupeneus forsskali* (Osteichthyes: Mullidae) from the Syrian Coast (Eastern Mediterranean). *Journal of Ichthyology*, 56 (4), 616-619.

Ali, M., Reynaud, C., Capape, C., 2017a. Has a viable population of Common Lionfish, *Pterois miles* (Scorpaenidae), Eastablished off the Syrian coast (Eastern Mediterranean)? *Annals for Istrian and Mediterranean Studies, Series Historia Naturalis,* 27 (2), 157-162.

Ali, M., Saad, A., Ali, A., Capape, C., 2017b. Additional records of striped eel catfish *Plotosus lineatus* (Osteichthyes:Plotosidae) from the Syrian coast (Eastern mediterranean). *Thalassia Salentina,* 39, 3-8.

Ali, M., Saad, A., Solimn, A. Rafrafi-Nouira, S., Capape, C., 2017c. Confirmed occurrence in the Mediterranean Sea of Red Sea orange face butterflyfish *Chaetodon larvatus* (Osteichthyes: Chaetodontida) and first record from the Syrian coast. *Cahiers de Biologie marine,* 58, 367-369.

Ali, M., Saad A., Jabour R., Rafrafi-Nouira S., Capapé C., 2017d. First record of nakedband gaper *Champsodon nudivittis* (Osteichthyes: Champsodontidae) off the Syrian Coast (Eastern Mediterranean). *Journal of Ichthyology,* 57, 1, 161-163.

Ali, M., Khaddour, M., Capape, C., 2018. Confirmed occurrence of Indian Ocean twospots Cardinalfish *Cheilodipterus novemstriatus* (Osteichthyes: Apogonidae) in the Levantine Sea with first record from the Syrian coast. *Acta Ichthyologica et Piscatoria.* 59 (1): 153-158.

Ali M.F. 2018. An Updated Checklist of the Marine fishes from Syria with emphasis on alien species. Mediterranean Marine Science 19(2): 388-393.

Al-Omari, K. 2008. Action Plan for the Conservation of Sea Birds in Syria. IUCN/ WAME.

Alshawy, F., Lahlah, M., Hussein, C., 2016. First record of the Berber ponyfish *Leiognathus berbis* Valenciennes, 1835 (Osteichthyes: Leiognathidae) from Syrian marine waters (Eastern Mediterranean). *Journal of Marine Biodiversity Records,* 9, 98, 2-4.

Alshawy, F., Lahlah, M., Hussein, C., 2017. First record of the Lessepsian migrant Smith's cardinalfish *Jaydia smithi* Kotthaus, 1970 (Pisces: Apogonidae) from Syrian marine Waters. Basrah Journal of Agricultural Sciences, 30 (2), 45-49.

ALSHAWY F., IBRAHIM A., HUSSEIN C., LAHLAH M., 2019 a. First Record of the Blacktip Cardinalfish *Apogon atradorsatus* Heller & Snodgrass, 1903 from Syrian Marine Waters (Eastern Mediterranean). International Journal of Advanced Research in Science, Engineering and Technology. Vol. 6, Issue 3, March 2019: 9299 – 8302.

ALSHAWY F., IBRAHIM A., HUSSEIN C., LAHLAH M., 2019 b. 2019b. First Record of the Broadbanded cardinalfish *Ostorhinchus fasciatus* (White, 1790) from the Syrian Marine Waters (Eastern Mediterranean). SSRG International Journal of Agriculture & Environmental Science (SSRG-IJAES) – Volume 6 Issue 3:14 -16.

ALSHAWY F., IBRAHIM A., HUSSEIN C., LAHLAH M., 2019 c. First record of arrow bulleye, *Priacanthus sagittarius* Starnes, 1988 from the Syrian marine waters (Eastern Mediterranean), Priacanthus. FISHTAXA (2019) 4(2): 21-24.

Ammar I., fadel S. 2017. Update list of sponges of Latakia Syria- New record exotic species Journal of Entomology and Zoology Studies 2017; 5(2): 1041-1047

Ammar I., Arabia I., 2018. First record of the moon crab *Ashtoret lunaris* (Forskål, 1775) from Syrian coast Mesopot. journal. Maine Science 2018, 33(2): 65 – 70.

Ammar I and Khalifa F. 2019. First record of Brachynotus atlanticus Forest, 1957 (Decapoda, Varunidae) from Syrian coast Species. Report. Vol. 20,151 – 153.

Alnesser Amina. 2009 . Ecological and taxonomical study of the Gammaridae Family (Amphipoda) and it is role as bio indicator at the Coastal Region of Lattakia . PH.D. Science Faculty-Tishreen University-Lattakia-Syria. 298p.

Anonymous, 1976. *Commercial fish species collected by the Korean mission for scientific cooperation in Syria*, local report, Ministry of Agriculture, 76 pp.

Bauchot, M.L., 1987. Poissons osseux, in Fiches FAO d'Identification pour les Besoins de la Pêche (Rev. 1). Méditerrané et Mer Noire, Zone de Pêche 37, Fischer, W., *et al*., Eds., Rome: Comm. Commun. Eur. FAO, vol. 2, pp. 891-1421.

By Ben Haj, S., Cebrian, D., Limam, A., Grimes, S., Halim, Y., Bitar, G., Bazairi, H., Ibrahim, A., Romdhane, M. S., Ed. RAC/SPA, Tunis; 40 pages.

Bethoux, J; Morin, P; Chaumery, C; Connan, O; Gentili, B; Ruiz-Pino, D., 1998. Nutrients in the Mediterranean sea, mass balance and statistical analysis of concentrations with respect to environmental change. Marine Chemistry, 63, 1-2, 155-169.

BirdLife International (2015). Country profile: Syria. Available from: http://www.birdlife.org/datazone/country/syria. Checked: 13/12/2015.

Byrnes, J.E., P.L. Reynolds and J.J. Stachowicz. 2007. Invasions and extinctions reshape coastal marine food webs. PLoS One. 3: e295.doi:10.1371/journal.pone.0000295.

Badran, Muaina. 2013: Nutritional requirements (protein - fat) for young mullet, *Liza aurata,* reared at different salinity degrees. PhD thesis at the Higher Institute for Marine Research, Tishreen University, Syria, 91 pages.

Capape, C., Ali, M., Ali, A., Esmail, A. 2018. Second Mediterranean record of Emperor angelfish, *Pomacanthus imperator* (Osteichthyes: Pomacanthidae), and first record from the Syrian coast. *Cahiers de Biologie marine,* (2018) 59, 395-397.

Castellani, C.; And Edwards, M. Marine Plankton: A practical guide to ecology, methodology, and taxonomy. Oxford University Press, Oxford, UK, 2017. ISBN: 978-19-923326-7. 1st. edition. (2017), 704 P.

Coll, M., H.K. Lotze and T.M. Romanuk. 2008. Structural degradation in Mediterranean Sea food webs: testing ecological hypotheses using stochastic and mass-balance modelling. Ecosystems 11: 939-960.

Coll M, Piroddi C, Steenbeek J, Kaschner K, Ben Rais Lasram F, et al. (2010) The Biodiversity of the Mediterranean Sea: estimates, Patterns, and Threats. PLoS ONE 5(8): e11842. doi:10.1371/journal.pone.0011842.

Dergham, Hani. Study of zooplankton in the coastal waters of Baniyas. Thesis prepared for a master's degree in Aquatic Environment, Tishreen University, Faculty of Science - Marine Research Institute, 1998, 180 p.

Darwish, Akram; Abido, May; Abdullah Ahmed; Al-Attar, Walid; Al-Shaish, Mahmoud; Al-Qayyim, Ghazi; Porter, Richard; Jabour, Sharif. 2008. Syria Birds book, field guide. The Syrian Society for Wildlife Conservation (SSCW) in cooperation with Birdlife. Damascus - Syria 450 pages.

Darwish, Fayrouz. Contribution to the study of phytoplankton in the coastal city of Baniyas. Master Thesis - Tishreen University 1999. 156.

Darwish, Fayrouz; Hassan, Muhannad 2014, To study the changes of Si: N ratio on the specific composition of phytoplankton in vitro. Tishreen University Journal for Research and Scientific Studies - Series of Biological Sciences, Volume (36), Issue (2).

Deeb, Nizar, 2013 Contribution to the study of marine animal primitives in the coastal waters north of Latakia. Thesis prepared for a master's degree in marine biology, Department of Marine Biology, Higher Institute for Marine Research, Tishreen University, Lattakia - Syria (2013), 186 p.

Dioub, 2015. A study of bird diversity in the Ferenlak reserve - Latakia Governorate. Master Dissertation. faculty of Agriculture. Tishreen University 97.

Dede, A; Saad, A; Fakhri, M; Ozturk, b. 2012: Cetacean sightings in the eastern Mediterranean sea during the cruise in summer 2008. J. Black sea/Mediterranean environment. Vol 18. N.1:49-57.

Durgham, H., Ikhtiyar, S., & Lahlah, M. 2012a. Seasonal Variations in Biomass and abundance of Zooplankton in Coastal Waters of Wadi-Kandil, Lattakia, Syria. International Journal of Oceans and Oceanography, 6(1), 1-8.

Durgham, H., & Ikhtiyar, S. 2012b. First records of alien toxic algae Heterosigma akashiwo (Raphidophyceae) from the Mediterranean Coast of Syria. The Arab Gulf Journal of Scientific Research, 30, 58-60.

Durgham H., Ikhtiyar S., Ibraheem R., 2016. "First record of Pelagia noctiluca (Forsskål, 1775) on the coast of Syria". Marine Biodiversity Records, 9 (1), 39.

El-moghrabi, L-Hamidan, N.2011. Birdwatching guide to Sabkhet Al-Jabboul. RSCN, SSCW, SDC, Amman, Jordan

European Environment Agency, 2006. European Environment Agency report, priority environmental issues in the Mediterranean region. No. 4/2006. Luxembourg: Official Publications Office for the European Union. 92 pages.

Faganeli, J.; Falnoga, I.; Benedik, L.; Jeran, Z.; Klun, K. Accumulation of 210Po in coastal waters (Gulf of Trieste, northern Adriatic Sea). Journal of Environmental Radioactivity. (2016), p. 1-7.

FAO, 2016. The State of the World's Fish Resources and Aquaculture. Contributing to Food Security for All, Rome. 2016. 204 pages.

FAO, 2018. The state of world fisheries and aquaculture. Meeting the sustainable development goals. Romw. 2018. 227P.

Foulquie, M., Dupuy de la Grandrive, R., 2003. *First assignment concerning the development of Marine Protected Area on the Syrian coast, from 8-15 November 2002*, RAC/SPA, 33 pp.

Ghazal Asswad, N.2014. Assessment of the National IBAS in Syria. Unpublished Report: SSCW, Birdlife International. Damascus, Syria-Amman, Jordan.

Golani D., Orsi-Relini L., Massuti E. & Quignard J.-P., 2002. CIESM Atlas of Exotic species in the Mediterranean. Vol. 1. Fishes. [F. Briand, Ed.]. 256 pages. CIESM Publishers, Monaco.

Gonzalvo J., Bearzi G. 2008. Action Plan for the conservation of cetaceans in Syria. Regional Activity Centre for Specially Protected Areas (RAC/SPA). 45pp

Gruvel, A., 1931. Les etats de Syrie, richesses marines et fluviales. Exploitation actuelle et avenire. *Societe des editions Geographiques, Maritimes et colonials, Paris,* 453 pp.

Ghanem, Wasim. 2014. Study the dynamics of fish stocks of two species of marine fish, Pagellus erythrinus and lithognathus mormyrus, in the marine ecosystem and their relationship to some biological and abiotic factors. PhD thesis - Faculty of Science - Tishreen University. Syrian. 87 pages.

Halloul, Rasha. 2015. A quantitative and qualitative study of fecal pollution microbes and

their relationship with the chemical properties of coastal waters opposite Lattakia city. Master Thesis, Higher Institute for Marine Research, Tishreen University, Syria, 100 pages.

Hassan, Nidal. 2018. Study of biological characteristics (fertility and sexual maturity) of pearl oysters Pinctada radiata, their hatching and laboratory culture of their larvae. PhD thesis, Faculty of Science, Tishreen University. Syrian 90 pages.

Hamama, Majid. 2014. The vertical distribution of zooplankton under the influence of some major environmental factors in the coastal area of Jableh. Thesis prepared for a PhD, Department of Animal Biology, Faculty of Science, Tishreen University, 370 p.

Hammoud, Nadim; Musa, Sawsan 2002. Classification of phytoplankton species in different locations in the coastal parts of the coastal area north of Lattakia. Jerash for Research and Studies, Volume (7), Issue (1), 41-57.

Hammoud, Nadim; Mayhoub, Hamed; Allan, Tariq 2014. Study of field distribution of phytoplankton species under the influence of some environmental factors. Tishreen University Journal for Research and Scientific Studies - Series of Biological Sciences, Volume (36) Issue (5) 139-155.

Hammoud, Nadim; Deeb, George; Salloum, Amama, 2015. The effect of some environmental factors on the distribution of phytoplankton in the coast of Tartous. Tishreen University Journal for Research and Scientific Studies - Series of Biological Sciences, Volume (37) Issue (2), 249-264.

Hasan H., Zeini A., Noel P. Y. 2008. THE MARINE DECAPOD CRUSTACEA OF THE AREA OF LATTAKIA, SYRIA. Crustaceana 81 (5): 513-536.

Ibrahim Amir; Saleh Hussain; Ghadeer, Samer; Hussein Mohamed; Arabic, Ezzat; Joony, Mohamed. 2015: A geobio-morphological survey of specific areas of the Syrian continental shelf and determining the nature of the bottom. A scientific research report in cooperation between the Higher Commission for Scientific Research and the Higher Institute for Marine Research at Tishreen University, Syria.

Ibrahim, A., Lahlah, M., Kassab, M.K., Ghanem, W., Ogaily, S., 2010. *Signatus javus*, a new record from the Syrian waters, with a reference to growth and feeding of two Lessepsian fish. *Rapport Commission international Mer Méditerranée*, 39, 544.

Ibrahim A., Maaroof R., 2019. First Record of the Squid Sepioteuthis Lessoniana Férussac, 1831 in the Syrian Coastal Water. SSRG International Journal of Agriculture & Environmental Science (SSRG - IJAES) - Volume 6 Issue 1 - Jan to Feb 2019: 52-55.

Ibrahim A., Hussein C., Alshawy F,. Alcheikh A.A., 2020. First Record of Pope's pony fish Equulites popei, (Osteichthyes: Leiognathidae) in the Syrian Marine Waters. Journal of Wildlife and Biodiversity volume (Special issue): X-X (2020) (*http://jwb.araku.ac.ir/*) DOI: 10.22120/jwb.2020.123579.1127.

Ikhtiar, Samir;; Nour al-Din, Saif al-Din, Bakr, Mohamed, 1997. Contribution to the study of the biochemical composition of zooplankton in waters north of Latakia. The Arab Jordanian Conference for Life Sciences and the Fourth Jordanian Conference for Life Sciences, November 8-11, University of Jordan, Amman, Hashemite Kingdom of Jordan.

Ikhtiar, Samir; Dhurgham, Hani, 2019. A description of a case of water blooming (red tide) on the Syrian beaches opposite the city of Latakia. Tishreen University Journal. Biological Sciences Vol (14), No. (3).

Julaq, Samar. 2020. The dynamism of nutrients in their various forms, organic and inorganic, and their association with some mineral elements in the coastal waters of Latakia. PhD thesis. Higher Institute for Marine Research - Tishreen University, Syria. 205 pages.

Karoom, Mahmoud; Yassin Kassab, Mohamed; Batal, Mohamed. 1989. Contribution to the taxonomic study of the Mollusk Division on the Syrian coast - Tishreen University Journal for Scientific Studies and Research, Volume (11), Issue (4).

Kayali, Nur Ghayath al-Din; Tarbush, Amin Khaled; Ghadeer, Samer. 2018a. Pollution of marine waters in the fishing and picnic port and in the commercial port of Latakia on the Syrian coast. Damascus University Journal of Arts and Human Sciences 24, 34.34 pages.

Kayali, Nur Ghayath al-Din; Tarbush, Amin Khaled; Ghadeer, Samer. 2018b. Tidal movements in the eastern basin of the Mediterranean Sea. Damascus University Journal of Arts and Humanities. Volume 40.26 Pages.

Kasparek M. 1995. The nesting of marine turtles on the coast of Syria. Zoology in Ihe Middle Easl 11, 1995

Katsanevakis, S., Wallentinus, I., Zenetos, A., Leppakoski, E., Çinar, M. E., Ozturk, B.,Cardoso, A. C. (2014). Impacts of marine invasive alien species on ecosystem services and biodiversity: A pan-European review. Aquatic Invasions, 9, 391–423. *https://doi.org/10.3391/ai*. 2014.9.4.01

Khalaf, G. Saad, A., Gemaa, S., Sabour, W., Lteif, M. *et al*., 2014. Population structure and sexual maturity of the pufferfish *Lagocephalus sceleratus* (Osteichthyes, Tetraodontidae) in the Lebanese and Syrian marine Waters (Eastern Mediterranean). *Journal of Earth Science and Engineering*, 7 (4) 56 pp.

Krom, M; Kress, N; Brenner, S; Gordon, L. 1991. Phosphorus limitation of primary productivity in the eastern Mediterranean sea. Limnology and oceanography, 36, 3,424-432.

Kuznetsov, A.P.; Sakr, F.; Kucheruk, N. V., Ryybmikov, A. V., 1992. Fauna of the near - Syrian region in the East Mediterranean . P. P. Shirshove Institute of Oenology, Russian Academy of Science, Moscow, Russia and Institute of Marine Research, Lattakia, Syria. J. Hydrobiology.

Lahlah Murhaf, Dargham Hani, Ikhtiyar Samer, 2012. Study of temporal and spatial changes of the values of quantitative abundance of fish and zooplankton in the northern part of the Syrian coastal waters. Tishreen University Journal for Research and Scientific Studies - Biological Sciences Series Volume 34, Issue 2.

Lopes, C. B.; Lillebo, A. I.; Dias, J. M.; Pereira, E.; Vale, C.; Duarte, C., 2007. Nutrient dynamics and seasonal succession of phytoplankton assemblages in a Southern European Estuary: Ria de Aveiro, Portugal. Estuarine, Coastal and Shelf Science, 71, 480-490.

Mamish, Samer, 2013 Study of marine jellyfish in the Syrian coastal waters and their content of trace heavy and radioactive elements. Thesis prepared for a master's degree in marine biology, Department of Marine Biology, Higher Institute for Marine Research, Tishreen University, Lattakia - Syria (2013), 145 pp.

Mamish, Samer; Dergham, Hani; Ikhtiyar, Samer. 2020. Study of the abundance of jellyfish Aequorea forskalea Péron & Lesueur, 1810 in the coast of Latakia. Al-Baath University Journal. Vol 32.

Mayhoub, Hamed. 1989. Brown moss from the Red Sea invades the Syrian shores. Damascus University Journal, Volume 5 - Issue 18: 65-79.

Mayhoub, Hamed. 2004. The presence of tropical brown algae of *Padina tetrastromatica* near Latakia. Damascus University Journal, Volume 20- Issue 2: 77-89.

Ministry of Local Governance and Environment, 2010. MED / MPA Project Report. Two pages.

Ministry of Local Governance and Environment, 2016. Fifth national report. Ministry of Local Administration and Environment - Directorate of Biodiversity, 90 pages.

Ministry of Local Governance and Environment. 2019: Report of the ASI Cetacean Survey Initiative in Syrian marine waters between 7-28-2019 and 8-8-2019. Syrian.

Mamish S., Durgham H., Al-Masri M.S., 2012. First record of Aequorea globosa Eschscholtz, 1829 (Cnidaria: Hydrozoa) in the coast of Syria. Mediterr Mar Sci. 13(2): pp. 259-61.

Mamish, S., Durgham, H., Al-Masri, M. S. 2016. First record of the new alien sea jelly species Marivagia stellata Galil and Gershwin, 2010 off the Syrian coast. Marine Biodiversity Records 9: 23

Mamish S., Durgham H. and Ikhtiyar S. 2019. The first Pelagia noctiluca outbreak off the Syrian coast (the eastern Mediterranean Sea), five years after its first appearance. SSRG International Journal of Agriculture & Environmental Science (SSRG-IJAES) – Volume 6 Issue 3 – p. 72-75.

Mayhoob, H., 1976. Research on marine vegetation of the Syrian coast. Experimental study on the morphogenesis and the development of some little known species. French. Thèse, Univ. Caen, France, 286p.

Mo, G; Gazo, M; Ibrahim, A; Ammar, I; Ghanem, W. 2003: Monk seal presence and habitat assessment results of preliminary mission carried out in Syria. The monachus Guardian. Vol. 6(1).

Moustafa,M; Laila. A. Mohamed, M.A. Mahmoud, W.S, Soliman and M.Y. El-gendy. 2010. Bacterial Infections Affecting Marine Fishes in Egypt. Journal of American Science 2010; 6 (11):603-612.

Murdoch, D,A Vos, R. Abdallah, A. Abdallah, M. Andrews, I. Al-Assad, A. Van Beusekom, R. Hofland, R. Roth, T. Saveyn, B.Serra, G. 2004.A winter surney of Syrian Wetland Expeditition: January- February 2004. Privately Published .London. UK.

Nawar Gerges Suleiman. The role of nutrients (nitrate, phosphate, silicates) in the growth of phytoplankton in the coastal waters of Lattakia. Thesis prepared for the MA in Marine Agriculture and Living Resource Management. Tishreen University, Higher Institute for Marine Research. 2014. 74 p.

Otero, M., Garrabou, J., Vargas, M. 2013. Mediterranean Marine Protected Areas and climate change: A guide to regional monitoring and adaptation opportunities. Malaga, Spain: IUCN. 52 pages.

Otero, M., Serena, F., Girofasilio, F., Poe, M., Baron, M., Arcos, M., Felkano, A., Javier, J. (2019). A guide for identifying endangered species targeted by accident during fishing activities in the Mediterranean. International Union for Conservation of Nature, Malaga, Spain, 204 pages. Rees A. and Saad A., 2004. Report on the status of marine turtles in Syria, 2004. Focus on nesting beach investigation. Tishreen Univerity Laboratory of Marine Sciences. 169 pp.

Rees A., Saad A. and Jony M. 2004. First Record of a Leatherback Turtle in Syria. Marine Turtle Newsletter No. 106, 2004 - Page 13.

Rees A., Saad A., Jony M., 2008. Discovery of a regionally important green turtle *Chelonia mydas* rookery in Syria. Fauna & Flora International, Oryx, 42(3), 456–459.

Ramsar Convention, 1971. The Convention on Wetlands of Special International Importance as a Waterbird Habitat. Two pages.Santhanam, P.; Jeyaraj, N.; Jothiraj, K.; Ananth, S.; Kumar, D.S.; Pachiappan P. Evaluation of the Suitability of Marine Copepods as an Alternative Live Feed in High-Health Fish Larval Production. Basic and Applied Zooplankton Biology. (2018) p. 277-292Ibrahim Amir, 2011. A field study of the sensitivity of the Syrian marine and coastal habitats and vertebrates and the required adaptations to climate change. A report on the scientific research that was carried out at the Higher Institute for Marine Research at Tishreen University and the Higher Commission for Scientific Research. Tishreen University. 101 pages.

Saad, A., 2002. Characterization of Lessepsian migrant fish at Syrian sea waters, In: "Mediterranean Vermitid Terrace and Migratory/ Invasive Organisms" *INOC and SNRSL, Beirut/ Lebanon, 19th-21th December 2002.*

Saad, A., 2005. Check-list of Bony fish collected from the Coast of Syria. *Turkish Journal of Fisheries and Aquatic Sciences*, 5, 99-106.

Saad, A., Hureau, J.C., Hammoud, V., Ali, M., 2002. Fish biodiversity and the impact of environmental factors and human activities in Syrian marine waters. *Proceeding of 9th conference of Arab Union Biologists Aleppo* (1-6 Sep. 2002).

Sabour, W., Saad, A., Jawad, L., 2014. First record of yellowspotted puffer Torquigener flavimaculosus Hardy & Randall, 1983 (Osteichthys: Tetraodontidae) from Mediterranean Sea coasts of Syria, Thalassia Salentina, 36, 29-34.

Skliris, N., 2014. Past, present and future patterns of the thermohaline circulation and characteristic water masses of the Mediterranean Sea. In: "*The Mediterranean Sea. Its history and present challenges*." Goffredo, S. & Dubinsky, Z. (Eds.), *Springer Science,* Heidelberg, pp. 29-48.

Soliman, A., Ali M., Saad, A., Renaud, C., Capape, C., 2014. First records of sideburn wrasse *Pteragogus pelycus* (Osteichthyes: Labridae) off the Syrian coast (eastern Mediterranean). *Annals for Istrian and Mediterranean Studies, Series Historia Naturalis,* 24 (1), 23-28.

SPA/RAC–UN Environment/MAP, 2020. Action Plan for the Conservation of Cartilaginous Fishes (Chondrichtyans) in the Mediterranean Sea; by: Bradai, M N., Ed SPA/RAC. Tunis, 18 pp.

Suzal, A; Bizsel, N; Bizsel, K; Husrevoglu,Y. S. 2008. Dissolved nutrient behavior along the estuarine salinity gradient at the Gediz River Mouth (Aegean sea, Turkey). Turkish Journal of Engineering and environmental science, 32, 2: 67-84.

Secretariat of the Convention on Biodiversity (2014). Global Biodiversity Outlook - Fourth Edition, Montreal, 155 pages.

Subeihi Mithqal, 1994. A taxonomic biological study of bony fish in the waters of the Syrian coast (Lattakia region). Thesis submitted to obtain a master's degree in natural sciences. 264 pages.

Subha, Ali; Sakr, Fayez; Abbas, Ghayath. 2013. The qualitative composition of gastropod assemblages and their migratory and economic types in several sites on the Syrian coast. Tishreen University Journal for Research and Scientific Studies, Series of Biological Sciences, Volume 35, Issue 5, Syria.

Sakr, Fayez; Ammar, Izdihar. 1996. A study of the qualitative composition and abundance of animal ponds in the sub-coastal region of Latakia "- Tishreen University Journal of Studies and Scientific Research - Basic Sciences Series, No. 2.

Sakr, Fayez; Saleh Mohamed. 2008. The qualitative composition of Bivalvia at the shore of industrial facilities in Baniyas, Tishreen University Journal for Research and Scientific Studies - Series of Biological Sciences, Volume No. (4).

Tarbush, Amin, Ghadeer, Samer; Kayali, Noor. 2018. The Water Budget of the Mediterranean Sea (a model for Syrian territorial waters). University of Aleppo Research Journal. Volume 117, 21 pages.

UNEP. 2013. Protocol concerning specially protected areas and biological diversity in the Mediterranean "Annex 2", list of endangered or threatened species.. UNEP, TURKEY,pp

UNEP-MAP RAC/SPA 2009. Sub-regional report on vulnerability and impacts of climate change on marine and coastal biological diversity in the Mediterranean Arab Countries.

UNEP-MAP-RAC/SPA, 2010. Impact of climate change on marine and coastal biodiversity in the Mediterranean Sea: Current state of knowledge. By S. Ben Haj and A. Limam, RAC/SPA Edit., Tunis : 1-28.

Wild- Allen, K; Skerratt, J; Whitehead, J; Rizwi, F; Parslow,J. 2013. Mecanisms driving estuarine water quality: a 3-Dbiogiochemical model informed management estuarne, costal and shelf science, Vol. 135: 33-45.

Yin K.; Qian, P.-Y.; Chen J. C.; Hsieh, D. P.;Harrison P. J., 2000. Dynamics of nutrients and phytoplankton biomass in the Pearl River estuary and adjacent waters of Hong Kong during summer: preliminary evidence for phosphorus and silicon limitation Marine Ecology Progress Series, 194: 295-305.

Zenetos, A., Gofas, S., Verlaque, M., Çinar, M.E., García Raso, J.E. et al., 2010. Alien species in the Mediterranean Sea by 2010. A contribution to the application of European Union's Marine strategy framework directive (MSFD). Part I. Spatial distribution. Mediterranean Marine Science, 11 (2), 381-493.

Zainab, Asmahan. 2004. The effect of sewers on the physical-chemical and biochemical properties and bacterial contamination in the waters of the North Kabir River, Damascus University Journal of Basic Sciences, Volume 16, Issue 2, Syria.

Zainab, Asmahan. 2010. Assessment of the bacterial quality of the Syrian shore waters. Damascus University Journal of Basic Sciences, Volume 26, Issue 1, Syria.

Important note: This document should be the main baseline available for the country to develop the National Biodiversity Strategic Action Plan (NBSAP) in relation to marine and coastal issues.

Annexes

Annex I.

Biodiversity of marine flora in coastal areas up to a depth of 12 m in Latakia and Jableh (Arag, 2016)

Rhodophyta	Phaeoohyceae	Chlorophyta	Seagrass
Alsidium helmminthochorton	*Colpomenia pergeina*	*Bryopsis plumusa*	*Cymode-cea nodosa*
Antithamnion cruciatum	*Colpomenia sinousa*	*Caulerpa prolifera*	
Asparogopsis taxiformis	*Cystoseira spinosa*	*Caulerpa taxifolia*	
Callithamnion granulatum	*Cystoseira amentacea*	*Chaetomorpha linum*	
Caulacanthus ustulatus	*Cystoseira crinita*	*Cladophora pellucida*	
Centroceras clavulatum	*Cystosiera barbata*	*Cladophora albida*	
Ceramium ciliatum	*Cystosiera barbatula*	*Cladophora laetevireus*	
Ceramium diaphanum	*Cystosiera compressa*	*Cladophoropsis modensis*	
Ceramium echionotum	*Cystosiera elegans*	*Codium bursa*	
Corallina elongata	*Cystosiera ercegovicii*	*Codium decorticatum*	
Ceramium.tenuissimum	*Dictyopteris membran-cea*	*Enteromorpha linza*	
Dasya arbuscola	*Dictyota dichotoma*	*Ulva fasciata*	
Dasycladus vermicularis	*Dictyota linearis*	*Chaetomorpha linum*	
Falkenberjia sp	*Dilophus Spiralis*	*Caulerpa scalpelliformis*	
Feldmannia caespitosa	*Ectocarpus confervoides*	*Cailerpa racemosa*	
Fosliella bjolisii	*Hydroclathrus clathratus*	*Halimeda tuna*	
Galaxaura lapidescence	*Padina boryana*	*Anadyomene stellata*	
Galaxaura oblongata	*Padina ditristromatica*	*Derbesia boergesenii*	
Galaxaura rogusa	*Padina pavonica*	*Udotea petiolata*	
Gelidiella pannosa	*Padina tetrasomatica*	*Valonia utricularis*	
Gelidium spathulatum	*Punctaria latifolia*	*Blidingia minima*	
Giffordia mitchellae	*Ralfsia verrocusa*		
Gigartina acicularis	*Rbodymenia ardissonei*		
Gilidium latifolium	*Sargassum acinarum*		
Hypnea cervicornis	*Sargassum vulgare*		
Hypnea musciformis	*Scytosiphone lomentaria*		

Rhodophyta	Phaeoohyceae	Chlorophyta	Seagrass
Jania longifurca	*Spathoglossum solieri*		
Jania rubens	*Spathoglossum variabile*		
Laurencia obtusa	*Sphacelaria fureigera*		
Laurencia pappilosa	*Sphacelaria tribuloides*		
Liagora farinsa	*Stypopodium schimperi*		
Lithophyllum byssoides	*Taonia atomaria*		
Lithothamnion Lenormandii	*Zanardinia prototypus*		
Lophocladia lallemandii	*Cutelaria chilosa*		
Lophosiphonia subadunca	*Nereia filiformis*		
Nemalion helminthooides	*Stypocaulon scoparium*		
Neogoniolithon notarisii			
Polysiphonia ferulacea			
Polysiphonia mottei			
Polysiphonia opaca			
Pterocladiella capillacea			
Gracillaria verrucosa			
Spyridia filamentosa			
Halopitys incurvus			
Acrochaetium savianum			
Peyssoniella squamaria			
Rytiphloea tinctoria			
Erythropeltis cilianis			
Cryptonemia lomation			
Cordylecladia erecta			

Annex II.

Benthic fauna in Syrian waters

Crustacea	Polychaeta	Bivalvia	Gastropoda
Lyptochela pugnax (de Man,1916)	*Polygordius lacteus (Schneider, 1868)*	*Chama pacifica (Broderip, 1835) d*	*Smaragdia viridis (Linnaeus, 1758) d*
Clibanarius erythropus (Latreille, 1818) d	*Aricidea fragilis (Webster, 1879)*	*Parvicardium exigum (Gmelin, 1791) d*	*Tricolia tenuis (Michaud, 1829)*
Macrophthalmus graeffei (A. Milne Edwards, 1873) d	*Streblospio benedicti (Webster, 1879)*	*Parvicardium minimum (Philippi, 1836)*	*Tricolia pontica (Milaschewitch, 1909)*

Crustacea	Polychaeta	Bivalvia	Gastropoda
Galathea Sp	*Mesochaetopterus xerecus (Petersen & Fanta, 1969)*	*Digitaria digitaria (Linnaeus, 1758)d*	*Astraea rugosa (Linnaeus, 1758)*
Phryxus abdominalis (Krøyer, 1840)	*Kefersteinia cirrata (Keferstein, 1862)*	*Digitaria digitaria2 (Linnaeus, 1758)*	*Gibbula ardens (von Salis, 1793)*
Nercolian bivittata&& Nerocila bivittata (Risso, 1816) d	*Odontosyllis fulgurans (Audouin & Milne-Edward, 1833)*	*Cardita calyculata(Linnaeus, 1758) FZ*	*Gibbula umbilicalis (Pesta, 1937)*
Gnathia phallonajopsis (Monod, 1925)	*Cossura longocirrata (Webser & Benedict, 1887)*	*Cardites antiquatus (Linnaeus, 1758) FZ*	*Jujubinus exasperatus (Pennant, 1777) d*
Orchestia gammarella (Pallas, 1766)	*Opisthotrochopodus tunnicliffeae (Pettibone, 1988)*	*Laevicardium oblongum (Gmelin, 1791) FZ*	*Jujubinus gravinae (Dautzenberg, 1881)*
Gammarus chevreuxi (Sexton, 1913)	*Pholoe glabra (Hartman, 1961)*	*Corbula gibba (Olivi, 1792) d*	*Pseudominolia nedyma (Melvill, 1897) d*
Gammarus Sp	*Ophryotrocha globopalpata (Blake & Hillbig, 1990)*	*Donax semistriatus (Poli, 1795) FZ*	*Emarginula elongata (O.G. Costa, 1828)*
Gammarus ligrinus (Sexton, 1939)	*Parougia wolfi (Blake & Hillbig, 1990)*	*Scrobicularia plana (da Costa, 1778) FZ*	*Diodora graeca (Linnaeus, 1758) d*
Phtisica marina (Slabber, 1769)	*Dorvillea rubrovittata (Grube, 1855)*	*Tellina rostillum (Hamley, 1844) d*	*Puncturella noachina (Linnaeus, 1771)*
Lysianassa longicornis (Lucas, 1849)	*Nephtys hombergi(Lamarck, 1818)*	*Tellina sp*	*Diodora italica (Defrance, 1820) d*
Colomastix pusilla (Grube, 1861)	*Nephtys simony (Perkins, 1980)*	*Abra longicallus (Scacchi, 1835)*	*Bogia labronica (Bogi 1984)*
Leptochela sydniensis (Dakin & Colefax, 1940)	*Vanadis Formosa (Claparède, 1870)*	*Abra ovata (Philippi, 1836) d*	*Payraudeautia intricata (Donovan, 1804)*
Leptochela sp	*Phyllodoce (Anaitides) mucosa (Oersted, 1843)*	*Astarte sulcata (da Costa, 1778)*	*Odostomia megastomia lorioli (Hornung & Mermod, 1924)*
Apseudes latreillei (Milne-Edwards, 1828)	*Phyllodoce mucosa (Örsted, 1843)*	*Axinulus croulinensis (Jeffreys, 1847) d*	*Odostomia conoidea (Brocchi, 1814) d*
Bodotria arenosa (Goodsir, 1843)	*Eunice aphroditois (Pallas, 1788)*	*Thracia papyracea (Poli, 1791) i376 FZ*	*Odostomia eulimoides (Hanley, 1844)*
Balanus balanus (Linnaeus, 1758) d	*Lysidice ninetta (Audouin & Milne-Edwards, 1833)*	*Ctena decussata (O.G. Costa, 1829) d*	*Odostomia turriculata*
Decsamin spineventris f528	*Glycera rouxii (Audouin & Milne-Edwards, 1833)*	*Myrtea sagrinata (Montagu)*	*Syrnola fasciata (Jickeli, 1882)*
Aristeomorpha foliacea (Risso, 1827)	*Goniada bobretzkii (Annenkova, 1929)*	*Loripes lucinalis (Lamarck, 1818) d*	*Chrysallida maiae (Hornung & Mermod, 1924) d*

Crustacea	Polychaeta	Bivalvia	Gastropoda
Penaeus semisulcatus (De Haan,1844)	*Hesione pantherina (Risso, 1826)*	*Lepton lacerum (Jeffreys, 1872) I 270*	*Bittium arenarium (da Costa) d*
Parapenaeus longirostris (Lucas,1846)	*Hyalinoecia tubicola (O.F. Müller, 1776)*	*Acanthocardia tuberculata (Linnaeus, 1758) d*	*Bittium Sp*
Metapenaeopsis aegyptia (Galil&Golani, 1990)	*Eteone picta (Quatrefages, 1866)*	*Acanthocardia spinosa (Lightfoot, 1786) FZ*	*Bittium tarentinum (Da Costa, 1778)*
Metapenaeus monoceros (Fabricius,1798)	*Perinereis cultrifera (Grube, 1840)*	*Acanthocardia echinata (Linnaeus, 1758) d*	*Cerithium scapridum (Philippi, 1848) d*
Marsupenaeus japonicus(Bate,1888)	*Ceratocephale loveni (Malmgren, 1867)*	*Acanthocardia paucicostata (G.B. Sowerby II, 1834)*	*Pseudorhaphitoma unicostata (Kilburn & Dekker, 2008)*
Pontocaris cataphracta (Aphia ID: 246191)	*Hediste diversicolor (O.F. Müller, 1776)*	*Clausinella fasciata (da Costa, 1778)*	*Mangelia unifasciata (Deshayes, G.P., 1835)*
Parapandalus narval(Fabricius,1787)	*Syllis gracilis (Grube, 1840)*	*Circomphalus casinus (Linnaeus, 1758)FZ*	*Conus mediterraneus (Brug, 1712) d*
Plesionika edwards (A. Milne Edwards, 1883)	*Syllis spongicola (Grube, 1850) d*	*Cerastoderma glaucum isthmicum (Issel, 1869) i225 FZ*	*Conus fumigates (Hwass in Bruguière, 1792)*
Polycheles typhlops(Heller, 1862)	*Typosyllis variegate (Grube, 1860)*	*Chamelea laminosa*	*Coralliophila meyendorffi (Calcara, 1845)*
Medorippelanata (Linnaeus, 1767)	*Owenia fusiformis (Delle Chiaje, 1844)*	*Chamelea striatula (da Costa, 1778)*	*Eulima glabra (Da Costa, 1778)*
Myra subgranulata (Kossmann, 1877)	*Magelona papillicornis (F. Müller, 1858)*	*Irus irus (Linnaeus, 1758) d*	*Eulima incurva (Renier, 1804)*
Charybdis longicollis(Leene,1938)	*Tharyx multibranchis= Aphelochaeta multibranchis (GRUBE, 1863)*	*Ruditapes philippinarum (Adams & Reeve 1850)*	*Eulima vitreolongata (A. Adams, 1854)*
	Chaetozone setosa (Malmgren, 1867)	*Venericardia antiquate (Linnaeus, 1758)*	*Sticteulima cf. lentiginosa (IP. A. Jan 2005)*
	Serpula vermicularis (Linnaeus, 1767) d	*Venericardia corbis (R. A. Philippi, 1836)*	*Melanella polita (Linnaeus, 1758)*
	Spirobranchus tetraceros (Schmarda, 1861)	*Azorinus chamasolen (da Costa, 1778)*	*Aclis walleri (Jeffreys, J.G., 1867)*
	Armandia cirrhosa (Filippi, 1861)	*Mysia undata (Pennant, 1777) d*	*Raphitoma purpurea (Montagu, 1803)*
	Polyophthalmus pictus (Dujardin, 1839)	*Lajonkairea lajonkairei (Payraudeau, 1826)*	*Raphitoma reticulata (Renier 1804)*
	Haploscoloplos elongates (Johnson, 1901)	*Mactra corallina (Linnaeus, 1758) d*	*Raphitoma rudis (Scacchi, A., 1836)*
	Flabelligera diplochaitus (Otto, 1820)	*Donacilla cornea (Poli, 1791)*	*Mitra cornicula (linnaeus, 1758) d*

Crustacea	Polychaeta	Bivalvia	Gastropoda
	Praxilella gracilis (M. Sars, 1861)	*Glycymmeris violascens (Lamarck, 1814)*	*Bulla striata (Brug, 1792) d*
	Capitella capitata (Fabricius, 1780)	*Anomia ephippium (Linnaeus, 1758) d*	*Bulla ampulla (Linnaeus, 1758)*
	Capitellides giardi (Mesnil, 1897)	*Chlamys nivea (Macgillivray, 1825)*	*Raphitoma sp= Corinnaeturris leucomata (Dall, 1881)*
	Capitella jones (Hartman, 1959)	*Chlamys sp*	*Eucithara capillaris(Kilburn & Dekker, 2008)*
	Heteromastus filiformis (Claparède, 1864)	*Chlamys varia (Linnaeus, 1758)d*	*Gibberula miliaria (Linnaeus, 1758)*
	Notomastus latericeus (Sars, 1851)	*Manupecten sp*	*Cythara taeniata (Deshayes, 1838)*
	Eupolymnia nebulosa	*Chlamys (Proteopecten) proteus*	*Cythara albida(Deshayes, 1838) d*
	Flabelligra diplochaitus	*(Dillwyn, 1817 ex Solander ms.)*	*Eucithara capillaris (Kilburn & Dekker, 2008)*
	Pholoe glabra (Hartman, 1961)	*Musculus costulatus (Risso, 1826)*	*Mitrolumna olivoidea (Cantraine, 1835)*
	Ophryotrocha globopalpata (Blake & Hillbig, 1990)	*Mytilaster lineatus (Gmelin, 1791)*	*Colubraria reticulata (Blainville, 1829)*
	Parougia wolfi (Blake & Hillbig, 1990)	*Modiolus adriaticus (Lamarck, 1819) d*	*Cantharus dorbignyi (Payraudeau, 1826) d*
	Dorvillea rubrovittata (Grube, 1855)	*Brachidonta variabilis (Krauss, 1962) d*	*Buccinum humphreysianum (Bennet, 1824) d*
	Nephtys hombergi(Lamarck, 1818)	*Arca noae (Linnaeus, 1758) d*	*Trphis sowerbyi (Brod)*
	Nephtys simony (Perkins, 1980)	*Striaca lactea (Linnaeus, 1758)*	*Hinia reticulata (Linnaeus, 1758)*
	Vanadis Formosa (Claparède, 1870)	*Barbatia barbata (Linnaeus,1758) d*	*Hinia Sp*
	Phyllodoce (Anaitides) mucosa (Oersted, 1843)	*Lima lima (Linnaeus, 1758) d*	*Nassarius louisi (Pallary, 1912)*
	Phyllodoce mucosa (Örsted, 1843)	*Pinctada radiata (Leachi, 1814) d*	*Sphaeronassa mutabilis (Linnaeus, 1758)*
	Eunice aphroditois (Pallas, 1788)	*Spondylus gaederopus (Linnaeus, 1758)*	*Ringicula conformis (Monterosato, 1877)*
	Lysidice ninetta (Audouin & Milne-Edwards, 1833)	*Saccostrea cucullata (Born, 1779)*	*Pyrunculus fourierii (Audouin, 1826)*
	Glycera rouxii (Audouin & Milne-Edwards, 1833)	*Nucula nucleus (Linnaeus, 1758) d*	*Pyrene scripta (Linnaeus, 1758) d*

Crustacea	Polychaeta	Bivalvia	Gastropoda
	Goniada bobretzkii (Annenkova, 1929)	*Nuculana pella (Linnaeus, 1767) d*	*Mitrella vatovai (coen)*
	Hesione pantherina (Risso, 1826)	*Boinia lupines*	*Ergalatax obscura (Houart, 1996) d*
	Hyalinoecia tubicola (O.F. Müller, 1776)	*Acanthacardia echinataechinata (Linnaeus, 1758)*	*Hydrobia ventrosa (Montagu, 1803).*
	Eteone picta (Quatrefages, 1866)	*Acanthacardia spinosa (Lightfoot, 1786)*	*Turbonilla pusilla (Philippi, 1844) d*
	Perinereis cultrifera (Grube, 1840)	*Anadara diluvii (Lamarck,1825)*	*Turbonilla striatula (Linnaeus, 1758) d*
	Ceratocephale loveni (Malmgren, 1867)	*Cuspidaria rostrata (Dall, 1886)*	*Turbonilla densecostata (Philippi, 1844)*
	Hediste diversicolor (O.F. Müller, 1776)	*Pecten jacobaeus(Linnaeus, 1758)*	*Turbonilla delicate (C. B. Adams, 1850)*
	Syllis gracilis (Grube, 1840)		*Turbonilla lactea (Linnaeus, 1758) d*
	Syllis spongicola (Grube, 1850) d		*Turbonilla sp 5spains*
	Typosyllis variegate (Grube, 1860)		*Turritella turbona (Monterosato, 1877) d*
	Owenia fusiformis (Delle Chiaje, 1844)		*Turritella communis (Risso, 1826)*
	Magelona papillicornis (F. Müller, 1858)		*Cerithiopsis tubercularis (Montagu, 1803) d*
	Tharyx multibranchis= Aphelochaeta multibranchis (GRUBE, 1863)		*Cerithiopsis pulvis (Issel, 1869)*
	Chaetozone setosa (Malmgren, 1867)		*Cerithiopsis tenthrenois (Melvill, J.C., 1896)*
	Serpula vermicularis (Linnaeus, 1767) d		*Biforina perversa (Linneo, 1758)*
	Spirobranchus tetraceros (Schmarda, 1861)		*Metaxa metaxa (delle Chiaje, 1828)*
	Armandia cirrhosa (Filippi, 1861)		*Alvania dorbignyi (Audouin, 1826)*
	Polyophthalmus pictus (Dujardin, 1839)		*Alvania reticulate (Montagu 1808)*
	Haploscoloplos elongates (Johnson, 1901)		*Alvania cimex (Linnaeus, 1758)*

Annex III.

of marine fauna in Syrian waters (Supplement to Appendix 2)

Sponges	Echinodermata	Cephalopoda	Anthozoa	Bryozoa
Chondrosia reniformis	*Luida ciliaris (Philippi, 1837)*	*Brachioteuthis riisei (Lesueur 1821)(Lesueur, 1821)*	*Dendrophyllia cornigera (Lamarck, 1816) d*	*Carbasea papyrea (Pallas, 1766)*
Ircinia sp.	*Astropecten spinulosus (Philippi, 1837)*	*Ommastrephaes bartramii Lesueur (1821)*	*Pennatula phosphorea Linnaeus, 1758*	*Cryptosula pallasiana (Moll, 1803)*
Hippospongia commuis	*Echinaster sepositus (Retzius, 1783)*			*Hincksinoflustra octodon (Busk, 1852)*
Spongia officinalis	*Echinocyamu spusillus (O.F. Müller, 1776)*			*Margaretta cereoides (Ellis & Solander, 1786)* *Retepora jermanensis (Waters, 1909)* *Idmonea serpens Hincks 1880*
Axinella verrucosa				
Axinella polypoides				
Axinella cannabina				
Crambe crambe				
Myxilla incrustans				
Agelas oroides				
Agelas linnaei				

Annex IV.

Exotic bony fish species in Syrian waters: +: a species of economic importance, -: a species that has no economic importance, *: a gas that causes environmental, tourism and economic damage

Type	Spread	Economic importance	The area of the first discovery And its history	First recording
Alepes djedaba	*confirmed*	*+*	*The Syrian coast, 1987*	*Bauchot , 1987*
Apogon atradorsatus	*Once*	*-*	*Baniyas N: 35 ° 14'35.11 ", E: 35 ° 55'12.56")*	*Alshawy et al., 2019a*

Type	Spread	Economic importance	The area of the first discovery And its history	First recording
Apogonichthyoides pharaonis	*confirmed*	-	*The Syrian coast, 1991*	*Sbaihi & Saad, 1992 (in Saad, 2005)*
Atherinomorus forskalii	*confirmed*	+	*The Syrian coast, 1999*	*Saad et al ., 2002*
Callionymus filamentosus	*confirmed*	-	*The Syrian coast, 1991*	*Saad & Sbaihi , 1992 (in Saad, 2005)*
Chaetodon larvatus	*Once*	-	*Tartous 34.83333333 N; 35.85000000 E; 11/27/2016*	*Ali et al. , 2017c*
Champsodon nudivittis	*confirmed*	-	*Gabala, 2015*	*Ali et al ., 2017d*
Cheilodipterus novemstriatus	*confirmed*	-	*35.48333334´N; 35.76666667 E; 2/10/2016*	*Ali et al ., 2018*
Crenidens crenidens	*confirmed*	-	*The Syrian coast, 2001*	*Saad et al ., 2002*
Cynoglossus sinusarabici	*confirmed*	-	*The Syrian coast, 1991*	*Saad & Sbaihi , 1992 (in Saad, 2005)*
Dussumieria elopsoides	*confirmed*	+	*The Syrian coast, 2001*	*Saad, 2002*
Epinephelus fasciatus	*Once*	-	*North of Latakia (Islam Tower), 2002*	*Foulquie & Dupuy de la Grandrive , 2003*
Equulites klunzingeri	*confirmed*	-	*The Syrian coast, 1930*	*Gruvel , 1931*
Equulites popei	*Once*	-	*Baniyas, 2020,(N35 ° 31 '; E35 ° 42',)*	*Ibrahim et al., 2020*
Etrumeus golanii	*confirmed*	-	*The Syrian coast, 2001*	*Saad, 2002 Reported as Etrumeus sadina*
Fistularia commersonii	*confirmed*	+	*The Syrian coast, 2001*	*Saad, 2002*
Hemiramphus far	*confirmed*	+	*The Syrian coast, 1929*	*Gruvel , 1931*
Herklotsichthys punctatus	*confirmed*	+	*The Syrian coast, 2004*	*Saad, 2005*
Hyporamphus affinis	*confirmed*	-	*The Syrian coast, 1996*	*Saad, 2005*
Jaydia smithi	*Once*	-	*Latakia (Ibn Hani), 2016 35.58333333 N, 35.71666667 E;*	*Alshawy et al ., 2017*
Lagocephalus sceleratus	*confirmed*	*	*Latakia, 2012*	*Khalaf et al ., 2014*
Lagocephalus suezensis	*confirmed*	-	*Latakia, 2001*	*Saad et al ., 2002*
Lagocephalus guentheri	*confirmed*	-	*The Syrian coast,*	*Anon, 1976 as L. spadiceus*

Type	Spread	Economic importance	The area of the first discovery And its history	First recording
Leiognathus berbis	*confirmed*	-	*Latakia, 2016 35.98333333 N, 35.71666667 E*	*Alshawy et al., 2016*
Liza carinata	*confirmed*	+	*The Syrian coast, 1995*	*Saad, 1995 in Saad 2005*
Nemipterus randalli	*confirmed*	-	*Latakia, Ras Ibn Hani, 2013 35.60000000 N; 35.66666667 E*	*Ali et al ., 2013a*
Ostorhinchus fasciatus	*confirmed*	-	*Opposite Baniyas, 2019 N: 35 ° 14'35.11 ", E: 35 ° 55'12 "*	*Alshawy et al., 2019b*
Oxyurichthys petersii	*confirmed*	-	*The Syrian coast, 1991*	*Saad & Sbaihi , 1992 (in Saad, 2005)*
Parexocoetus mento	*confirmed*	-	*The Syrian coast, 1997-1998*	*Saad et al ., 2002*
Parupeneus forsskali	*confirmed*	+	*North Gabala, 2015 35.36666667 N; 35.83333333 E*	*Ali et al ., 2016b.*
Pelates quadrilineatus	*confirmed*	-	*The Syrian coast, 2004*	*Saad, 2005*
Pempheris rhomboidea	*confirmed*	-	*The Syrian coast, 1991*	*Sbaihi & Saad, 1992 (in Saad, 2005) reported as Pempheris vanicolensis*
Petroscirtes ancylodon	*confirmed*	-	*The Syrian coast, 2002*	*Saad, 2002*
Platycephalus indicus	*confirmed*	-	*The Syrian coast, 2001*	*Saad et al ., 2002*
Plotosus lineatus	*confirmed*	*	*Tartous, 2014 34.85000000 N; 35.86666667 E*	*Ali et al ., 2015*
Pomacanthus imperator	*Twice*	-	*Gabala, 2017 35.31666667 N; 35.91666667 E;*	*Capape et al ., 2018*
Pomadasys stridens	*confirmed*	-	*The Syrian coast, 2004*	*Saad, 2005*
Priacanthus sagittarius	*Once*	-	*Baniyas, 2019 35 ° 14'35.11"N, 35 ° 55'12.56 "E*	*Alshawy et al., 2019c*
Pteragogus trispilus	*confirmed*	-	*Tartous, 2014 34.85000000 N; 35.80000000 E*	*Soliman et al ., 2014*
Pterois miles	*confirmed*	*	*Lattakia until Jableh, 2015 35.40000000 N, 35.90000000 E & 35.31666667 N, 35.85000000 E*	*Ali et al ., 2016a*

Type	Spread	Economic importance	The area of the first discovery And its history	First recording
, *Rhabdosargus Haffara*	*confirmed*	-	*Lattakia (Islam Tower), 2002*	*Saad, 2005*
Sargocentron rubrum	*confirmed*	+	*The Syrian coast, 1975*	*Anon, 1976*
Saurida lessepsianus	*confirmed*	+	*The Syrian coast, 1975*	*Anon, 1976 as Saurida undosquamis*
Scarus ghobban	*confirmed*	-	*Tartous, 2013*	*Ali, 2018*
Scomberomorus commerson	*confirmed*	+	*The Syrian coast, 1975*	*Anon, 1976*
Siganus luridus	*confirmed*	+	*The Syrian coast, 1930*	*Gruvel , 1931*
Siganus rivulatus	*confirmed*	+	*The Syrian coast, 1929*	*Gruvel , 1931*
Siganus javus	*Once*	-	*Latakia, 2009 35.51666667 N; 35.73333333 E*	*Ibrahim et al ., 2010*
Silhouettea aegyptia	*confirmed*	-	*The Syrian coast, 1992*	*Sbaihi , 1994*
Sphyraena chrysotaenia	*confirmed*	+	*The Syrian coast, 1997*	*Saad, 2002*
Sphyraena flavicauda	*confirmed*	-	*The Syrian coast, 1999*	*Saad et al ., 2002*
Stephanolepis diaspros	*confirmed*	-	*The Syrian coast, 1929*	*Gruvel, 1929 (in Golani et al., 2002)*
Terapon puta	*confirmed*	-	*The Syrian coast, 2003*	*Saad, 2005*
Tetrosomus gibbosus	*confirmed*	-	*The Syrian coast, 2002*	*Saad, 2002*
Torquigener flavimaculosus	*confirmed*	-	*Dredged from Ras Al-Basit to Tartous, 2009*	*Sabour et al ., 2014*
Tylosurus choram	*confirmed*	-	*The Syrian coast, 2001*	*Saad et al ., 2002*
Upeneus moluccensis	*confirmed*	+	*The Syrian coast, 1930*	*Gruvel , 1931*
Upeneus pori	*confirmed*	+	*The Syrian coast, 1991*	*Sbaihi & Saad, 1992 (in Saad, 2005)*

SPA/RAC WORKING AREAS

*SPA/ RAC, the UNEP/ MAP **Specially Protected Areas Regional Activity Centre**, was created in 1985 to assist the Contracting Parties to the Barcelona Convention (21 Mediterranean contries and the European Union) in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).*

POST-2020 SAPBIO

Strategic Action Programme for the **Conservation** of **Biodiversity** and **Sustainable Management** of **Natural Resources** in the **Mediterranean Region**

SPAMI

Specially Protected Areas of **Mediterranean Importance**

Marine turtles

Cetaceans

Specially Protected Areas

Monitoring

Mediterranean Monk Seal

Cartilaginous fishes
(Chondrichtyans)

Coralligenous and other calcareous bio-concretions

Marine vegetation

Marine and coastal bird species
Listed in Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean

Dark Habitats
Habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena

Species introduction and invasive species

POST-2020

SAP BIO

Strategic Action Programme
for the **Conservation** of **Biodiversity**
and **Sustainable Management**
of **Natural Resources**
in the **Mediterranean Region**

UN environment programme

Mediterranean Action Plan
Barcelona Convention

SPA / RAC
The Mediterranean Biodiversity Centre

Specially Protected Areas Regional Activity Centre (SPA/RAC)
Boulevard du Leader Yasser Arafet
B.P. 337 - 1080 - Tunis Cedex - Tunisia
+216 71 206 649 / +216 71 206 485
car-asp@spa-rac.org
www.spa-rac.org

MAVA FONDATION POUR LA NATURE

This publication has been prepared
with the financial support of the MAVA foundation