



MERSIN INTERNATIONAL PORT A MEMBER OF PSA GROUP

**MERSIN PORT EXPANSION PROJECT
PHASE 2 DOCK CONSTRUCTION AND DREDGING PROJECT
MARINE ECOSYSTEM ASSESSMENT REPORT**



March 2022

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1. INTRODUCTION

The project includes the process of “Additional filling and constructing of a new port for Cruise Vessels and Container ships” in Mersin Cruise and Container Port which is run by Mersin International Port Corporation (MIP) in Mersin Port in Akdeniz province, Mersin City. Thus, dredging will be conducted while the main breakwater will be shortened for 100 meters.

An additional filling which has a total footprint of $176.335 \text{ m}^2 - 164.490 \text{ m}^2$ for container port filling and 11.845 m^2 for cruise port filling- will be constructed in the south and the west of the 27.912 m^2 - constructed land which has already finished according to the EIA (Environmental Impact Assessment) positive decision.

The port will not serve for cruise ships anymore because of the new additional filling planned in this project. Thus, a new cruise port will be built on the ground of new filling area, which is located in the south of the present cruise port, and it will have 11.845 m^2 – included in the filling ground with total footprints of 176.335 m^2 .

Moreover, because of modelling studies it is decided that the- $2370 \text{ m} \times 8 \text{ m}$ - main breakwater (eastern breakwater) will be shortened for 100 m and will be $2270 \text{ m} \times 8 \text{ m}$, and dredging will be performed in order to reach draft depth for bigger vessels, so the ships may approach easily and safely.

After the filling yard has been completed, there will be no change in the total number of terminals. Following construction of the new additional filling area in the western part of current filling yard, 3 terminals, which will be 743- meter- long in total, will be built in the place of existing ports; furthermore, a new 368- meter- long terminal will be added to the existing terminals in the eastern part of the current filling area. Thus, the total number of terminals will not change. After the new additional filling yard has been completed, any sorts of operational activities such as handling, loading, and unloading will not be conducted in the quays except for the terminal no. 1 – the cruise terminal.

In addition to this, an additional filling area will significantly increase the capacity of ships accepted by the port. When the project has been put into effect, the current capacity of handling containers will increase from 2.6 million TEU (Twenty-foot Equivalent Unit) to 3.6 million TEU, and that of storage will go up from 2.1 million TEU to 2.9 million TEU.

In this context, the operations conducted in related to this project can be explained under 4 main headings,

1. Additional Fill Area
2. A New Cruise Terminal Fill Area
3. Shortening of the main breakwater for 100 m
4. Dredging

Additional Fill Area (Footprint, 164.490 m²)

The fill area has about 164.490 m². It is planned to fill the western and front part of the terminal no. 1 where cruise ships are approaching as well as the the front parts of berths no. 2 and 3 and the front part of concrete yard which has been constructed in a 27.912 m² footprints according to EIA positive decision (Figure 1).



Figure 1 Additional Fill Area

A New Cruise Terminal Fill Area

As a result of new fill area created in the project, Mersin Port will not serve as a Cruise port anymore. Thus, a new fill area will be made and it will have 11.845 m² yard which will be located in the west part of the existing cruise port (far from it for 80m away). (Figure 2)

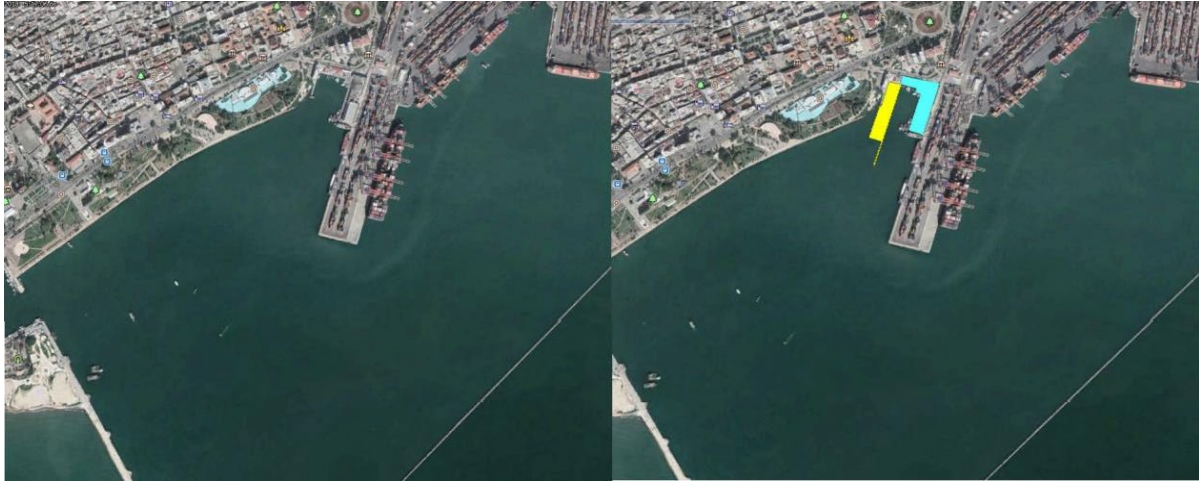




Figure 2 New Cruise Terminal Fill Area

-  Existing Cruise Terminal
-  New Cruise Terminal Area (11.845 m²)

Shortening the main breakwater for 100 m

The main breakwater will be shortened for 100 m to let ships berth and maneuvering easily as a result of modelling studies conducted during the planning of the project. (Figure 3).




-  Shortening the main breakwater for 100 m

Figure 3 Shortening the main breakwater for 100 m

Dredging

The purpose of the bottom dredging is to reduce the elevation of the sea level at the bottom of the port and on the access roads due to sedimentation and organic sediments in the sea, and to provide the bottom depth where the ships with large drafts can safely approach. Within this scope, the dredging will be conducted in the total volume of 4.275.322,80 m³ including berths, the front parts of terminals and approaching channels regarding the decision of EIA Not Required dated 24.04.2008. (Figure 4)

Within the scope of the project, the figure 5 shows that a dredging process with volume of 3.283.046 m³ is being planned to be conducted in the area which has 2.120.000 m². Dredging will be operated physically in water and neither chemical substances nor explosives will be used under any circumstances.



Figure 4 The areas where the dredging process will be performed.



Figure 5 Project Impact Area

2 SCOPE OF THIS STUDY

Findings and evaluations related to biodiversity (algae, zooplanktonic organisms, benthic organisms, and fish) and the habitats (biotopes) concerned which can be affected by International Mersin Port Expansion studies are provided in this study.

A fieldwork was carried out on December 08, 2018 to identify the biotopes (habitats) inside the port and to determine the biological diversity they live in. On the other hand, another fieldwork was conducted on April 18, 2021 in order to implement a benchmark evaluation of the biological diversity in the habitats determined in this study using the control stations located away from the impact area of the project, so that biodiversity indexes and clustering analysis are created based on the macro biological diversity data. Finally, a marine habitat map of the project impact area which covers inside and outside the port (considering dredging activities) was created with the field studies carried out on 20-21-22 December 2021. In this field study, coastal zone habitats of immediate surroundings were also evaluated considering sensitive species like monk seals and sea

turtles and other fish species. In addition, the project impact area, its immediate surroundings, and the region were evaluated depending on literature search in terms of sensitive species (Figure 6).

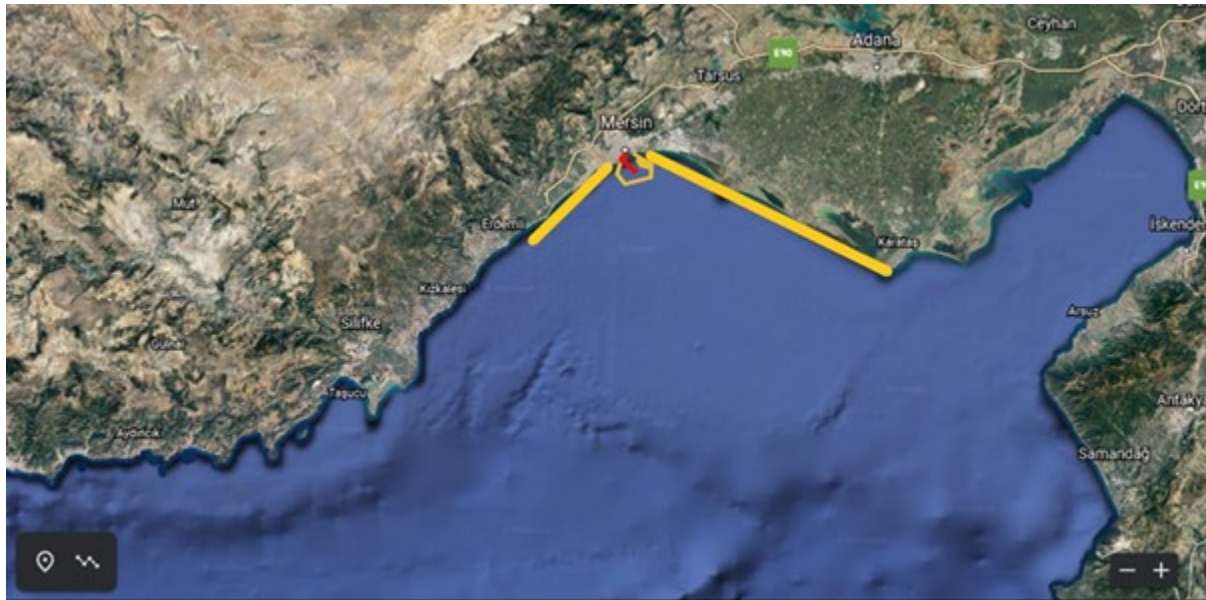


Figure 6. Scope of the study and literature search (Project impact area: MIP; project area immediate surroundings [the coastline scanned in the vicinity of the project area is marked with a yellow line] and the region [Mersin and Iskenderun Bays]).

In summary, the following studies have been conducted to evaluate the impacts of the planned filling and dredging areas on the marine biodiversity/ecosystem,

- Identification of marine habitats of the project impact area
- Detection of marine organisms (macro and microalgae, zooplanktonic organisms, benthic organisms and fish) of to the areas to be filled and dredged
- Comparative evaluation (statistical) of the biodiversity and related habitats of the project impact area with control stations chosen from immediate surroundings
- Identification of rare, sensitive, endemic, protected species and their conservation status in the project impact area, immediate surroundings and the region
- Evaluation of habitats and the biodiversity of rare, sensitive, endemic, protected species in the immediate surroundings of the project area
- To determine the extent to which the marine ecosystem and biodiversity in the region will be affected by the activity.

3 EVALUATION OF COASTAL ZONE HABITATS OF THE PROJECT AREA

Methodology

Habitats (terrestrial and marine) in the coastal zone were evaluated and mapped (marine habitat map) in this study. Within the scope of the study, a direct observation technique (Surface controlled camera) was used to map marine habitats, especially targeting seagrass like *Posidonia oceanica*, and to monitor their distribution in general. A general bathymetric map and low/medium resolution satellite map were used as auxiliary layers in the GIS environment to present the determined habitat features with physical structures and geographical accuracy (Figure 7).

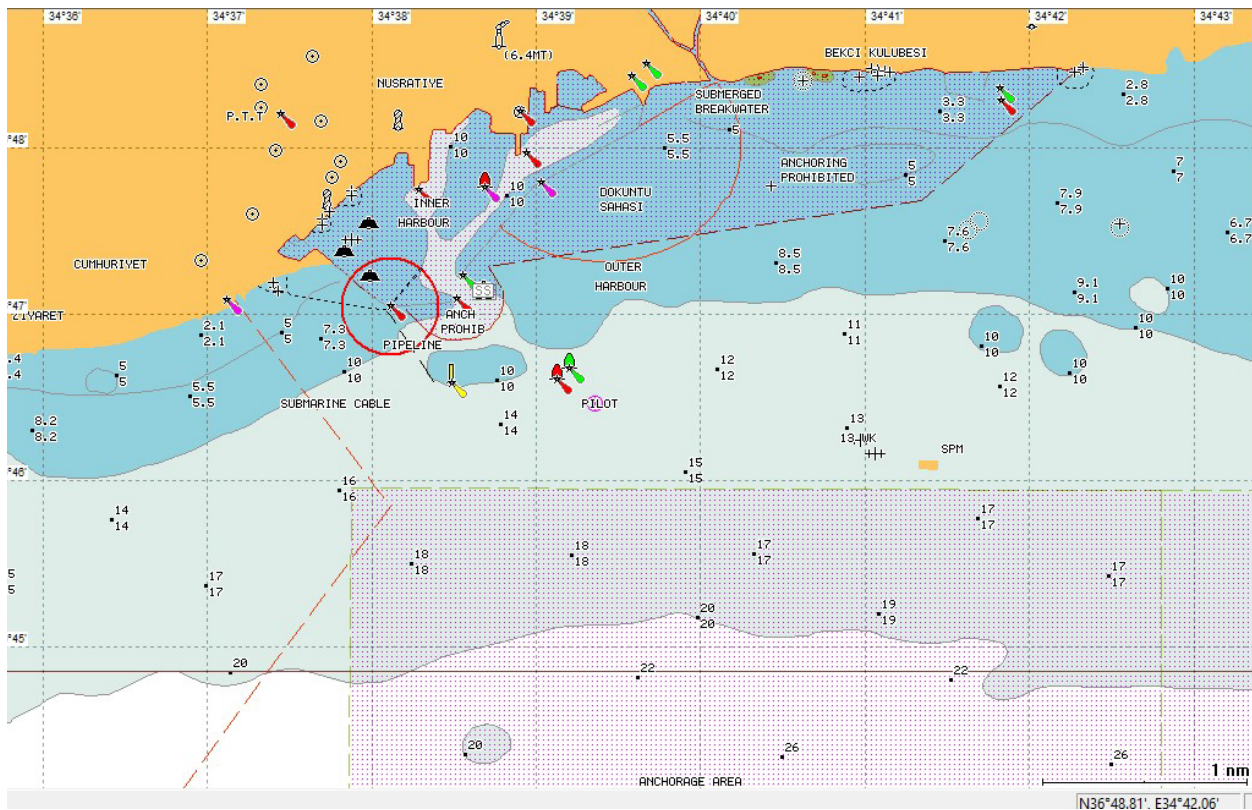


Figure 7: Bathymetric chart of the study area.

Direct (Underwater Robot [ROV], Surface Controlled Camera Underwater Visual Counting [UVC]) and indirect (Remote Sensing Techniques [Sonar, Side-scan sonar, Satellite images, etc.]) observation techniques can be used (Cogan et al., 2009; Freitas et al., 2003; Ierodiaconou et al., 2007; Kenny et al., 2003; Kostylev et al., 2001; Mumby et al., 1999) for mapping marine habitats

to be used for the preparation of ecosystem-based environmental management plans (Marine Protected Areas, fisheries management plans, Port Management Plans, EIA, Strategic EIA, etc.)

The resolution (sensitivity) of the map to be generated/created depends on the purpose of the study, the size of the area, available facilities, project budget, and environmental parameters in the area (Mumby et al., 1999; Mumby et al., 2002; Pasqualini et al., 2005). Satellite images can be used to scan large areas. A quick conclusion can be reached by combining the reflection differences determined in the high/medium resolution satellite image obtained with the ground features. However, satellite images cannot be used after a depth of 15-20 meters due to the turbidity (Mumby et al., 1999). Studies on scanning the seafloor with sound waves are developing. Using sound waves (Side Scan Sonar [SSS] and Sonar) is an effective technique for rapidly scanning the seafloor spreading over large areas (Kenny et al., 2003). However, this technique is not easy to use in shallow waters, and there may be errors in the determination of biotic and abiotic features near the bottom. Although this method, which is used to scan large areas quickly and indirectly provides information (shape and coloration of sound waves), is relatively easier, it does not allow detailed mapping of some habitats. Although this system creates clear images by scanning objects at a certain height from the base, it cannot detect objects and structures very close to the bottom (Kenny et al., 2003).

In summary, the technique applied in this study, which is direct observation and sampling (where available), require very high investment (boat, personnel) and budget. However, it is preferred to be used due to very high accuracy as stated in Mumby et al. (1999).

In order to map the marine habitats a field work was done at 21.12.2021 with an 11 m boat which have quick manoeuvring and can be used in shallow waters. A surface-controlled camera (aqua-vu) deployed on boat with a 50-meter cable was used for detecting features. The features were monitored continuously during the travel in parallel transects (lines) to the shore, with 50 meters of distance between each transect in the study area. GPS coordinates were recorded by the system during the travel together with information of the features of the bottom inserted manually by the observer when needed. With this simple technique, borders of the different habitat types together with their coverage can be determined in detail.

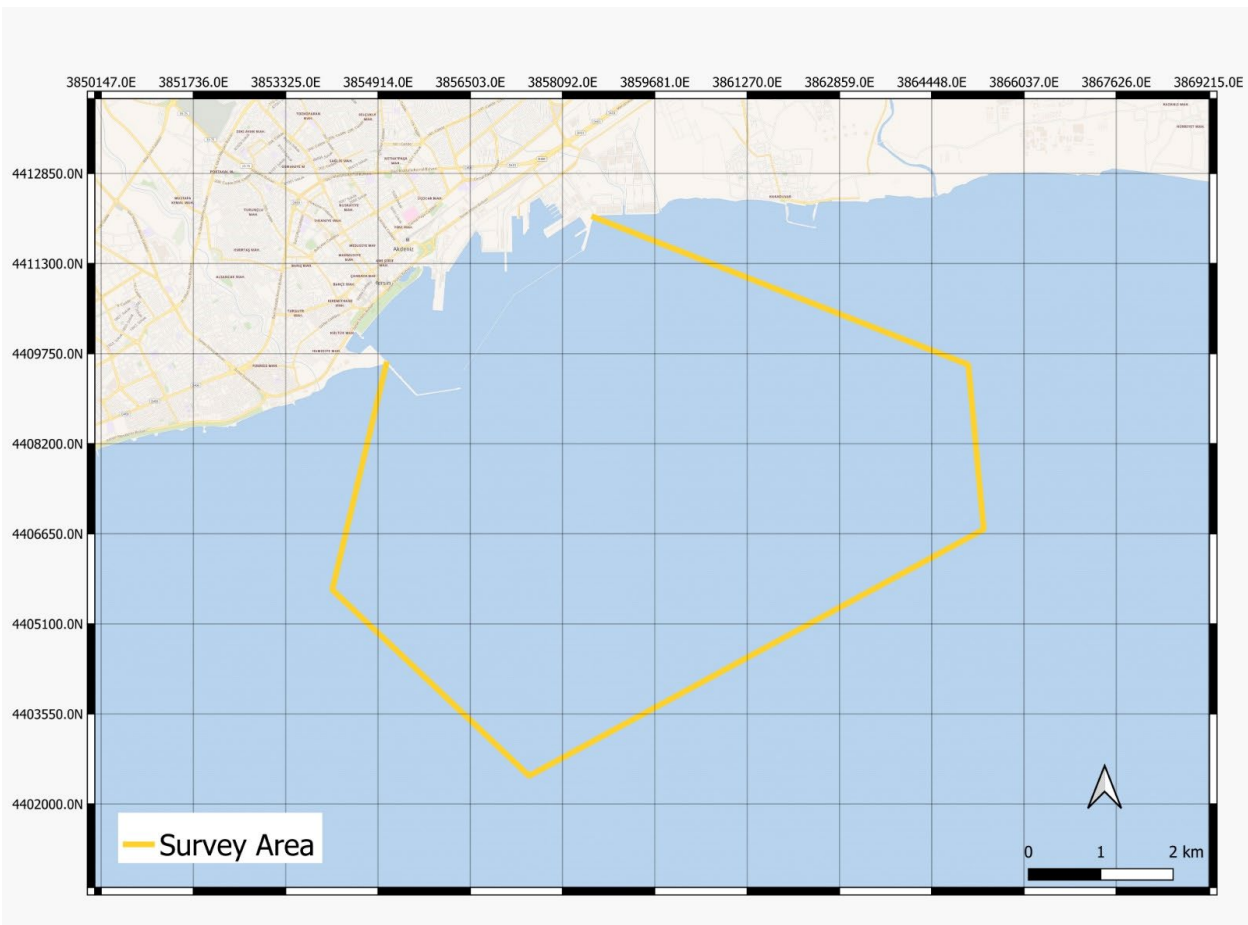


Fig 8: Area surveyed.

Findings

Habitats in the coastal zone (terrestrial and marine) and the dispersal of those habitats (marine habitat map) have been evaluated in this study.

Coastal Structures and Terrestrial Habitats on the Coastal Zone

The coastal zone shows a “low coast” structure; however, initial features have been vanished after the construction of piers of Mersin Marina. It has been determined that the back coast has also been completely disappeared due to Mersin Port storage areas and administrative buildings, and that the buildings belong to port starts to show up from the first meter at the end of the coast.

It was found that the new built coastal structure consists of breakwaters, large rocks dumped into the sea to build the port docks, and pier feet (Photograph 1).



Photo 1. Port and dock structures.

Marine Habitats

Four different types of marine habitats were determined in the study area. They are named as breakwater rock, hard substratum, rocky and muddy. No seagrass habitat was observed during the study. No data was recorded at a very small proportion of the study area at the field work is shown as data deficient on the map. Due to technical problems encountered, system didn't record GPS points at data deficient areas. Although, there was no observation/manual record of a critical habitat other than muddy, those GPS data lacking areas are left as Data Deficient.

The habitat close to the shore is the breakwater rock (artificial reef) habitat formed by rock fragments and pier legs (concrete) used to construct berths and breakwaters. This rocky habitat has the characteristics of an "artificial reef" since it was created by human, and it creates caves, caverns

including dark environments because of natural rock forms. It has got rich biological diversity like the natural rocky habitats/formations on the shores of the region (Photo 2 to 8).

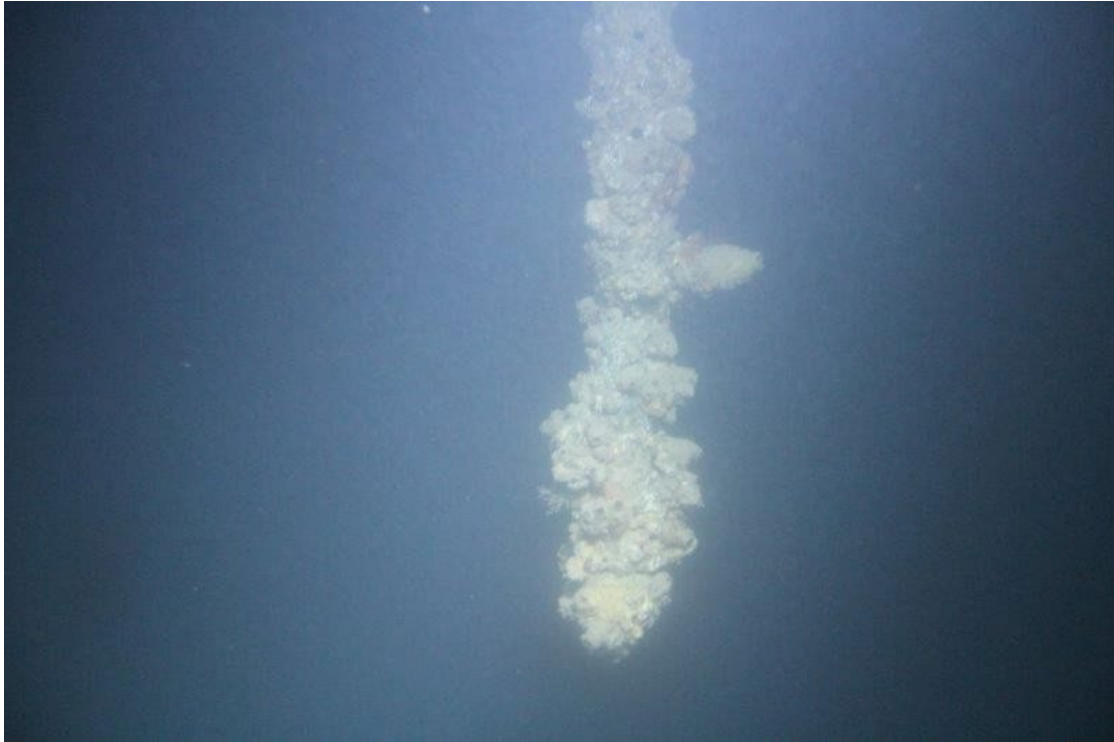


Photo 2. The pieces of rock and Rocky areas created by Pier Legs (concrete)



Photo 3 Rock Biotope-2



Photo 4. Rock Biotope-3



Photo 5. Rock Biotope-4



Photo 6. Rock Biotope-5



Photo 7. Rock Biotope-6



Photo 8. Rock Biotope-7

The dominant marine habitat inside and outside of the port is “muddy habitat” as shown on the habitat map. This soft substratum on the bottom starts just after the shore and the breakwater rocks (Photo 9, Figure 8). This mud bed is characteristic of the area (Mersin and İskenderun Bays) at the freshwater input points and especially in ports and harbors. It is formed by the accumulation of very fine-grained material transported to the bottom of the bays, inlets and harbours over the years, regardless of the depth, due to the extremely limited wave/current effect. This pattern of such bottoms is used by the burrying and mud-sand dwelling species. Moreover, the smallest movements in the water column such as tiny inflows, varied flows, propeller effect stimulates turbidity above the natural surface. Although it is a normal circumstance in the freshwater input points of Mersin and Iskenderun Bays, it is much more intense and long-lasting inner parts of the port.



Photo 9. Muddy Biotope

According to the observations, a hard substratum formed by deposits of pebbles is found in front of the main breakwater and only a small proportion of the survey area is “rocky habitat”

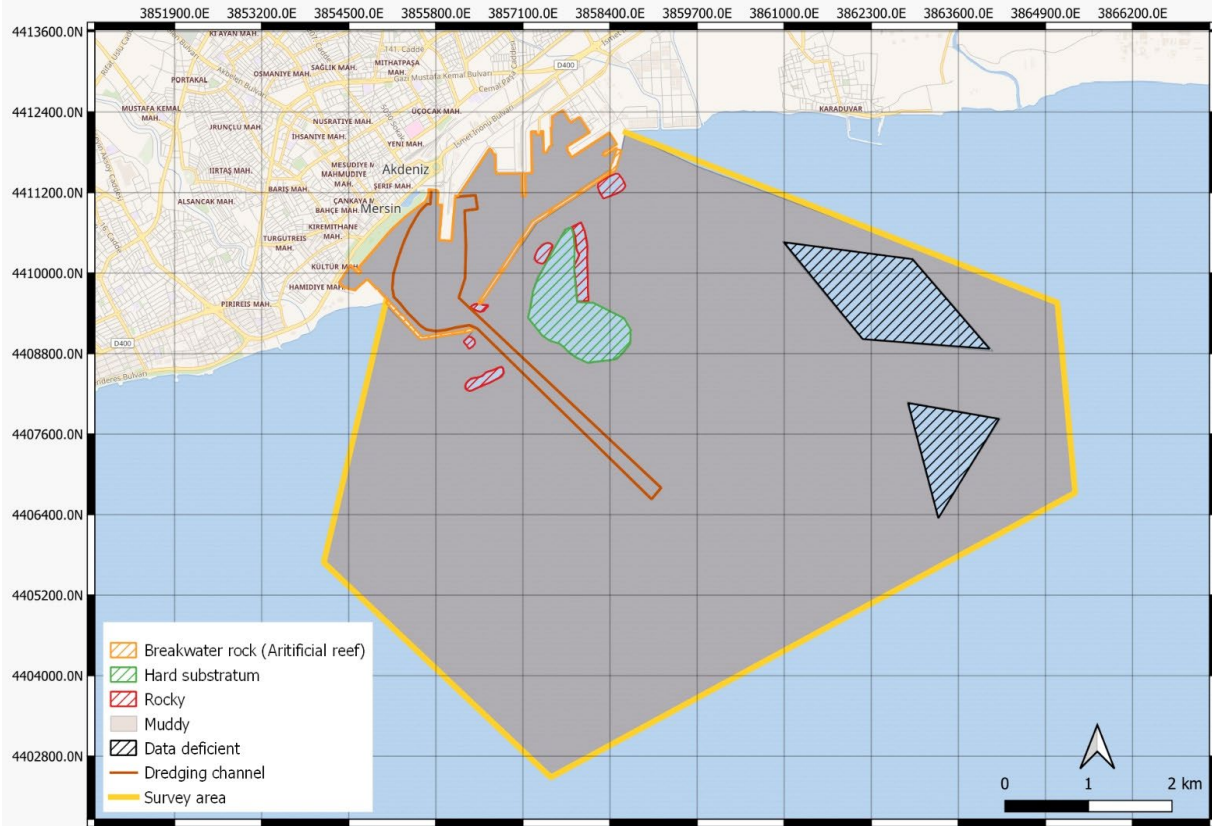


Figure 9. Marine Habitat Map of the surveyed area.

In summary, 34 km² area is surveyed under marine habitat mapping studies. In the surveyed area, 0,95 km² is found as hard substratum, 0,32 km² as rocky and the rest is muddy habitat. Species that occur in related habitats are listed in related sections of this study. No important marine habitats (e.g., *Posidonia oceanica* – seagrass beds, *Cladocora caespitosa* - Mediterranean Pillow Coral; EN), and specific habitats of other threatened species were detected/observed except the possibility of their abundance related as possible feeding behaviour or being on immigration routes.

The habitats observed in Underwater Visual Census (UVC) were also evaluated according to EUNIS habitat types. EUNIS habitat types with EUNIS and Red List Codes are given in Table 1.

Table 1. EUNIS habitat types with Red List Codes.

Biotope types of the survey area and control area	EUNIS Level	EUNIS Code	Red List Code	Name
Breakwater rock	4	MA153	A1.13	Biocenosis of Mediterranean upper mediolittoral rock
Breakwater rock	4	MA154	A1.14	Biocenosis of Mediterranean lower mediolittoral rock
Breakwater rock	4	MA154	A1.23	Biocenosis of Mediterranean lower mediolittoral rock
Breakwater rock	4	MA154	A1.34	Biocenosis of Mediterranean lower mediolittoral rock
Breakwater rock and Rocky	3	MB15	A3.36	Mediterranean infralittoral rock
Hard substratum and muddy	4	MB151	A3.1x	Biocenosis of Mediterranean infralittoral algae
Breakwater rock	3	MB25	A5.6v	Mediterranean infralittoral biogenic habitat
Hard substratum	3	MB35	A5.13	Mediterranean infralittoral coarse sediment
Hard substratum	3	MB45	A5.5x	Mediterranean infralittoral mixed sediment
Muddy	4	MB551	A5.23	Biocenosis of Mediterranean fine surface sands
Muddy	4	MB552	A5.23	Biocenosis of Mediterranean well sorted fine sands
Muddy	4	MB553	A5.28	Biocenosis of Mediterranean superficial muddy sands in sheltered waters
Muddy	4	MC451	A5.38	Biocenosis of Mediterranean muddy detritic bottoms

4 MARINE BIODIVERSITY

4.1 Planktonic Organisms

Two different sampling points (stations) targeting different habitat types have been selected for sampling planktonic organisms. Sampling covered both muddy and rocky habitat types which are the two dominant habitat types in the project impact area (Table 2, Figure 10).

Table 2. Sampling Stations for planktonic organisms

Station	Coordinate	Introduction	Habitat
Station Number L_1	646051.00 E 4073273.00 N	Sampling area 500 m away from the original/initial coast	Breakwater Rock
Station Number L_2	646212.87 E 4072561.94 N	Sampling area 1 km away from the original/initial coast	Muddy

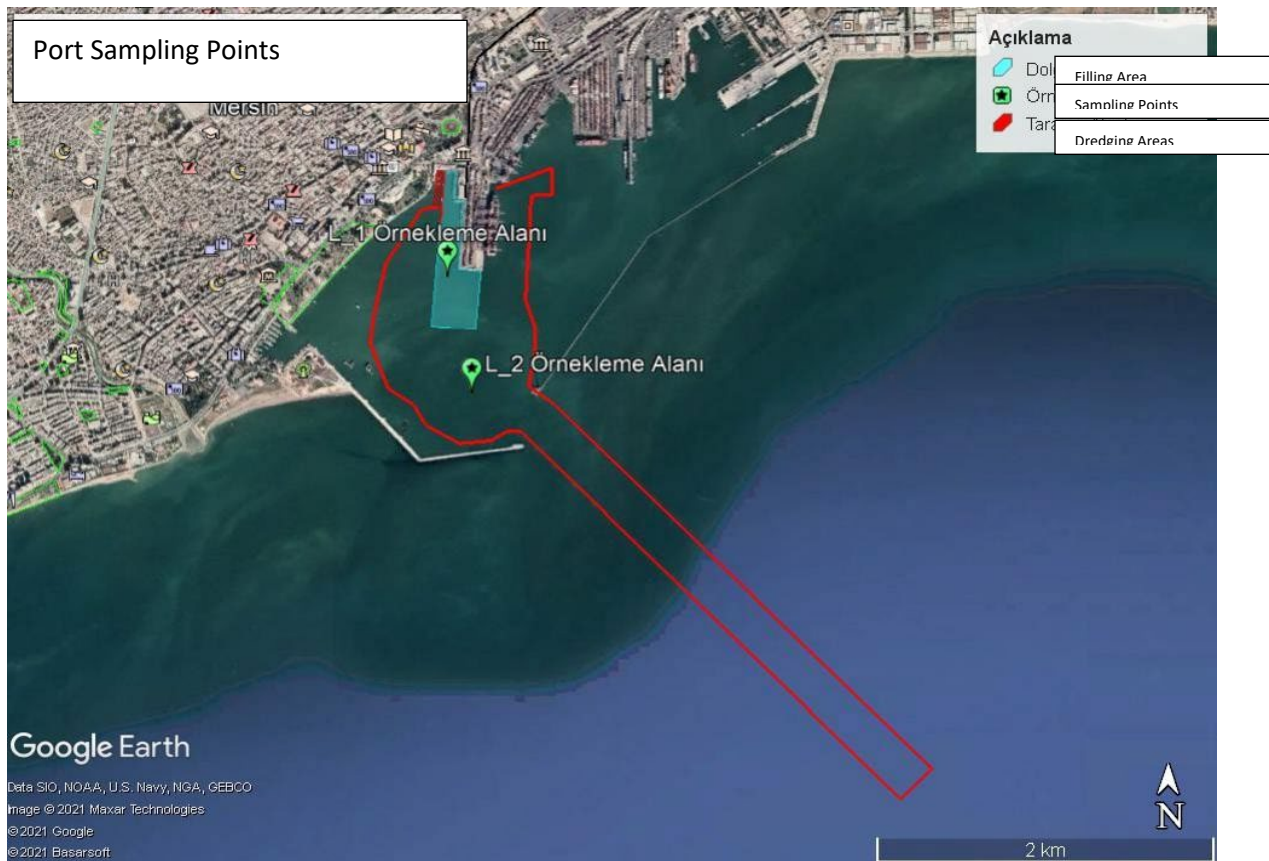


Figure 10. Sampling Stations for planktonic organisms

4.1.1 Materials and Methods

In the studies carried out in December 2018 regarding the marine ecosystem planktonic organisms of the Mersin Port Area, samples were taken from two stations that were evaluated biologically. A plankton net of 33 μm -pore opening, 30 cm- diameter and a 1 m – length was used to identify phytoplanktonic and zooplanktonic organisms in each station selected in the study area. (Photo 10). The samples, which were collected by pulling the plankton scoop horizontally for 200 m (for 6 minutes) by a boat were taken into 250 cc plastic jars. Planktonic samples were fixed by buffering with 4% formaldehyde.



Photo 10. Collecting the Planktonic Samples From Coast Station

Temporary preparations of algae other than diatoms were prepared from the samples brought to the laboratory, and their diagnosis was made under a Leica microscope and their photographs were taken. Temporary preparations were made by covering the samples taken on the slide with a coverslip and examining them under a microscope.

Permanent preparations are prepared only for the diagnosis of diatom species. Accordingly, acid boiling method was used in order to clearly see the structures such as raphe and citria used in the diagnosis of diatoms (Round, 1973). According to this method; Formol water was poured on the samples, which were centrifuged for 2 minutes at 2.3 rpm, and 20 ml of distilled water was taken to the remaining residue. This was transferred to 100 ml flasks after shaking. 2 ml of 0.1 N potassium permanganate, which was prepared before, was added to it. In this way, it was kept closed for four hours at room temperature. After 7 ml of HCl was added to the samples at the end of the waiting period, the flasks were boiled in this state for 20 minutes in a fume hood. After boiling, centrifugation was applied again at 2.3 rpm for 2 minutes in order to remove it from the acid. The residue from the bottom was spread over the lamellas and left to dry. Canada balsam was dripped on the slide and the coverslip containing our dried sample was closed on top of it. It was then left to stand at 70 °C for two days in an oven to allow the Canadian balsam to dry.

For the identification of zooplanktonic organisms, two types of preparations, temporary and permanent, have been prepared. Temporary preparations were obtained by covering the coverslip on the samples taken on the slide during the study or by directly examining them. Insect needle numbered 0.00 was used in making the permanent preparations. Euromex arnhem brand binocular microscope was used in the preparation of the permanent preparations. The organism taken was arranged in the middle of the slide and in order to prevent the organism from being deformed, it was closed by touching the plastilin on the four sides of the lamella and after the water in the glycerin was completely evaporated, the edges of the lamella were covered with entellan and labeled.

The sources used for algae and zooplanktonic organisms identified during the studies are given below;

Aysel ve ark (2000); Basson (1979); Bold and Wynne (1978); Demirhindi (1972); Dickman (1996); Dumond and Pensaert (1983); Dumont (1981); Dumont and Ridder (1987); Dural ve ark. (1989); Dural ve ark. (1992); Elliot et al. (1982); Emir (1990); Flössner and Krebstieve (1974); Fritsch (1965); Güner ve ark. (1985); Holme and McIntyre (1984); Kocataş ve Bilecik (1992); Zeybek ve ark (1993); Öztürk (1992); Phyllis et al (1991); Round (1973); Setchhell and Gardner (1967); Songül (1991); South (1976); Tekoğlu (1991); Tsekos and Haritonidis (1977); Ünal ve ark. (2000); Wetzel (1983)

4.1.2 Findings Concerning Planktonic Organisms

4.1.2.1 Project Area Phytoplanktonic Organisms and Macro Algae

Algae, which convert carbon dioxide and water into carbohydrates with the effect of light, are primary producers in the aquatic environment, thanks to the pigments in their structure. Thus, the nutrient value and the dissolved oxygen ratio in the aquatic environment are increased. As a result, they form the first link of the food chain by ensuring their own development. In this way, they are important in terms of their contribution to production and their relations with living things in the upper step.

Algae are quite different in appearance, both structurally and externally. They are structurally divided into two large groups: eukaryotic (advanced cell type) and prokaryotic (simple cell type). Accordingly, Blue-Green algae have prokaryotic cell characteristics in terms of their cell organization. They differ from other algae in the absence of a distinct cell nucleus, the distribution of pigments in the very simple chromatophore structure, and their prokaryotic cell characteristics. In terms of their external appearance, they can be observed in different forms, from single-celled and filamentous forms to mixed individuals (Round, 1973).

The micro and macro algae species detected in the project area and its surroundings are available in Table 3.

Table 3. Micro and macro algae species detected in the project area and its surroundings

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
BACILLARIOPHYTA				
Class Bacillariophyceae				
Order Naviculales				
Family Amphipleuraceae				
<i>Amphiprora gigantea</i>	--	--	--	O
Order Tabellariales				
Family Tabellariaceae				
<i>Asterionella japonica</i>	--	--	--	O
Order Surirellales				
Family Surirellaceae				
<i>Campylodiscus sp.</i>	--	--	--	O
Order Bacillariales				
Family Bacillariaceae				
<i>Cylindrotheca closterium</i>	--	--	--	O
Order Rhabdonematales				
Family Grammatophoraceae				
<i>Grammatophora sp.</i>	--	--	--	O
Order Naviculales				
Family Naviculaceae				
<i>Gyrosigma balticum</i>	--	--	--	O
<i>Gyrosigma spenceri</i>	--	--	--	O
<i>Gyrosigma sp.</i>	--	--	--	O
<i>Gyrosigma tenuisumum</i>	--	--	--	O
Order Licmophorales				

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Family Licmophoraceae				
<i>Licmophora abbreviata</i>	--	--	--	O
Order Naviculales				
Family Naviculaceae				
<i>Navicula sp.</i>	--	--	--	O
Order Bacillariales				
Family Bacillariaceae				
<i>Nitzschia longissima</i>	--	--	--	O
<i>Nitzschia paradoxa</i>	--	--	--	O
<i>Nitzschia sigma</i>	--	--	--	O
<i>Nitzschia sp.</i>	--	--	--	O
Family Bacillariaceae				
<i>Pseudonitzschia pungens</i>	--	--	--	O
Order Fragilariales				
Family Fragilariaceae				
<i>Podocystis sp.</i>	--	--	--	L
Order Rhabdonematales				
Family Rhabdonemataceae				
<i>Rhabdonema adriaticum</i>	--	--	--	L
Order Naviculales				
Family Pleurosigmataceae				
<i>Pleurosigma elongatum</i>	--	--	--	L
<i>Pleurosigma normanii</i>	--	--	--	L
<i>Pleurosigma spl.</i>	--	--	--	O

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Pleurosigma sp 2.</i>	--	--	--	O
Order Striatellales				
Family Striatellaceae				
<i>Striatella unipunctata</i>	--	--	--	L
Order Surirellales				
Family Surirellaceae				
<i>Surirella fastuosa</i>	--	--	--	O
<i>Ulnaria ulna</i>	--	--	--	O
Order Thalassionematales				
Family Thalassionemataceae				
<i>Thalassionema nitzschioides</i>	--	--	--	O
<i>Thalassiothrix mediterranea</i>	--	--	--	O
Class Coscinodiscophyceae				
Order Asterolamprales				
Family Asterolampraceae				
<i>Asterolampra grevillei</i>	--	--	--	O
<i>Asterolampra marylandica</i>	--	--	--	L
<i>Asteromphalus flabellatus</i>	--	--	--	L
Order Coscinodiscales				
Family Coscinodiscaceae				
<i>Coscinodiscus perforatus</i>	--	--	--	O
<i>Coscinodiscus radiatus</i>	--	--	--	O
<i>Coscinodiscus sp.</i>	--	--	--	O
Order Rhizosoleniales				

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Family Rhizosoleniaceae				
<i>Dactyliosolen mediterraneus</i>	--	--	--	O
<i>Guinardia flaccida</i>	--	--	--	O
<i>Rhizosolenia alata .f.gracillima</i>	--	--	--	O
<i>Rhizosolenia calcar-avis</i>	--	--	--	O
<i>Rhizosolenia imbricata var.shrubslei</i>	--	--	--	L
<i>Rhizosolenia robusta</i>	--	--	--	L
<i>Rhizosolenia setigera</i>	--	--	--	O
<i>Rhizosolenia sytliformis</i>	--	--	--	L
Order Melosirales				
Family Melosiraceae				
<i>Melosira sulcata</i>	--	--	--	O
Class Mediophyceae				
Order Chaetocerotales				
Family Chaetocerotaceae				
<i>Bacteriastrum delicatulum</i>	--	--	--	O
<i>Bacteriastrum hyalinum</i>	--	--	--	O
<i>Chaetoceros affinis</i>	--	--	--	O
<i>Chaetoceros anastomosans</i>	--	--	--	L
<i>Chaetoceros coarctatum</i>	--	--	--	O
<i>Chaetoceros constrictum</i>	--	--	--	O
<i>Chaetoceros costatum</i>	--	--	--	L
<i>Chaetoceros debile</i>	--	--	--	L
<i>Chaetoceros didymum</i>	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Chaetoceros diversum</i>	--	--	--	O
<i>Chaetoceros gracile</i>	--	--	--	O
<i>Chaetoceros lorenzianum</i>	--	--	--	O
<i>Chaetoceros rostratum</i>	--	--	--	O
<i>Chaetoceros tetrastichon</i>	--	--	--	L
Order Lithodesmiales				
Family Lithodesmiaceae				
<i>Ditylum brightwellii</i>	--	--	--	L
Order Hemiaulales				
Family Hemiaulaceae				
<i>Eucampia zoodiacus</i>	--	--	--	L
<i>Cerataulina pelagica</i>	--	--	--	L
<i>Hemiaulus hauckii</i>	--	--	--	L
Order Thalassiosirales				
Family Lauderiaceae				
<i>Lauderia borealis</i>	--	--	--	L
Order Chaetocerotales				
Family Leptocylindraceae				
<i>Leptocylindricus danicus</i>	--	--	--	O
<i>Leptocylindricus minimus</i>	--	--	--	O
Order Lithodesmiales				
Family Lithodesmiaceae				
<i>Lithodesmium undulatum</i>	--	--	--	L
Order Eupodiscales				

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Family Odontellaceae				
<i>Odontella mobiliensis</i>	--	--	--	O
Order Thalassiosirales				
Family Skeletonemataceae				
<i>Skeletonema costatum</i>	--	--	--	O
Phylum Miozoa				
Class Dinophyceae				
Order Dinophysales				
Family Amphisoleniaceae				
<i>Amphisolenia bidentata</i>	--	--	--	L
<i>Amphisolenia truncataner</i>	--	--	--	L
Order Gonyaulacales				
Family Ceratiaceae				
<i>Ceratium arietinum</i> var. <i>arietinum</i>	--	--	--	L
<i>Ceratium biceps</i>	--	--	--	O
<i>Ceratium breve</i> var. <i>schmidtii</i>	--	--	--	L
<i>Ceratium concilians</i>	--	--	--	L
<i>Ceratium contortum</i> var. <i>karstenii</i>	--	--	--	L
<i>Ceratium euarquatum</i>	--	--	--	L
<i>Ceratium furca</i> var. <i>furca</i>	--	--	--	O
<i>Ceratium hexacanthum</i> var. <i>contortum</i>	--	--	--	L
<i>Ceratium horridum</i> var. <i>horridum</i>	--	--	--	L
<i>Ceratium inflatum</i>	--	--	--	L
<i>Ceratium kofoidi</i>	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Ceratium longirostrum</i>	--	--	--	L
<i>Ceratium macroceros var.gallicum</i>	--	--	--	O
<i>Ceratium pentagonum</i>	--	--	--	L
<i>Ceratium ranipes var. palmatum</i>	--	--	--	L
<i>Ceratium teres</i>	--	--	--	O
<i>Ceratium trichoceros</i>	--	--	--	O
Family Protoceratiaceae				
<i>Ceratocorys armata</i>	--	--	--	L
<i>Ceratocorys gourreti</i>	--	--	--	L
<i>Ceratocorys horrida</i>	--	--	--	L
Family Pyrocystaceae				
<i>Pyrocystis fusiformis</i>	--	--	--	L
<i>Pyrophacus horologium</i>	--	--	--	L
Family Gonyaulacaceae				
<i>Spiraulax jollifei</i>	--	--	--	L
Family Dinophysaceae				
<i>Dinophysis caudata</i>	--	--	--	O
<i>Dinophysis doryphorum</i>	--	--	--	L
<i>Dinophysis mitra</i>	--	--	--	L
<i>Diplopsalis lenticula</i>	--	--	--	L
<i>Gonyaulax birostris</i>	--	--	--	L
<i>Gonyaulax diegensis</i>	--	--	--	L
<i>Gonyaulax monocantha</i>	--	--	--	L
<i>Gonyaulax polygramma</i>	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Gonyaulax turbynei</i>	--	--	--	L
<i>Ornithocercus quadratus</i>	--	--	--	L
Order Thoracosphaerales				
Family Thoracosphaeraceae				
<i>Heteraulacus sphaericus</i>	--	--	--	L
Order Peridinales				
Family Oxytoxaceae				
<i>Oxytoxum scolopax</i>	--	--	--	L
Family Podolampadaceae				
<i>Podolampas bipes</i>	--	--	--	O
<i>Podolampas spinifera</i>	--	--	--	O
Family Protoperidiniaceae				
<i>Protoperidinium brochi</i>	--	--	--	L
<i>Protoperidinium depressum</i>	--	--	--	L
<i>Protoperidinium divergens</i>	--	--	--	O
<i>Protoperidinium grande</i>	--	--	--	L
<i>Protoperidinium steini</i>	--	--	--	L
Order Prorocentrales				
Family Prorocentraceae				
<i>Prorocentrum compressum</i>	--	--	--	L
<i>Prorocentrum micans</i>	--	--	--	O
Order Noctilucales				
Family Kofoidiniaceae				
<i>Kofoidinium velloides</i>	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Phylum Ochrophyta				
Class Phaeophyceae				
Order Ectocarpales				
Family Acinetosporaceae				
<i>Acinetospora crinita</i>	--	--	--	L
<i>Anadyomena stellata</i>	--	--	--	O
Order Ectocarpales				
Family Scytosiphonaceae				
<i>Colpomenia sinuosa</i>	--	--	--	L
Order Fucales				
Family Sargassaceae				
<i>Cystoseria barbata</i>	--	--	--	O
<i>Cystoseria corniculata</i>	--	--	--	L
<i>Cystoseria foeniculacea</i>	--	--	--	L
Order Dictyotales				
Family Dictyotaceae				
<i>Dictyota dichotoma</i>	--	--	--	L
<i>Dictyota linearis</i>	--	--	--	L
Family Dictyotaceae				
<i>Padina pavonia</i>	--	--	--	O
Order Fucales				
Family Sargassaceae				
<i>Sargassum acinarum</i>	--	--	--	O
<i>Sargassum vulgare</i>	--	--	--	O

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Family Dictyotaceae				
<i>Taonia atomaria</i>	--	--	--	O
Order Sphacelariales				
Family Sphacelariaceae				
<i>Sphacelaria funcigera</i>	--	--	--	L
Family Cladostephaceae				
<i>Cladostephus spongiosus</i>	--	--	--	L
<i>Cladostepus verticillatus</i>	--	--	--	L
Class Dictyochophyceae				
Order Dictyochales				
Family Dictyochaceae				
<i>Dictyocha fibula</i>	--	--	--	O
Phylum Chlorophyta				
Class Ulvophyceae				
Order Bryopsidales				
Family Caulerpaceae				
<i>Caulerpa prolifera</i>	--	--	--	L
Order Cladophorales				
Family Cladophoraceae				
<i>Cladophora sp.</i>	--	--	--	O
Family Cladophoraceae				
<i>Chaetomorpha linum</i>	--	--	--	L
Order Dasycladales				
Family Dasycladaceae				

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Dasycladus vermicularis</i>	--	--	--	O
Order Ulvales				
Family Ulvaceae				
<i>Enteromorpha sp.</i>	--	--	--	O
<i>Enteromorpha compressa</i>	--	--	--	O
<i>Enteromorpha linza</i>	--	--	--	L
Order Bryopsidales				
Family Halimedaceae				
<i>Halimeda tuna</i>	--	--	--	L
Phylum Rhodophyta				
Class Florideophyceae				
Order Ceramiales				
Family Ceramiaceae				
<i>Ceramium sp.</i>	--	--	--	O
Family Rhodomelaceae				
<i>Acanthophora nayadiformis</i>	--	--	--	L
Family Delesseriaceae				
<i>Dasya corymbifera</i>	--	--	--	L
<i>Dasya ocellata</i>	--	--	--	L
<i>Diegena simplex</i>	--	--	--	L
Family Rhodomelaceae			-	
<i>Laurencia papillosa</i>	--	--	--	L
Family Callithamniaceae				
<i>Spyridia filamentosa</i>	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Order Corallinales				
Family Corallinaceae				
<i>Corallina elongata</i>	--	--	--	L
Family Corallinaceae				
<i>Jania rubens</i>	--	--	--	O
Order Gelidiales				
Family Gelidiaceae				
<i>Gelidium sp.</i>	--	--	--	O
Order Halymeniales				
Family Halymeniaceae				
<i>Halymenia latifolia</i>	--	--	--	L
Order Gigartinales				
Family Cystocloniaceae				
<i>Hypnea musciformis</i>	--	--	--	L
Phylum Cyanobacteria				
Class Cyanophyceae				
Order Oscillatoriales				
Family Oscillatoriaceae				
<i>Oscillatoria sp.</i>	--	--	--	O

A total of 151 taxa records belonging to 8 different algae divisions were given in the research area. According to the data we have obtained as a result of the sampling, it is seen that phytoplanktonic organisms are more dominant in terms of species diversity than the bound forms. Especially Bacillariophyceae group algae has been the richest class in terms of diversity. There were 66 taxa belonging to this class, 47 from Dinophyceae, 11 from Chlorophyceae, 11 from Phaeophyceae, 13 from Rhodophyceae, 1 from Cyanophyceae, 1 from Prymnesiophyceae and 1 from Dictyochophyceae. Some of the species given in the relevant table are supported by literature information.

None of the algae species listed in the table are included in the IUCN Red List, Bern and CITES Agreement lists.

The fact that the sampling period coincided with the end of winter and the beginning of spring caused the species diversity to be less than expected. In winter, a decrease in algae density and diversity is observed as a result of the scarcity of nutrients and the decrease in temperature. However, in high temperature environments where the amount of nutrients is high, especially in summer, an increase in species diversity can be seen due to the predominance of certain species and the increase in explosion levels.

Some factors play a role in the development and distribution of algae in study zone. The most important of these are sea water temperature, light transmittance, pH, salinity, and dissolved oxygen.

From a large area to the smallest unit area, each region has certain types of algae specific to its temperature. Although the seasonal temperature differences of large areas are much less, the temperatures of coastal areas with the characteristics of coves change more rapidly.

Depending on the temperature, it is possible to see seasonal as well as annual and perennial plants all together in spring and summer time when the rate of photosynthesis is higher than the respiratory rate.

Algae need light for photosynthesis, and their distribution depends on light in water. Particles suspended in the water prevent light from reaching the lower layers and affects algae growth negatively. The light transmittance at the time of sampling was found to be quite suitable.

However, excessive wave movements mix the bottom parts, causing the dunes to mix with the water body. Although this situation poses a temporary problem for the development of algae, it does not create significant problems in terms of biological cycle.

Seawater pH is mostly alkaline, which is also effective in the distribution of algae. Generally Brown and Red Algae creates the groups that mostly affected by pH changes. On the other hand, there is not a profoundly serious pH increase in the study area or no such serious input that can affect the pH in seawater.

Comparing the data about the dominance values among divisions, Bacillariophyta has been the most dominant organism group in the whole research area. Then Pyrrophyta and Cyanophyta divisions comes out on the top of the list. While the abundance of Rhodophyta and Chlorophyta are found closer to each other, Phaeophyta division has the lowest one.

Besides algae, sea grass species also create the flora in the Mediterranean Region. *Posidonia oceanica*, which is the most significant seagrass species in Turkey and is an endemic to the Mediterranean, can be found in the whole Mediterranean Region. It can be seen on the shores of the Mediterranean and Aegean Sea in Turkey, up to 35-40 m- depth while in the Marmara Sea, it spreads in a limited area around the Dardanelles and Kapıdağ Peninsula and Marmara Island. *P. oceanica* has a stem called a rhizome that is creeping or erected, and usually covered with sediment.

Posidonia oceanica and *Cymodocea nodosa*, which can be seen commonly in the Mediterranean, are classified by the IUCN as “species that possess low risk (LC)” status with a tendency of decreasing population. However, these flowering sea plants are more important as seagrass that provide habitats apart from the risk category they fall for as a species. In this respect, it is mostly on the top of the list in all ecosystem-based wildlife protection constitutions such as IUCN Habitat Red List, RAMSAR, EUNIS and Natura 2000.

Seagrass, in native language called "noodles", are aquatical angiosperms adapted to the marine environment and have roots, stems, leaves, flowers and seeds like terrestrial plants. 50 species of marine angiosperms exist in the world. 7 species of angiosperm which belong to the genus *Cymodocea*, *Halophila*, *Posidonia*, *Ruppia*, *Zostera* widely spread around the coastline and transitional waters in the Mediterranean region of Turkey. These species are *Cymodocea nodosa*, *Halophila stipulacea*, *Posidonia oceanica*, *Ruppia cirrhosa*, *Ruppia maritima*, *Zostera marina* ve *Zostera noltii*.

However, aquatical angiosperms such as *Posidonia oceanica*, were not detected in the survey area during this research.

4.1.2.2 Zooplanktonic Organisms

Cladocera and Copepoda, which form an important group of zooplanktonic organisms, are groups of very small, mostly microscopic animals. Most of the species belonging to the order Cladocera are distributed in fresh waters. Species such as *Podon*, *Eudadne* and *Penilia* are marine. Species living in freshwater are generally planktonic and are found in the limnetic regions of lakes. These animals can reproduce both parthenogenetically and sexually. When environmental conditions are favorable, female individuals in the population produce a large number of eggs that have not undergone meiosis.

When environmental conditions become inconvenient, females produce fewer eggs that have undergone meiosis. After the fertilization, the incubation chamber is surrounded by a very thick cover which make the egg resistant to environmental conditions.

Another group of zooplanktonic organisms is Rotifera. Rotifera consists of quite small, microscopic organisms. Most of them are found in fresh waters. The number of marine species is less than fresh water. There are also some species that live in pools, ponds, hard water and salty waters. Most of the species are planktonic and live in the limnetic and littoral regions of lakes, while some of them spread sessile in the bottom parts. The use of Rotifera species as an indicator in determining the water quality of freshwater systems is important because they form the food of many invertebrate and vertebrate organisms in aquatic ecosystems.

The results of zooplanktonic sampling performed in Mersin Port project sea area are available in Table 3.

Table 4. Zooplanktonic Organisms detected in the project area and its surroundings

Phylum: Arthropoda	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Subphylum: Crustacea				
Class: Hexanauplia				
Subclass: Copepoda				
Order: Calanoida				
Family: Acartiidae				
<i>Acartia clausi</i>	--	--	--	O
<i>Acartia discaudata</i>	--	--	--	L
<i>Acartia grani</i>	--	--	--	L
<i>Acartia negligens</i>	--	--	--	L
<i>Aetideus giesbrechti</i>	--	--	--	L
Family: Paracalanidae				
<i>Paracalanus parvus</i>	--	--	--	O
<i>Mecynocera clausi</i>	--	--	--	L
<i>Calocalanus pavo</i>	--	--	--	O
<i>Calocalanus pavoninus</i>	--	--	--	L
<i>Calocalanus styliremis</i>	--	--	--	O
Family: Pontellidae				
<i>Pontella mediterranea</i>	--	--	--	L
<i>Calonopia elliptica</i>	--	--	--	L
Family: Calanidae				
<i>Calanus gracilis</i>	--	--	--	O
<i>Calanus minör</i>	--	--	--	L
<i>Calanus tenuicornis</i>	--	--	--	L
Family: Candaciidae				
<i>Candacia armata</i>	--	--	--	L
<i>Candacia ethiopica</i>	--	--	--	L
Family: Centropagidae				

Phylum: Arthropoda	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Centropages furcatus</i>	--	--	--	O
<i>Centropages kroyeri</i>	--	--	--	L
<i>Centropages violaceus</i>	--	--	--	L
Family: Clausocalanidae				
<i>Clausocalanus arcuicornis</i>	--	--	--	L
<i>Clausocalanus furcatus</i>	--	--	--	O
Family: Temoridae				
<i>Temora stylifera</i>	--	--	--	O
Order: Cyclopoida				
Family: Corycaeidae				
<i>Corycaeus spp.</i>	--	--	--	O
<i>Corycaeus clausi</i>	--	--	--	L
<i>Farranula rostrata</i>	--	--	--	L
Family: Pontellidae				
<i>Labidocera brunescens</i>	--	--	--	L
<i>Labidocera pavo</i>	--	--	--	O
Family: Oithonidae				
<i>Oithona helgolandica</i>	--	--	--	L
<i>Oithona nana</i>	--	--	--	O
<i>Oithona plumifera</i>	--	--	--	O
<i>Oithona spinirostris</i>	--	--	--	L
Family: Oncaeidae				
<i>Oncaea media</i>	--	--	--	O
<i>Oncaea mediterranea</i>	--	--	--	L
Order: Harpacticoida				
Family: Peltidiidae				
<i>Clytemnestra scutellata</i>	--	--	--	L
Family: Tachidiidae				

Phylum: Arthropoda	IUCN Red List	Bern Agreement	CITES	Observation/Literature
<i>Euterpina acutifrons</i>	--	--	--	L
Nauplius	--	--	--	O
Phylum: Arthropoda				
Subphylum: Crustacea				
Class: Branchiopoda				
Subclass: Copepoda				
Superorder: CLADOCERA				
Order: Onychopoda				
Family: Podonidae				
<i>Evadne spinifera</i>	--	--	--	L
<i>Evadne tergestina</i>	--	--	--	O
Order: Ctenopoda				
Family: Sididae				
<i>Penilia avirostris</i>	--	--	--	O
Family: Podonidae				
<i>Podon polyphemoides</i>	--	--	--	O
DIGER HOLOPLANKTON				
Amphipoda				O
Radiolaria				O
Appendicularia				O
Chaetognatha				O
Doliolida				O
Foraminifera				O
Heteropoda				O
Pteropoda				O
Siphonophora				O
MEROPLANKTON				O
Balık larvası				O

Phylum: Arthropoda	IUCN Red List	Bern Agreement	CITES	Observation/Literature
Bivalvia				O
Cirripedia				O
Decapoda				O
Echinodermata				O
Gastropoda				O
Polychaeta				O

In marine food chains, carbohydrates, fats, and proteins are first synthesized by phytoplanktonic algae groups and then, they pass through higher levels in food chain. This vegetable protein first converts into animal protein in the Crustacea group of the zooplankton. The Copepods are the most important group of zooplankton in most parts of the seas and oceans. Copepods are mostly the dominant forms of zooplankton throughout warm oceans. They constitute a quite significant link in the food chain for the species that need animal protein in the marine environment since they convert vegetable protein into animal protein.

Copepoda is the most dominant group among zooplanktonic organisms and have 37 species. *Temora stylifera*, *Acartia clausi*, *Oithona nana*, *Paracalanus parvus* taxa in the the class of Copepoda are the dominant organisms. *Evadne spinifera* is also the most dominant taxon in Cladocera. These are true planktonic organisms and are called Holoplankton. On the other hand, there are some species that spend only a certain period of their lives in water and they continue the rest of other periods in different environments, and such organisms are called Meroplankton.

None of the zooplanktonic organisms are stated in the IUCN Red List, Bern and CITES Agreement lists.

Copepods are strongly predominant among all zooplanktonic groups, followed by Cladocera.

4.2 Benthic Organisms

The process of Van Veen Grap sampling has been conducted to determine the existing zoobenthic organisms living in the benthos of project impact area, embedded in the sediment, to reveal their qualitative and quantitative status (L_1, K_5 and K_6 stations; Table 5, Figure 11). While grap sampling can be performed only in muddy habitats, sessile macrobenthic organisms attached on rocky habitats recorded in underwater visual census (UVC) study were also included in overall inventory/evaluation of benthic organisms.

Sampling Stations for zoobenthic organisms

Station	Coordinate	Introduction	Habitat
Station Number L_1	34.6373066 E 36.7944033 N	Sampling point 500 m away from the original/initial coast	Breakwater Rock

Station Number K - 5	34.6427252 E 36.7878743N	Sampling point inside the harbour	Muddy
Station Number K - 6	34.6562002 E 36.775895 N	Sampling point outside the harbour, on the dredging channel	Muddy



Figure 11. Van Veen Grap Sampling Stations for zoobenthic organisms

4.2.1 Materials and Methods

The benthic material has been washed with sea water in the study zone and separated; after that, the organisms on the sieve were placed in plastic bags containing 5% formaldehyde and then saved in 5-liter plastic containers. The samples brought to the laboratory were first washed in a sieve with fresh water. Then, the organisms obtained by examining the organisms under binocular stereomicroscope were divided into systematic groups to which they belong and placed in tubes containing 70% alcohol. After the determination of the species, the table containing the species lists was prepared (Photograph 11-12).



Photo 11. The Sampling with Benthic Scoop



Photo 12. Sieving the samples

4.2.2 Findings on Benthic Organisms

It is necessary to know the biological diversity in the ecosystem of a natural marine environment so we can determine the results of any human or other external impact on it. Specifically most of the invertebrate benthic organisms are widely used as indicator species to monitor possible changes in the marine environment. Because these invertebrates are in direct contact with the water column and most species live by fixing themselves in one place, they immediately react to any impact that may occur in the environment. In marine environments, depending on various activities, weakening of oxygen in the bottom water, increase in the amount of total sulfide in the sediment, temporary faunal deterioration, remarkable changes in benthic fauna, and significant decreases in the biomass of benthic communities and the number of species can be observed (Tsutsumi et al., 1991). In order to understand the deterioration of fauna in the region, benthic organisms are the organisms that best reflect the degree of this effect.

Benthic species that were detected in the area are available in Table 6.

Table 6. Bethic Species detected in the project area and its surroundings

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
PHYLUM: CNIDARIA					
Class: Hydrozoa					
Order: Anthoathecata					
Family: Pennariidae					
<i>Halocordyle disticha</i>	--	--	--	--	O
Order: Siphonophorae					
Family: Apolemiidae					
<i>Apolemia uvaria</i>	--	--	--	--	L
Order: Anthoathecata					
Family: Tubulariidae					
<i>Tubularia sp.</i>	--	--	--	--	O
Class: Anthozoa					
Order: Spirularia					
Family: Cerianthidae					
<i>Cerianthus sp.</i>	--	--	--	--	O
Family: Cerianthidae					
<i>Aiptasia diaphana</i>	LC	--	--	--	L
Order: Zoantharia					
Family: Parazoanthidae					
<i>Parazoanthus axinellae</i>	LC	--	--	--	L
Order: Hexacorallia					
Family: Caryophylliidae					
<i>Caryophyllia smithii</i>	LC	--	--	--	L
<i>Caryophyllia sp.</i>	--	--	--	--	O
Order: Scleractinia					
Family: Dendrophylliidae					
<i>Astroides sp.</i>	--	--	--	--	L
<i>Balanophyllia sp.</i>	--	--	--	--	L
Family: Leptothecata					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
<i>Madracis</i> sp.	--	--	--	--	L
Order: Leptothecata					
Family: Aglaopheniidae					
<i>Gymnangium</i> sp.	--	--	--	--	L
Family: Eudendriidae					
<i>Eudendrium</i> sp.	--	--	--	--	L
Class: Scyphozoa					
Order: Semaestomeae					
Family: Ulmaridae					
<i>Aurelia aurita</i>	--	--	--	--	O
PHYLUM: NEMERTEA					
<i>Nemertopsis</i> sp.	--	--	--	--	L
PHYLUM: ANNELIDA					
Class: Polychaeta					
Order: Echiuroidea					
Family: Bonelliidae					
<i>Bonellia viridis</i>	--	--	--	--	L
<i>Aricidea</i> sp.	--	--	--	--	L
Subclass: Sedentaria					
Order: Spionida					
Family: Spionidae					
<i>Prinospio cf. cirrifera</i>	--	--	--	--	L
<i>Prinospio fallax</i>	--	--	--	--	L
<i>Prinospio</i> sp.	--	--	--	--	L
<i>Malaccoceros</i> sp.	--	--	--	--	L
<i>Spio filicornis</i>	--	--	--	--	L
<i>Spio</i> sp.	--	--	--	--	O
<i>Spiophanes bombyx</i>	--	--	--	--	L
<i>Nerine</i> sp.	--	--	--	--	L
<i>Nerine cf. cirratulus</i>	--	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
<i>Aonides oxycephala</i>	--	--	--	--	L
Family: Capitellidae					
<i>Notomastus latericeus</i>	--	--	--	--	L
<i>Capitomastus sp.</i>	--	--	--	--	L
<i>Heteromastus filiformis</i>	--	--	--	--	L
Family: Cirratulidae					
<i>Monticellina heterochaeta</i>	--	--	--	--	L
<i>Cirratulus sp.</i>	--	--	--	--	L
Family: Cossuridae					
<i>Cossura sp.</i>	--	--	--	--	L
Family: Paraonidae					
<i>Paradoneis lyra</i>	--	--	--	--	
Order: Sabellida					
Family: Serpulidae					
<i>Pomatoceros trigueter</i>	--	--	--	--	L
Subclass: Errantia					
Order: Phyllodocida					
Family: Glyceridae					
<i>Glycera cf rouxi</i>	--	--	--	--	L
<i>Glycea tridactyla</i>	--	--	--	--	L
<i>Glycera sp.</i>	--	--	--	--	L
Order: Phyllodocida					
Family: Polynoidae					
<i>Polynoidae (sp.)</i>	--	--	--	--	L
<i>Harmothoe impar</i>	--	--	--	--	L
<i>Harmothoe sp.</i>	--	--	--	--	L
Family: Sigalionidae					
<i>Sigalion cf. mathildae</i>	--	--	--	--	L
Family: Pilargidae					
<i>Sigambra parva</i>	--	--	--	--	L
Family: Nephtyidae					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
<i>Nephtys caeca</i>	--	--	--	--	L
<i>Nephtys hombergii</i>	--	--	--	--	L
<i>Nephtys sp.</i>	--	--	--	--	L
Order: Eunicida					
Family: Lumbrineridae					
<i>Lumbrinerides cf amoueuxi</i>	--	--	--	--	L
<i>Lumbrineris sp.</i>	--	--	--	--	L
Subclass: Polychaeta incertae sedis					
Family: Magelonidae					
<i>Magelona papillicornis</i>	--	--	--	--	L
PHYLUM: ARTHROPODA					
Subphylum: Crustacea					
Class: Eumalacostraca					
Order: Decapoda					
Family: Alpheidae					
<i>Alpheus glaber</i>	--	--	--	--	L
Family: Chirostyloidea					
<i>Anomura sp.</i>	--	--	--	--	O
Family: Portunidae					
<i>Callinectes sp.</i>	--	--	--	--	O
Family: Grapsidae					
<i>Pachygrapsus marmoratus</i>	--	--	--	--	O
Family: Penaeidae					
<i>Penaeus semisulcatus</i>	--	--	--	--	O
Family: Carcinidae					
<i>Portumnus latipes</i>	--	--	--	--	L
Family: Processidae					
<i>Processa sp.</i>	--	--	--	--	L
Family: Upogebiidae					
<i>Gebia pusilla</i>	--	--	--	--	L
Order: Amphipoda					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Family: Urothoidae					
<i>Urothoe grimaldii</i>	--	--	--	--	O
Family: Leucothoidae					
<i>Leucothoe richiardii</i>	--	--	--	--	L
<i>Macrophthalmus graeffei</i>	--	--	--	--	L
Family: Ampeliscidae					
<i>Ampelisca brevicornis</i>	--	--	--	--	O
Family: Caprellidae					
<i>Caprella</i> sp.	--	--	--	--	O
Order: Tanaidacea					
Family: Alpheidae					
<i>Apseudes latreillei</i>	--	--	--	--	L
Order: Amphipoda					
Family: Bathyporeiidae					
<i>Bathyporeia lindstromi</i>	--	--	--	--	L
Order: Balanomorpha					
Family: Balanidae					
<i>Balanus</i> sp.	--	--	--	--	O
Order: Balanomorpha					
Family: Chthamalidae					
<i>Chthamalus stellatus</i>	--	--	--	--	L
<i>Chthamalus montagui</i>	--	--	--	--	L
Class: Malacostraca					
Order: Leptostraca					
Family: Nebaliidae					
<i>Nebalia bipes</i>	--	--	--	--	L
PHYLUM: MOLLUSCA					
Class: Gastropoda					
Family: Acteonidae					
<i>Acteon tornatilis</i>	--	--	--	--	L
Order: Neogastropoda					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Family: Acteonidae					
<i>Anachis savignyi</i>	--	--	--	--	L
Order: Caenogastropoda					
Family: Cerithiidae					
<i>Bittium reticulatum</i>	--	--	--	--	O
<i>Bittium submamillatum</i>	--	--	--	--	L
<i>Cerithium rupestre</i>	--	--	--	--	L
<i>Cerithium scabridum</i>	--	--	--	--	L
<i>Cerithium vulgatum</i>	--	--	--	Table 1 and item 16	L
<i>Rhinoclavis kochi</i>	--	--	--	--	L
<i>Finella pupoides</i>	--	--	--	--	L
<i>Pirenella conica</i>	LC	--	--	--	L
<i>Tenagodus obtusus</i>	--	--	--	--	L
<i>Turritella communis</i>	--	--	--	--	L
Family Epitoniidae					
<i>Janthina nitens</i>	--	--	--	--	L
Order: Trochida					
Family: Trochidae					
<i>Gibbula adansonii</i>	--	--	--	--	L
<i>Trochus erythreus</i>	--	--	--	--	L
<i>Gibbula divaricata</i>	--	--	--	--	O
<i>Gibbula umbrilicaris</i>	--	--	--	--	L
<i>Monodonta articulata</i>	--	--	--	--	L
<i>Monodonta turbinata</i>	--	--	--	--	L
<i>Tricolia pallus</i>	--	--	--	--	L
Family: Calliostomatidae					
<i>Calliosoma granulatum</i>	--	--	--	--	L
Family: Caecidae					
<i>Caecum trachea</i>	--	--	--	--	L
Order: Littorinimorpha					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Family: Cassidae					
<i>Phalium granulatum</i>	--	--	--	--	L
<i>Galeodae echinophora</i>	--	--	--	--	L
Family: Tonnidae					
<i>Tonna galea</i>	--	--	--	--	O
Family: Naticidae					
<i>Neverita josephina</i>	--	--	--	--	L
Family: Cypraeidae					
<i>Erosaria spurca</i>	--	--	--	--	L
Family: Vermetidae					
<i>Vermetus rugulosus</i>	--	--	--	--	L
<i>Vermetus triquetrus</i>	--	--	--	--	L
<i>Dentropoma petraeum</i>	--	--	--	--	L
<i>Petalonochus glomeratus</i>	--	--	--	--	L
<i>Serpulorbis arenaria</i>	--	--	--	--	L
Family: Aporrhaidae					
<i>Aporrhais pespelecani</i>	--	--	--	--	L
Family: Strombidae					
<i>Strombus decorus</i>	--	--	--	--	O
Family: Littorinidae					
<i>Littorina sp.</i>	--	--	--	--	O
<i>Melarhaphe neritoides</i>	--	--	--	--	L
<i>Littorina neritoides</i>	--	--	--	--	L
<i>Littorina punctata</i>	--	--	--	--	L
Family: Rissoidae					
<i>Rissoina bruguiri</i>	--	--	--	--	L
<i>Rissoina bertholleti</i>	--	--	--	--	L
Order: Neogastropoda					
Family: Nassariidae					
<i>Nassarius gibbosulus</i>	--	--	--	--	L
<i>Nassarius sp.</i>	--	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Order: Pylopulmonata					
Family: Pyramidellidae					
<i>Odostomi sp.</i>	--	--	--	--	L
Order: Patelloidea					
Family: Patellidae					
<i>Patella caerulea</i>	--	--	--	--	O
<i>Patella rustica</i>	--	--	--	--	O
<i>Patella ulyssiponensis</i>	--	--	--	--	L
Order: Cycloneritida					
Family: Neritinae					
<i>Smaragdia viridis</i>	--	--	--	--	O
Order: Lepetellida					
Family: Fissurellidae					
<i>Diodora graeca</i>	--	--	--	--	O
<i>Diodora ruppellii</i>	--	--	--	--	L
Family: Haliotidae					
<i>Haliotis tuberculata</i>	--	--	--	Table 1 and item 16	L
Order: Neogastropoda					
Family: Muricidae					
<i>Bolinus brandaris</i>	--	--	--	--	L
Family: Muricidae					
<i>Hexaplex trunculus</i>	--	--	--	--	L
<i>Thais lacera</i>	--	--	--	--	L
<i>Murex edwardsii</i>	--	--	--	--	O
Family: Fasciolariidae					
<i>Fusus striata</i>	--	--	--	--	L
Family: Buccinidae					
<i>Buccinum dorbignyi</i>	--	--	--	--	L
<i>Columbella rustica</i>	--	--	--	--	O
<i>Nassarius corniculus</i>	--	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
<i>Nassarius mutabilis</i>	--	--	--	--	L
Family: Fasciariidae					
<i>Fusinus rostratus</i>	--	--	--	--	L
Family: Conidae					
<i>Conus mediterraneus</i>	LC	--	--	--	L
<i>Bela brachystoma</i>	--	--	--	--	L
Order: Cephalaspidea					
Family: Bullidae					
<i>Bulla striata</i>	--	--	--	--	L
Order: Sacoglossa					
Family: Plakobranchidae					
<i>Elysia viridis</i>	--	--	--	--	O
Order: Umbraculida					
Family: Umbraculidae					
<i>Umbraculum umbraculum</i>	--	--	--	--	L
Order: Ellobiida					
Family: Ellobiidae					
<i>Auriculinella erosa</i>	--	--	--	--	L
<i>Ovatella firminii</i>	LC	--	--	--	L
<i>Ovatella myosotis</i>	LC	--	--	--	L
Class: Bivalvia					
Family: Semelidae					
<i>Abra alba</i>	--	--	--	--	O
<i>Abra prismaica</i>	--	--	--	--	L
Family: Mytilidae					
<i>Brachidontes pharaonis</i>	--	--	--	--	L
Order: Lucinida					
Family: Lucinidae					
<i>Loripes lacteus</i>	--	--	--	--	L
<i>Myrtea spinifera</i>	--	--	--	--	L
Order: Cardiida					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Family: Tellinidae					
<i>Macoma cumana</i>	--	--	--	--	L
Order: Arcida					
Family: Arcidae					
<i>Arca noae</i>	--	--	--	--	L
<i>Barbatia barbata</i>	--	--	--	--	O
<i>Anadara diluvii</i>	--	--	--	--	L
<i>Scapharca natalensis</i>	--	--	--	--	L
Family: Noetiidae					
<i>Striarca lactea</i>	--	--	--	--	L
Family: Glycymerididae					
<i>Glycymeris bimaculata</i>	--	--	--	--	L
<i>Glycymeris glycymeris</i>	--	--	--	--	L
Order: Mytilida					
Family: Mytilidae					
<i>Mytilus sp.</i>	--	--	--	--	O
<i>Mytilus galloprovincialis</i>	--	--	--	--	O
<i>Brachidontes pharaoneis</i>	--	--	--	--	L
<i>Mytilaster minimus</i>	--	--	--	--	L
<i>Lithophağa lithophaga</i>	--	--	--	--	O
<i>Amygdalum agglutinans</i>	--	--	--	--	L
Order: Ostreida					
Family: Pteriidae					
<i>Pteria hirundo</i>	--	--	--	--	L
Family: Margaritidae					
<i>Pinctada radiata</i>	--	--	--	--	L
Family: Malleidae					
<i>Malleus regulus</i>	--	--	--	--	L
Order: Pectinida					
Family: Pectinidae					
<i>Pecten jacobeus</i>	--	--	--	--	O

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
<i>Chlamys varia</i>	--	--	--	--	O
Family: Spondylidae					
<i>Spondylus gaederopus</i>	--	--	--	--	L
Family. Anomiidae					
<i>Anomia ephippium</i>	--	--	--	--	L
Order: Limida					
Family: Limidae					
<i>Lima lima</i>	--	--	--	--	O
Order: Ostreida					
Family: Ostreidae					
<i>Ostrea edulis</i>	--	--	--	--	O
<i>Loripes lacteus</i>	--	--	--	--	L
Order: Venerida					
Family: Chamidae					
<i>Chama gryphoides</i>	--	--	--	--	L
Family: Mactridae					
<i>Mactra stultorum</i>	--	--	--	--	L
Family: Veneridae					
<i>Chamelea gallina</i>	--	--	--	--	L
<i>Chione ovata</i>	--	--	--	--	O
<i>Meretrix rudis</i>	--	--	--	--	O
<i>Tapes decussatus</i>	--	--	--	--	L
<i>Venerupis senegalensis</i>	--	--	--	--	L
Order: Carditida					
Family: Carditidae					
<i>Glans trapezia</i>	--	--	--	--	L
<i>Glans aculeata</i>	--	--	--	--	L
<i>Venericardia antiquata</i>	--	--	--	--	L
<i>Acanthocardia aculeata</i>	--	--	--	--	L
<i>Cerastoderma glaucum</i>	--	--	--	--	L
<i>Papyridea papyraecea</i>	--	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Family: Tellinidae					
<i>Tellina tenuis</i>	--	--	--	--	L
<i>Tellina radiata</i>	--	--	--	--	O
<i>Tellina planata</i>	--	--	--	--	L
Order: Imparidentia					
Family: Solenidae					
<i>Solen marginatus</i>	--	--	--	--	L
Family: Family:					
<i>Ensis ensis</i>	--	--	--	--	L
Family: Donacidae					
<i>Donax semistriatus</i>	--	--	--	--	O
<i>Donax trunculus</i>	--	--	--	--	L
Family: Pharidae					
<i>Pharus legumen</i>	--	--	--	--	L
Order: Myida					
Family: Pholadidae					
<i>Pholas dactylus</i>	--	--	--	--	L
Class: Scaphopoda					
Order: Dentaliida					
Family: Dentaliidae					
<i>Dentalium dentalis</i>	--	--	--	--	L
<i>Dentalium vulgare</i>	--	--	--	--	L
Order: Mytilida					
Family: Mytilidae					
<i>Modiolus adriaticus</i>	--	--	--	--	L
Family: Donacidae					
<i>Donax venustus</i>	--	--	--	--	L
Family: Semelidae					
<i>Abra alba</i>	--	--	--	--	L
Order: Venerida					
Family: Veneridae					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
<i>Venus verrucosa</i>	--	--	--	--	L
<i>Dosinia lupinus</i>	--	--	--	--	L
Family: Mesodesmatidae					
<i>Paphia lucens</i>	--	--	--	--	L
Class: Cephalopoda					
Order: Sepiida					
Family: Sepiidae					
<i>Sepia elegans</i>	DD	--	--	--	L
<i>Sepia officinalis</i>	LC	--	--	--	L
<i>Sepiola rondeleti</i>	DD	--	--	--	L
Order: Myopsida					
Family: Loliginidae					
<i>Loligo vulgaris</i>	DD	--	--	--	O
Order: Octopoda					
Family: Octopodidae					
<i>Octopus macropus</i>	--	--	--	--	L
<i>Octopus vulgaris</i>	LC	--	--	--	L
Family: Eledonidae					
<i>Eledone moschata</i>	LC	--	--	--	L
Family: Argonautidae					
<i>Argonauta argo</i>	LC	--	--	--	L
Order: Arcida					
Family: Noetiidae					
<i>Striarca lactea</i>	--	--	--	--	L
PHYLUM: BRYOZOA					
Class: Gymnolaemata					
Order: Cheilostomatida					
Family: Aeonidae					
<i>Reptadeonella violacea</i>	--	--	--	--	L
Family: Aeteidae					
<i>Aetea truncata</i>	--	--	--	--	L

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Family: Phidoloporidae					
<i>Reteporella aporosa</i>	--	--	--	--	L
Family: Catenicelloidea					
<i>Savignyella lafontii</i>	--	--	--	--	L
Family: Bitectiporidae					
<i>Schizomavella</i> sp.	--	--	--	--	L
Family: Bugulidae					
<i>Bugula</i> sp.	--	--	--	--	L
Class: Stenolaemata					
Order: Cyclostomatida					
Family: Crisiidae					
<i>Crisia</i> sp.	--	--	--	--	L
Family: Frondiporidae					
<i>Frondipora verrucosa</i>	--	--	--	--	L
Family: Plagioeciidae					
<i>Plagioecia sarniensis</i>	--	--	--	--	L
Family: Lichenoporidae					
<i>Disporella hispida</i>	--	--	--	--	L
PHLUM: ECHINODERMATA					
Class: Ophiuroidea					
Order: Amphilepidida					
Family: Amphiuridae					
<i>Amphiopholis squamata</i>	--	--	--	--	L
Class: Echinoidea					
Order: Spatangoida					
Family: Loveniidae					
<i>Echinocardium cordatum</i>	--	--	--	--	L
Order: Camarodonta					
Family: Parechinidae					
<i>Paracentrotus lividus</i>	--	--	--	--	O
Class: Holothuroidea					

	IUCN Red List	Bern Agreement	CITES	ASC (5/1; 5/2)	Observation/Literature
Order: Apodida					
Family: Synaptidae					
<i>Synaptula nigra</i>	--	--	--	--	L
PHYLUM: HEMICHORDATA					
Class: Enteropneusta					
Order: Enteropneusta					
Family: Harrimaniidae					
<i>Saccoglossus sp.</i>	--	--	--	--	L
PHYLUM: CHORDATA					
Class: Ascidiacea					
Order: Stolidobranchia					
Family: Pyuridae					
<i>Microcosmus sp.</i>	--	--	--	--	O
Order: Ascidiacea	--	--	--	--	
Family: Cionidae	--	--	--	--	
<i>Ciona sp.</i>	--	--	--	--	L

Mollusca species are living in almost all biotopes in marine ecosystems and showing many characteristics of soft soil-species, and they are also the indicator of communities that are contaminated or under stress due to anthropogenic effects. However, it is seen that the research area is clean according to the water chemistry parameter results and there is no organic pollution. Therefore, the rich-Mollusca species-diversity in the zone is completely because of the bottom structure which compound from sand, sand-gravel and rock.

Generally, Benthic invertebrates detected in the research have a wide distribution in the Aegean and Mediterranean and they are species living in clear marine environments.

As a result of the sampling performed and literature, 221 benthic invertebrate species in total amounts of 9 orders were identified in the study zone. 14 of such species belong to Cnidaria, while 1 of them belong to Nemertea- 1 Hemichordata, 136 Mollusca, 19 Arthropoda, 34 Annelida and 10 Bryozoa, 4 Echinodermata and 2 Chordata. It can be concluded that the group of the Mollusca phylum has the ultimate number of species identified. Since the species belonging to the phylum Mollusca mostly consist of crustaceans, they have been easily encountered and identified, especially in the coastal areas. Another dominant group is Arthropoda regarding number of species (Table 5).

The detected species are not stated in the Bern and CITES Agreement lists.

According to the IUCN Red List, a significant part of the species is not in the list, while 11 taxa are categorized as LC (least concern) and 3 taxa as DD (data deficient).

Within the scope of the communiqués on the regulation of commercial and amateur fisheries No. 5/1 and 5/2 published by the Ministry of Agriculture and Forestry, 2 of the listed benthic species are in the strictly prohibited species list.

According to all sampling results about benthic species, Mollusca has the highest number in environments where sand-mud is dominant, while Polychaeta is seen in rather muddy bottoms, and Crustacea is seen in sand-mud bottoms.

It has been observed that the sampling areas in coastline have richer diversity and abundance related to the species compared to the deeper bottoms, which may be attributed to the intensive inter-species relationship in the littoral zone.

Littoral zones, providing convenient conditions in terms of abiotic factors such as temperature, light, nutrients, and dissolved oxygen, are also suitable areas for benthic organisms.

Species belonging to some benthic species identified in the research are shown in Photographs 13-22.



Photo 13. *Pachygrapsus marmoratus*



Photo 14. *Patella caerulea*



Photo 15. *Meretrix rudis*



Photo 16. *Penaeus semisulcatus*



Photo 17. *Ascida*, *Microcosmus* sp.



Photo 18. Hydrozoa sp, *Halocordyle disticha* (Goldfuss, 1820)

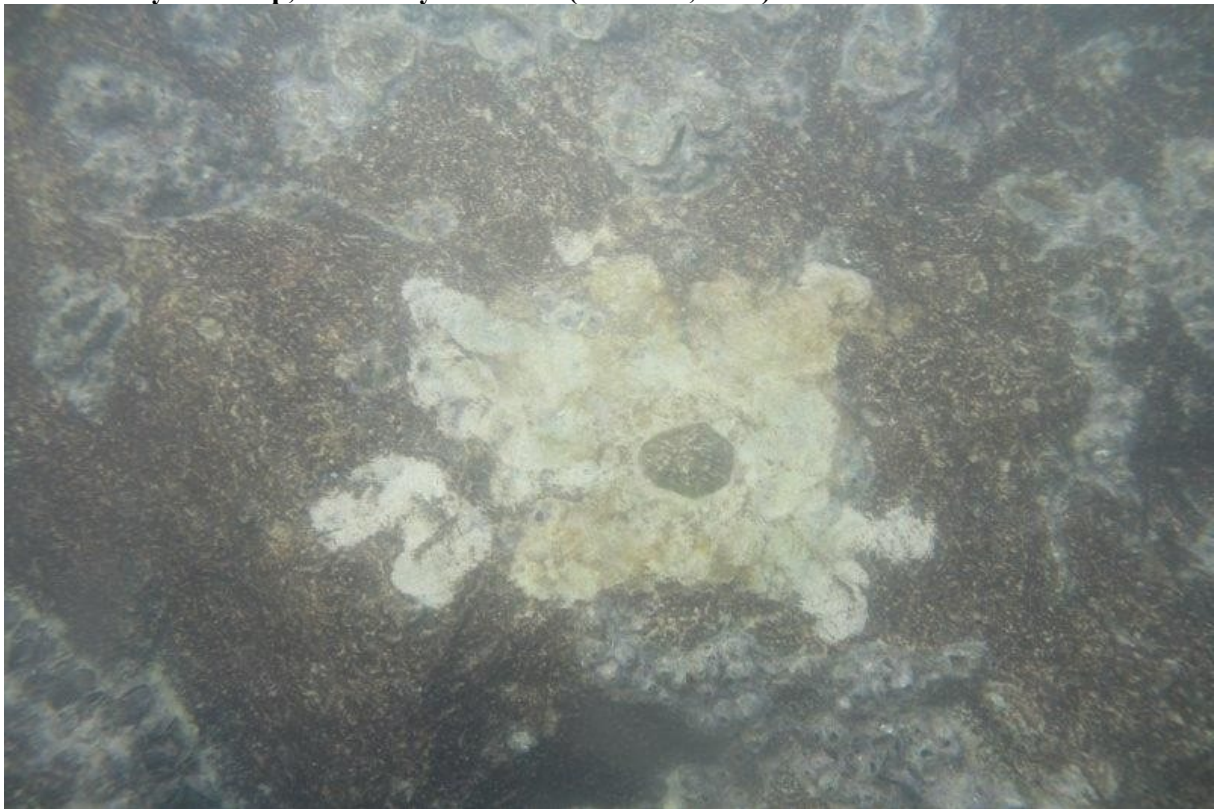


Photo 19. Mollusca sp, *Patella caerulea* Linnaeus, 1758



Photo 20. Mollusca, Mytilus sp. Community.



Photo 21. Crustacea, Callinectes sp.



Photo 22. Crustacea, Balanus sp. Community

4.3. Studies on Marine Vertebrates

4.3.1 Materials and Methods

Sampling for marine vertebrates were conducted in two ways. Underwater Visual Census (UVC) techniques were implemented with SCUBA diving in order to observe/record vertebrates on transects (as well as macro invertebrates provided in above sections) with information about their habitats of presence/preference. In addition to UVC, species caught by the professional fishers in the project impact area and the immediate surroundings were listed/evaluated (Photograph 23).



Photo 23. Scuba-diving during underwater observations

When the turbidity in the port did not allow us to use image reception equipment effectively- especially while determining the biodiversity/biotopes-, scuba diving along the perpendicular and transverse lines to the shore, given in Figure 11 (a, b, and c), was performed to scan such points by hand in December 2018.

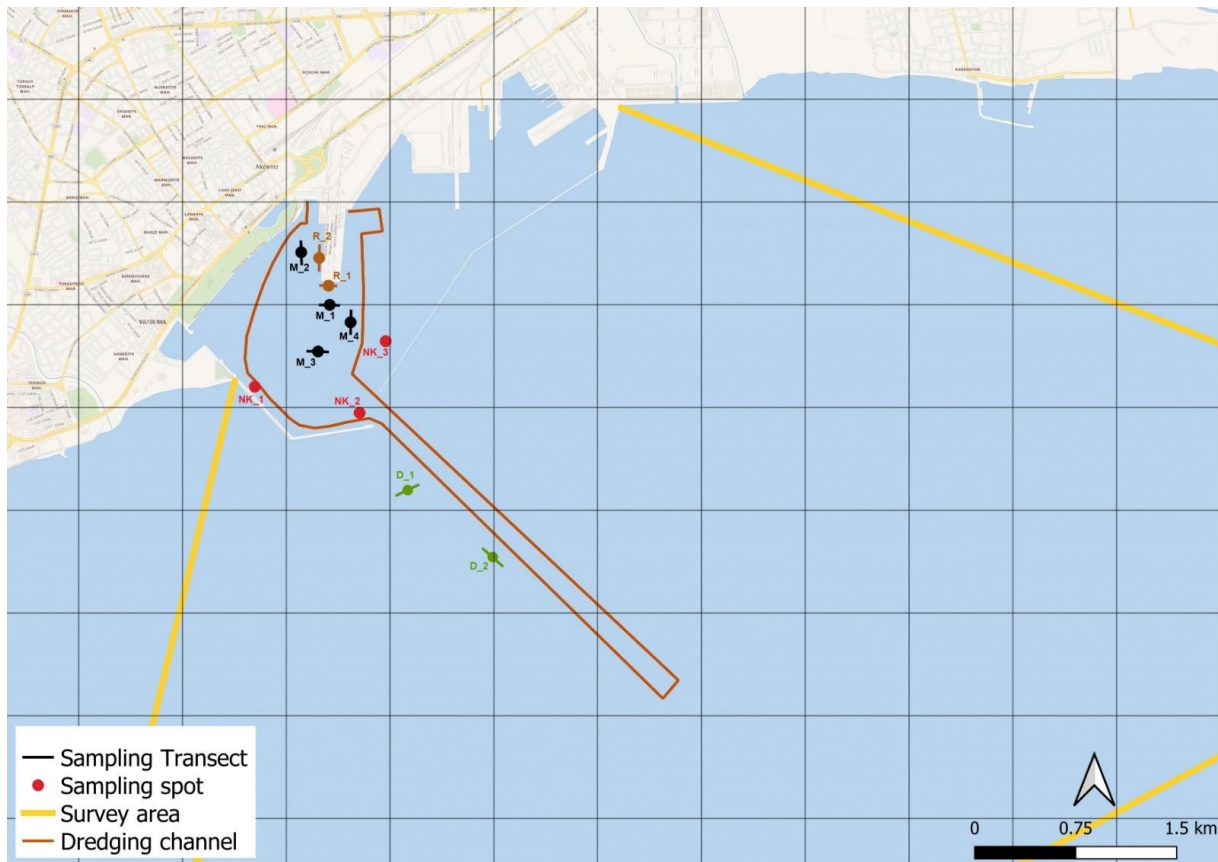


Figure 12: Underwater Visual Census (UVC) transects and spots at survey area.

Monitoring methodology Underwater Visual Census (UVC) implementations – while determining habitat boundaries- were carried out in parallel with UVC practices applied during determining of biological diversity. While measuring biological diversity with UVC, the flora - fauna elements in the habitats (biotopes) where these species found were assessed based on the transects (see Figure 12).

The research has provided information on the biotope (habitat) structure and distribution as well as macro biological diversity applying Underwater Visual Census (UVC) technique. Table 6 shows the middle coordinates of the lines where this technique has been applied. During these studies, an inventory of marine macroflora and macrofauna species in the biotope (habitat) and plant communities was recorded with imaging techniques (Sea and Sea Underwater Imaging System). The data generated with the help of Garmin GPS in area studies were recorded geographically (Table 7).

Table 7. Middle coordinates of the transects where the Underwater Visual Census technique is applied to determine the biodiversity/habitat structures and distribution

Station	Middle Coordinate of the Transect	Definition/Description	Biotope
R_1	36,7941013 N, 34,6389644 E	Middle coordinate of dock transect 1	Rocky
R_2	36,7949353 N 34,6383221 E	Middle coordinate of dock transect 2	Rocky
Ç_1	36,7948026 N 34,6383283 E	Middle coordinate of mud transect 1	Muddy
Ç_2	36,7933165 N 34,6420898 E	Middle coordinate of mud transect 2	Muddy
Ç_3	36,7944589 N 34,6408049 E	Middle coordinate of mud transect 3	Muddy
Ç_4	36,7944589 N 34,6408049 E	Middle coordinate of mud transect 4	Muddy
NK_1	36,7892885 N 34,6353978 E	Spot_1	Muddy
NK_2	36,7873354 N 34,6379978 E	Spot_2	Muddy
NK_3	36,7877132 N 34,6381585 E	Spot_3	Muddy
D_1	36,7820049 N 34,6490299 E	Middle coordinate of rocky biotope close to drainage channel	Rocky
D_2	36,7820049 N 34,6490299 E	Middle coordinate of muddy biotope close to drainage channel	Muddy

Detailed methodology for Underwater Visual Counting (UVS) technique is described below.

UVC – among different sampling techniques used to assess the diversity of macro fauna and flora in the marine ecosystem - is decided to be implement in shallow coast as well as surrounding biotopes (habitats) which can be with heterogeneous substrates such as artificial reef, rock or coral (De Girolamo, Mazzoldi, 2000).

The UVC technique, which is used to determine species composition, has a variety of protocols and practices, so it is used in a range of environmental conditions and study purposes as well as distribution and biomass studies for the purpose of both qualitative and quantitative data (Ensign, Angermeir, Dolloff, 1995; Harmelin-Vivien et al., 1985; Kulbicki, 1988; Kulbicki, 1998; Kulbicki, Wantiez, 1990; Letourneur, Kulbicki, Labrosse, 1998; Letourneur, Kulbicki, Labrosse, 1998; Sanderson and Solonsky, 1986; Thresher and Gunn, 1986).

Using these techniques, information about many biological characters (Costello, 1992; Garcia Charton and Pérez Ruzafa, 1998; Green 1996; Koppel, 1998; Luckhurst and Luckhurst, 1978; Macpherson, 1994; Mc Gehee, 1994), and trait (de Jonge and Videler, 1989; Lejeune, 1985; Samoilys, 1997; Wirtz, 1978), can be found, which is not possible while using other techniques. UVC provides higher quality information in heterogeneous habitats such as coral or reef than other common techniques such as using nets, trap, fishinghooks (De Girolamo, Mazzoldi, 2000; Gili and Ross, 1985; Kulbicki, Labrosse, Letourneur, 2000).

This method is useful especially when doing sampling in sensitive habitats such as marine reserves because this technique does not destroy the environment and has minimum impact on communities (Russ, 1985; Sale, 1980; Samoilys, 1988; Samoilys and Carlos, 1991).

However, there are also biased approaches towards UVC techniques (Harmelin-Vivien et al., 1985), some of which are related to fish trait. Such approaches are based on data leading to inadequate estimation about benthic and latent species (Brock, 1982; Harmelin-Vivien et al., 1985, Lincoln Smith, 1988). In addition, it is a fact that the observer in the environment can affect some species positively or negatively (Bell, 1983; Chapman, Johnstone, Dunn and Creasey, 1974; Harmelin-Vivien et al., 1985; Stanley and Wilson, 1995). The precision and clarity of each technique may vary depending on the area, time of day or season when it is used.

For instance, UVC techniques- used survey results can be affected by environmental complexity, visibility, temperature, and community richness (Harmelin-Vivien et al., 1985), fish activity (Costello, Darwall and Lysaght, 1995) and hunting stress on the studied population (Bell, 1983). Harmelin-Vivien et al., 1985). With that being said, UVC techniques can easily be modified to adapt to different environmental conditions and different species. For example, more accurate results can be obtained by varying the observer speed (Lincoln Smith, 1988, 1989) and transect width (Cheal and Thompson, 1997; Harmelin-Vivien et al., 1985).

UVC techniques have been used to study the species and abundance of reef fish since the 1950s (Brock, 1954; Harmelin-Vivien et al., 1985). Such techniques have been increasingly used in the research in the Mediterranean Region since 1975 (Fasola, Canova, Foschi, Novellini and Bressan,

1997; García Charton and Pérez Ruzafa, 1998; Garcia-Rubies and Zabala, 1990; Harmelin, 1987; Harmelin, Brachet and Garcia, 1995; Marconato, Mazzoldi, De Girolamo and Stefanni, 1996; Mazzoldi and De Girolamo, 1998; Vacchi and La Mesa, 1999).

The UVC technique can be applied with different methods (Cappo, Brown, 1996; Samoily, 1992), however, the most commonly used methods are fixed-width transect and point counts (Bellwood, 1988; Chabanet, Letourneur, 1995; Fowler, 1990; Galzin, 1987; Letourneur, 1996; Kulbicki and Sarramegna, 1999; Russ, 1985; Samoily, 1992).

Watson and Quinn (1997) investigated the variations that may occur between transect and spot counts in fish density estimations using UVC techniques. Fish density and the energy spent for sampling were calculated and no significant differences were found and they found that the effect was related to the size of the sampling area. Likewise, Samoily and Carlos (1997) compared the two methods and found insignificant differences in results between transect and spot counting. These researchers stated that point counting could be performed in 70% of the time spent on 50 m x 5 m transect sampling. They also predicted that small area scanning is better for small sedentary species.

De Girolamo and Mazzoldi (2000) used the transect UVC technique (Harmelin-Vivien et al., 1985; Threshner and Gunn, 1986) to collect both qualitative and quantitative data in their study. This method is frequently used in the Mediterranean (Bell, 1983, Fasola et al., 1997; García Charton and Pérez Ruzafa, 1998; Garcia-Rubies and Zabala, 1990; Harmelin, 1987; Harmelin et al., 1995; Marconato, Mazzoldi, De. Girolamo and Stefanni, 1996).

De Girolamo and Mazzoldi (2000) conducted a research on the applicability of UVC techniques in availability studies. **This study included performance tests related to the effect of the SCUBA observer, the benefits of multiple survey versus single survey, and repeated survey on the same transect.** The study revealed that the presence of the SCUBA observer did not affect the number of fish in each survey, and slow speed was useful for benthic species while higher speed was useful for epibenthic species, and there was no significant difference between repeated transect counts. The researchers used the ropes to limit the transect width to 10 m and specified the transect lengths to include homogeneous habitats. After the system was placed, 15 minutes

wait time passed for the environment to return to its normal state, and then sampling was performed in 15-minute periods.

Observers made sampling and observations using SCUBA and snorkeling techniques. The data collected during the dive has been transferred to the PVC notebook.

The speeds were classified in the study as low speed 3.5 m / min, high speed 10 m / min and medium speed 6 m / min. Valuable information about Mediterranean seagrass and rock habitat has been recorded by UVC techniques (Harmelin-Vivien and Francour, 1992).

In this study, the UVC technique was applied defining visual count transects which were parallel and perpendicular the coast, therefore, the depths and biotope limits in the research area could be identified. Macro species belonging to the biotope were scanned (observed/recorded) in lines parallel to the coast considering the limits of each biotope. Depending on the depth and substratum characteristics, biotope limits were determined along the lines perpendicular to the coast, therefore, it was aimed to create a habitat (biotope) map. As a result, the study managed to identify two characteristic biotopes. Since the inner side of port is completely muddy, the differentiation among biotopes could be studied on two biotopes one of which was situated in the inner side of the port and rock piles (dock/breakwater) and the other was in the mounth of port (see Photo 2-8).

The scanning process was carried out from deep to shallow. Since the depth (4 - 17 meters) in the mud biotope and visibility are limited due to turbidity, the line width is limited to 2 meters (manual sampling/substrate determination was carried out in places). In other biotopes (the turbidity is also at a level that partially limits visibility/sampling in the rocky biotope) it is determined as 5 meters. However, all organisms observed along the line were recorded. In the field studies, habitat limit coordinates were determined with Garmin GPS and the diver took video and photos with the Sea and Sea Underwater Imaging System (Canon D-600 SLR + 2500 Lumen Probe) in addition to the PVC notebook.

Fish species caught with fishinghooks and nets, in addition to the UVC technique, were also assessed in surrounding environment of port in order to observe pelagic and deep demersal species. Fishing nets with various pore diameters were released into the sea on 07.12.2018 with the help of

the fisherman who was hired the day before the field study was started, and these fishing nets stayed in the project area for one day and were collected on 08.12.2018. Fish sampling was carried out with fishing nets with various pore size. The fishing nets stayed released for a day and the fish in the nets were collected and identified. A net with 500-meter mesh size was used to conduct a detailed the sampling regarding the structure of the area.

The resources referred during identification of fish are available below; Bibby, et al., 1998, Bilecenoğlu, M. (2005), Claudet and Frascchetti (2010), El-Din (2004), Fischer, et al. (1987a), Fischer et al. (1987b), Fishbase (2014), Golani (1996), Golani (2002), Gözcelioğlu and Aydıncılar (2001), Kocataş and Bilecik (1992), Öztürk et al. (2003), Whitehead et al. (1984a), Whitehead et al. (1984b), Whitehead et al. (1984c).

4.3.2 Findings Regarding Fish Species

Fish are crucial biological components in the upper levels of aquatic systems. Ecologically, fish feed with algae, zooplankton or benthic species and located at the top of the food chain in the water. Birds followed by marine mammals and humans complete the upper links of the chain. Fish are not only an important source of ecological input but also that of economic importance.

Mersin Bay is an important area in terms of fisheries and a significant amount of fishing is done in terms of economy. It has been reported that there are around 417 fish species in the Levant Basin, which includes Mersin Bay (Bilecenoğlu et al., 2014); however, the Levant Basin, together with the Iskenderun Bay, includes a very large area and also contains the Suez Canal entrances. Ergüden and Turan (2013) mention the existence of 43 non-indigenous fish species in the Iskenderun Bay alone. In this respect, the records of Mersin Port's immediate surroundings are taken into account in this report. The fish species determined based on the literature and observations in the region are given in Table 7.

Fish species caught according to the results of observation and sampling that we conducted in the Project Area and its surrounding environments are in Photo 24-42.

Table 8. Fish species determined or likely determined in study area (L: Literature; G: Observation; B: Fisheries data)

Class	Order	Family	Genus	Turkish CoName	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
CHONDRICHTHYES	Carchariniformes	Scyliorhinidae	<i>Galeus melastomus</i> Rafinesque-Schmaltz, 1810	Kedi köpekbalığı	Blackmouth Catshark	LC			L
			<i>Scyliorhinus canicula</i> Linnaeus, 1758	Kedi köpekbalığı	Small Spotted Catshark	LC			L
			<i>Scyliorhinus stellaris</i> Linnaeus, 1758	Hemşire köpekbalığı	Nursehound	NT			L
		Triakidae	<i>Mustelus asterias</i> Cloquet, 1821	Köpekbalığı	Starry Smoothhound	VU			L
			<i>Mustelus mustelus</i> Linnaeus, 1758	Köpekbalığı	Common Smoothhound	VU			L
			<i>Mustelus punctulatus</i> Risso, 1827	Köpekbalığı	Blackspotted Smoothhound	VU			L
	Hexanchiformes	Hexanchidae	<i>Hexanchus griseus</i> Bonnaterre, 1788	Köpekbalığı	Bluntnose Sixgill Shark	NT			L
			<i>Heptranchias perlo</i> Bonnaterre, 1788	Köpekbalığı	Sharpnose Sevengill Shark	DD			L
	Lamniformes	Odontaspidae	<i>Carcharias taurus</i> Rafinesque-Schmaltz, 1810	Kum kaplan köpekbalığı	Sand Tiger Shark	CR			L
	Rajiformes	Dasyatidae	<i>Dasyatis pastinaca</i> (Linnaeus, 1758)	İğneli vatoz	Common stingray	VU			L
			<i>Dasyatis centroura</i> Mitchill, 1815	Vatoz	Roughtail Stingray	VU			L
		Gymnuridae	<i>Gymnura altavela</i> Linnaeus, 1758	Vatoz	Spiny Butterfly Ray	CR			L
		Myliobatidae	<i>Myliobatis aquila</i> Linnaeus, 1758	Vatoz	Common Eagle Ray	VU			L
			<i>Aetomylaeus bovinus</i> Geoffroy Saint-Hilaire, 1817	Vatoz	Bullray	CR			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Rajidae	<i>Dipturus oxyrinchus</i> Linnaeus, 1758	Vatoz	Longnosed Skate	NT			L
			<i>Leucoraja naevus</i> Müller & Henle, 1841	Vatoz	Cuckoo Skate	NT			L
			<i>Raja clavata</i> Linnaeus, 1758	Vatoz	Thornback Skate	NT			L
			<i>Raja miraletus</i> Linnaeus, 1758	Vatoz	Brown Skate	LC			L
			<i>Raja radula</i> Delaroche, 1809	Vatoz	Rough Skate	EN			L
			<i>Rostroraja alba</i> Lacepède, 1803	Vatoz	White Skate	EN	EK-III		L
	Squaliformes	Centrophoridae	<i>Centrophorus granulosus</i> Bloch & Schneider, 1801	Köpekbalığı	Gulper shark	CR			L
		Dalatiidae	<i>Etmopterus spinax</i> Linnaeus, 1758	Köpekbalığı	Velvet Belly Lanternshark	LC			L
		Oxynotidae	<i>Oxynotus centrina</i> Linnaeus, 1758	Köpekbalığı	Angular Rough Shark	CR			L
		Squalidae	<i>Squalus acanthias</i> Linnaeus, 1758	Köpekbalığı	Spiny Dogfish	EN		Çiz_I	L
			<i>Squalus blainville</i> Risso, 1827	Köpekbalığı	Longnose Spurdog	DD		Mad.16	L
	Squatiniiformes	Squatinaidae	<i>Squatina squatina</i> Linnaeus, 1758	Köpekbalığı	Angelshark	CR		Mad.16	L
	Torpedinidae	Torpedinidae	<i>Torpedo marmorata</i> Risso, 1810	Torpil balığı	Spotted Torpedo	LC			L
	Chimaeriformes	Chimaeridae	<i>Chimaera monstrosa</i> Linnaeus, 1758	Kimera, tavşan balığı	Rabbitfish	NT			L
OSTEICHTHYES	Anguilliformes	Congridae	<i>Conger conger</i> Linnaeus, 1758	Mıgır	Conger Eel	LC			L
		Anguillidae	<i>Anguilla anguilla</i> (Linnaeus, 1758)	Yılan balığı	European eel	CR	Ek III		L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Murenidae	<i>Muraena helena</i> Linnaeus, 1758	Müren	Mediterranean moray	LC			L
		Ophichthidae	<i>Ophisurus serpens</i> Linnaeus, 1758	Mıgır	Serpent Eel	LC			L
	Aulopiformes	Chlorophthalmidae	<i>Chlorophthalmus agassizi</i> Bonaparte, 1840	Yeşilgöz balığı	Agassiz's Thread-sail Fish	LC			L
		Synodontidae	<i>Saurida undosquamis</i>			LC			G
	Beryciformes	Trachichthyidae	<i>Hoplostethus mediterraneus</i> Cuvier, 1829	Kütükbalığı	Silver Roughy	LC			L
	Clupeiformes	Clupeidae	<i>Alosa agone</i> Scopoli, 1786	Tirsi	Agone	LC			L
			<i>Sardina pilchardus</i> Walbaum, 1792	Bayağı Sardalya	European Pilchard	LC			L
			<i>Sprattus sprattus</i> Linnaeus, 1758	Çaça	Sprat	NE			L,G
		Engraulidae	<i>Engraulis encrasiolus</i> (Linnaeus, 1758)	Hamsi	Anchovy	LC			L
	Atheriniformes	Atherinidae	<i>Atherina boyeri</i> Risso, 1810	Aterina	big-scale sand smelt	LC			L, G
			<i>Atherina hepsetus</i> Linnaeus, 1758	Aterina	Smelt	LC			L
			<i>Atherinomorus forskalii</i> (Rüppell, 1838)	Aterina	Smelt	LC			L
	Beloniformes	Belonidae	<i>Belone belone</i> (Linnaeus, 1761)	Zargana	Garfish	LC			L
			<i>Belone svetovidovi</i> Collette & Parin, 1970	Zargana	Garfish	DD			L
			<i>Tylosurus acus</i> (Lacepède, 1803)	Zargana	keel-jawed needlefish	LC			L
	Gadiformes	Gadidae	<i>Gadiculus argenteus</i> Guichenot, 1850	Pamukçuk balığı	Sivery pout	DD			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
			<i>Merlangius merlangus</i> Linnaeus, 1758	Mezgit	Whiting	LC			L
			<i>Micromesistius poutassou</i> Risso, 1827	Mavi mezgit, bakalyaro	Blue Whiting	LC			L
			<i>Trisopterus minutus</i> Linnaeus, 1758	Tavuk balığı	Poor cod	LC			L
		Lotidae	<i>Molva macrophthalma</i> Rafinesque-Schmaltz, 1810	Gelincik	Spanish Ling	DD			L
		Macrouridae	<i>Caelorinchus caelorhincus</i> Risso, 1810	Fare balığı	Saddled Grenadier	NE			L
			<i>Hymenocephalus italicus</i> Giglioli, 1884	Fare balığı	Glasshead Grenadier	LC			L
		Merluccidae	<i>Merluccius merluccius</i> Linnaeus, 1758	Berlam	European Hake	VU			L
		Phycidae	<i>Phycis blennoides</i> Brünnich, 1768	Gelincik	Forkbeard	LC			L
			<i>Phycis phycis</i> Linnaeus, 1766	Gelincik	Forkbeard	LC			L
	Lophiiformes	Lophiidae	<i>Lophius budegassa</i> Spinola, 1807	Fener balığı	Black-bellied Angler	LC			L
			<i>Lophius piscatorius</i> Linnaeus, 1758	Fener balığı	Angler fish	LC			L
	Ophidiiformes	Ophidiidae	<i>Ophidion rochei</i> Müller, 1845	Kayış balığı	Blenny	DD			L
			<i>Ophidion barbatum</i> Linnaeus, 1758	Kayış balığı	Blenny	LC			L
	Osmeriformes	Argentinidae	<i>Argentina sphyraena</i> Linnaeus, 1758	Derinsu gümüşü	Argentine	LC			L
	Perciformes	Ammodytidae	<i>Gaymmamodytes cicerolus</i> Rafinesque, 1810	Kum Balığı	Mediterranean Sand Eel	DD			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Mugilidae	<i>Chelon auratus</i> (Risso, 1810)			LC			G
		Epinephelidae	<i>Epinephelus aeneus</i>			NT			G
		Bleniidae	<i>Blennius ocellaris</i> Linnaeus, 1758	Horozbina	Blenny	LC			L
			<i>Salaria pavo</i> (Risso, 1758)	İbikli horozbina	Peacock blenny	LC			L
		Callionymidae	<i>Callionymus fasciatus</i> Valenciennes, 1837	Üzgün	Banded Dragonet	LC			L
			<i>Callionymus lyra</i> Linnaeus, 1758	Üzgün	Dragonet	LC			L
		Carangidae	<i>Trachurus trachurus</i> (Linnaeus, 1758)	Karagöz istavriti	Atlantic horse-mackerel	LC			L
			<i>Trachurus mediterraneus</i> Steindachner, 1868	İstavrit	Mediterranean Horse Mackerel	LC			L
			<i>Trachurus picturatus</i> Bowdich, 1825	İstavrit	Blue Jack Mackerel	LC			L
			<i>Lichia amia</i>			DD			G
		Centranchidae	<i>Spicara maena</i> Linnaeus, 1758	İzmarit, beyazgöz	Blotched Picarel	LC			L, G
			<i>Spicara smaris</i> Linnaeus, 1758	İzmarit, istrangiloz	Picarel	LC			L
		Cepolidae	<i>Cepola macrophthalma</i> Linnaeus, 1758	Kurdela balığı	Red Bandfish	LC			L
		Gobiidae	<i>Deltentosteus quadrimaculatus</i> Valenciennes, 18	Kayabalığı	Goby	LC			L
			<i>Gobius niger</i> Linnaeus, 1758	Kayabalığı	Black Goby	LC	EK-III		L
			<i>Lesueurigobius friesii</i> Malm, 1874	Kayabalığı	Frie's Goby	LC			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Pomacentridae	<i>Chromis chromis</i> (L.,1758)	Papaz	Damsel fish	LC			L
		Labridae	<i>Coris julis</i> Linnaeus, 1758	Gelin balığı	Mediterranean Rainbow Wrasse	LC			L
		Labridae	<i>Labrus viridis</i> Linnaeus, 1758	Lapın-Otbalığı	Green wrasse	VU			L
			<i>Labrus merula</i>	Lapın-Otbalığı	Brown wrasse	LC			L
			<i>Symphodus cinereus</i> (Bonattere, 1788)	Gri Çırçır-Ot Balığı	Grey wrasse	LC			L
			<i>Symphodus ocellatus</i> (Forsskal, 1775)	Benekli çırçır	Ocellated wrasse	LC			L
			<i>Symphodus roissali</i> (Risso, 1810)	Çırçır	Five-spotted wrasse	LC			L
			<i>Symphodus tinca</i> (Linnaeus, 1758)	Çırçır	East Atlantic peacock wrasse	LC			L
		Moronidae	<i>Dicentrarchus labrax</i> (Linnaeus, 1758)	Levrek	European seabass	NT			L
		Mullidae	<i>Mullus barbatus</i> Linnaeus, 1758	Barbun balığı	Plain red mullet	LC			L
			<i>Mullus surmuletus</i> Linnaeus, 1758	Barbun balığı	Striped Red Mullet	LC			L
			<i>Upeneus moluccensis</i>			LC			G
		Pemperidae	<i>Pempheris vanicolensis</i> Cuvier, 1831	Pemperis	Vanikoro sweeper	LC			L, G
		Pomatomidae	<i>Pomatomus saltatrix</i> (Linnaeus, 1758)	Lüfer	Bluefish	NT			L
		Sciaenidae	<i>Sciaena umbra</i> Linnaeus, 1758)	Eşkına	Brown meagre	NT	EK-III		L
			<i>Umbrina cirrosa</i>			VU	EK-III		G

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Scombridae	<i>Scomber japonicus</i> Houttuyn, 1782	Kolyoz	Pacific Chub Mackerel	LC			L
			<i>Scomber scombrus</i> L., 1758	Uskumru	Atlantic Mackerel	LC			L
			<i>Sarda sarda</i> (Bloch, 1793)	Palamut	Atlantic bonito	LC			B
		Serranidae	<i>Serranus cabrilla</i> (Linnaeus, 1758)	Asıl Hani	Comber	LC			L
			<i>Serranus scriba</i> (Linnaeus, 1758)	Yazılı hani	Painted comber	LC			L
			<i>Serranus hepatus</i> (Linnaeus, 1758)	Benekli hani	Brown comber	LC			L
		Sparidae	<i>Boops boops</i> Linnaeus, 1758	Kupes	Bogue	LC			L
			<i>Sarpa salpa</i>			LC			G
			<i>Sparus aurata</i>			LC			G
			<i>Dentex dentex</i> Linnaeus, 1758	Sinarit	Common Dentex	VU			L
			<i>Dentex macrophthalmus</i> Bloch, 1791	Patlakgöz mercan	Large-eyed Dentex	LC			L
			<i>Dentex maroccanus</i> Valenciennes, 1830	Fas mercanı	Morocco Dentex	DD			L
			<i>Diplodus annularis</i> (Linnaeus, 1758)	Isparoz	Annular seabream	LC			L, G
			<i>Diplodus puntazzo</i> (Cetti, 1777)	Sivriburunlu Karagöz	Sharpsnout seabream	LC			L
			<i>Diplodus sargus</i> (Linnaeus, 1758)	Sargoz	White seabream	LC			G
			<i>Diplodus vulgaris</i> Geoffroy Saint-Hilaire, 1817	Karagöz	Common Two- banded Seabream	LC			L, G

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SUA Tebliği (5/1; 5/2)	Source
			<i>Lithognathus mormyrus</i> (Linnaeus, 1758)	Mırmır-Trat	Striped sea bram	LC			G
			<i>Oblada melanura</i> Linnaeus, 1758	Melanur	Saddled Seabream	LC			G
			<i>Pagellus acarne</i> Risso, 1826	Yabani mercan	Axillary Seabream	LC			L
			<i>Pagellus bogaraveo</i> Brünnich, 1768	Mandalgöz mercan	(Blackspot Seabream	LC			L
			<i>Pagellus erythrinus</i> Linnaeus, 1758	Kırma mercan	Common Pandora	LC			G
			<i>Pagrus caeruleostictus</i> Linnaeus, 1758	Fangri	Red Porgy	DD			G
			<i>Spondyliosoma cantharus</i> Linnaeus, 1758	Sarıgöz	Black Seabream	LC			L
		Sphyraenidae	<i>Sphyraena sphyraena</i> Linnaeus, 1758	Iskarmoz	European Barracuda	LC			L
			<i>Sphyraena viridensis</i> Cuvier, 1829	Turna balığı	Yellowmouth Barracuda	LC			L
		Trachinidae	<i>Trachinus draco</i> Linnaeus, 1758	Trakonya	Greater Weever	LC			G
			<i>Trachinus radiatus</i> Cuvier, 1829	Trakonya	Starry Weever	LC			L
		Trichiuridae	<i>Lepidopus caudatus</i> Euphrasen, 1788	palaska balığı	Silver Scabbardfish	LC			L
		Uranoscopidae	<i>Uranoscopus scaber</i> Linnaeus, 1758	Kurbağa balığı	Stargazer	LC			G
	Pleuronectiformes	Bothidae	<i>Arnoglossus imperialis</i> Rafinesque-Schmaltz, 1810	Pisi balığı	Imperial Scaldfish	LC			L
			<i>Arnoglossus laterna</i> (Walbaum, 1792)	Küçük pisi balığı	Scaldback	LC			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
			<i>Arnoglossus rueppelii</i> Cocco, 1844	Pisi balığı	Rüppell's Scaldback	LC			L
			<i>Arnoglossus thori</i> Kyle, 1913	Pisi balığı	Thor's Scaldfish	LC			L
		Citharidae	<i>Citharus linguatula</i> Linnaeus, 1758	Spotted Flounder	Spotted Flounder	LC			L
		Cynoglossidae	<i>Symphurus nigrescens</i> Rafinesque-Schmaltz, 1810	Tonguesole	Tonguesole	LC			L
		Scophthalmidae	<i>Psetta maximus</i> (Linnaeus, 1758)	Kalkan	Turbot	NT			L
			<i>Lepidorhombus boscii</i> Risso, 1810	Benekli pisi balığı	Four-spot megrim	LC			L
			<i>Lepidorhombus whiffiagonis</i> Walbaum, 1792	Küçük pisi balığı	Flounder	LC			L
			<i>Scophthalmus rhombus</i> Linnaeus, 1758	Dişi kalkan	Brill	LC			L
		Soleidae	<i>Microchirus ocellatus</i> Linnaeus, 1758	Noktalı dil balığı	Foureyed Sole	LC			L
			<i>Microchirus variegatus</i> Donovan, 1808	Lekeli dil balığı	Thickback Sole	LC			L
			<i>Monochirus hispidus</i> Rafinesque, 1814	Dil balığı	Whiskered Sole	DD			L
			<i>Buglossidium luteum</i> (Risso, 1810)	Küçük dil balığı	Yellow sole	LC			L
			<i>Solea solea</i> (Linnaeus, 1758)	Dil balığı	Common sole	LC			G
	Tetraodontiformes	Balistidae	<i>Balistes capriscus</i> Gmelin, 1789	Tetik balığı	Grey triggerfish	DD			L
		Monacanthidae	<i>Stephanolepis diaspros</i> Fraser-Brunner, 1940	Domuz balığı	Reticulated filefish	LC			G

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Tetraodontidae	<i>Lagocephalus lagocephalus</i> (Linnaeus, 1758)	Balon balığı	Puffer	LC			L
			<i>Lagocephalus sceleratus</i>	Balon balığı	Silver cheek	LC			L
			<i>Lagocephalus spadiceus</i> (Richardson 1845)	Balon balığı	Spadiceus puffer	LC			L
			<i>Lagocephalus suezensis</i> Clark & Gohar, 1953	Balon balığı	Suez Puffer	LC			L
			<i>Sphoeroides pachygaster</i> (Müller & Troschel, 1848)	Balon balığı	Blunthead	LC			L
			<i>Torquigener flavimaculosus</i> Hardy & Randall, 1983	Balon balığı	Yellowspotted	LC			L
			<i>Tylerius spinosissimus</i> (Regan, 1908)	Balon balığı	Spiny blaasop	LC			L
	Scorpaeniformes	Scorpaenidae	<i>Scorpaena porcus</i> Linnaeus, 1758	Lipsoz	Blackscorpion fish	DD			L
			<i>Scorpaena elongata</i> Cadenat, 1943	İskorpit	Slender Rockfish	LC			L
			<i>Scorpaena maderensis</i> Valenciennes, 1833	İskorpit	Madeira Rockfish	LC			L
			<i>Scorpaena notata</i> Rafinesque-Schmaltz, 1810	İskorpit	Red Scorpionfish	LC			L
			<i>Scorpaena scrofa</i> Linnaeus, 1758	İskorpit	Red Scorpionfish	LC			L
		Sebastidae	<i>Helicolenus dactylopterus</i> Delaroche, 1809	İskorpit	Blackbelly Rosefish	LC			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
		Peristediidae	<i>Peristedion cataphractum</i> Linnaeus, 1758	Dikenli öksüz balığı	African Armoured Searobin	LC			L
		Triglidae	<i>Chelidonichthys lucernus</i> (Linnaeus, 1758)	Kırlangıç	Sapphirine gurnard	LC			L
			<i>Chelidonichthys cuculus</i> Linnaeus, 1758	Kırlangıç	Red Gurnard	LC			L
			<i>Chelidonichthys gurnardus</i> Linnaeus, 1758	Kırlangıç	Gurnard	LC			L
			<i>Chelidonichthys lastoviza</i> Bonnaterre, 1788	Kırlangıç	Streaked Gurnard	LC			L
			<i>Lepidotrigla cavillone</i> Lacepède, 1803	Kırlangıç	Gurnard	LC			L
			<i>Trigla lyra</i> Linnaeus, 1758	Öksüz	Piper	LC			L
	Syngnathiformes	Centriscidae	<i>Macroramphosus scolopax</i> Linnaeus, 1758	Boru balığı	Longspine Snipefish	LC			L
		Syngnathidae	<i>Syngnathus abaster</i> Risso, 1827	Deniz iğnesi	Black-stripped pipefish	LC	EK-III		L
			<i>Syngnathus typhle</i> Linnaeus, 1758	Geniş burunlu deniz iğnesi	Broad-nosed pipefish	DD			L
			<i>Hippocampus guttulatus</i> Cuvier, 1829	Deniz atı	Long-snouted sea horse	NT			L
			<i>Hippocampus hippocampus</i> (Linnaeus, 1758)	Deniz atı	Short-snouted seahorse	NT		Çiz.-I ve Mad.16	L
			<i>Hippocampus fuscus</i> Rüppell, 1838	Deniz atı	Sea pony	NE			L
	Stomiiformes	Sternoptychidae	<i>Maurollicus muelleri</i> Gmelin, 1789	Balta balığı	Pearlside	LC			L

Class	Order	Family	Genus	Turkish Name	English Name	IUCN	Bern	SÜA Tebliği (5/1; 5/2)	Source
	Zeiformes	Caproidae	<i>Capros aper</i> Linnaeus, 1758	Peri balığı	Boarfish	LC			L
		Zeidae	<i>Zeus faber</i> Linnaeus, 1758	Peygamber balığı	Atlantic John Dory	LC			L



Photo 24. *Stephanolepis diaspros*

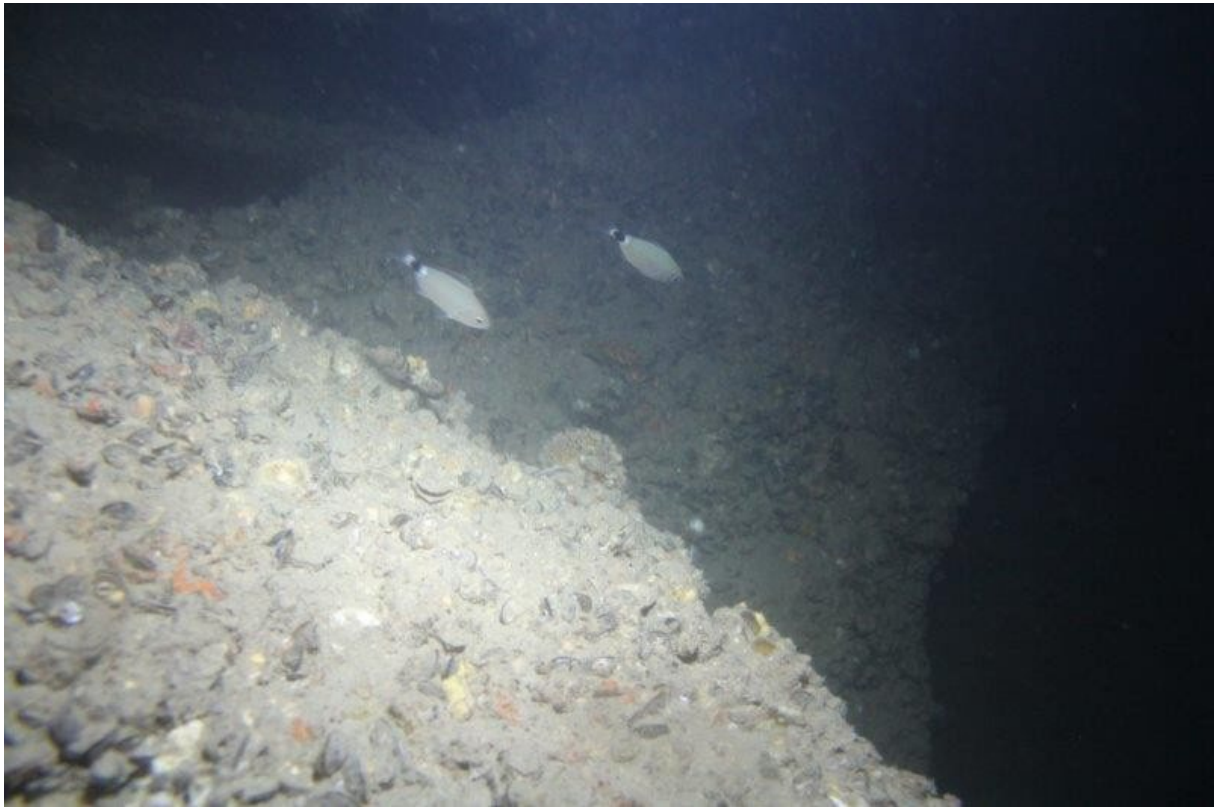


Photo 25. *Oblada melanura*



Photo 26. *Diplodus sargus*



Photo 27. *Diplodus sargus*

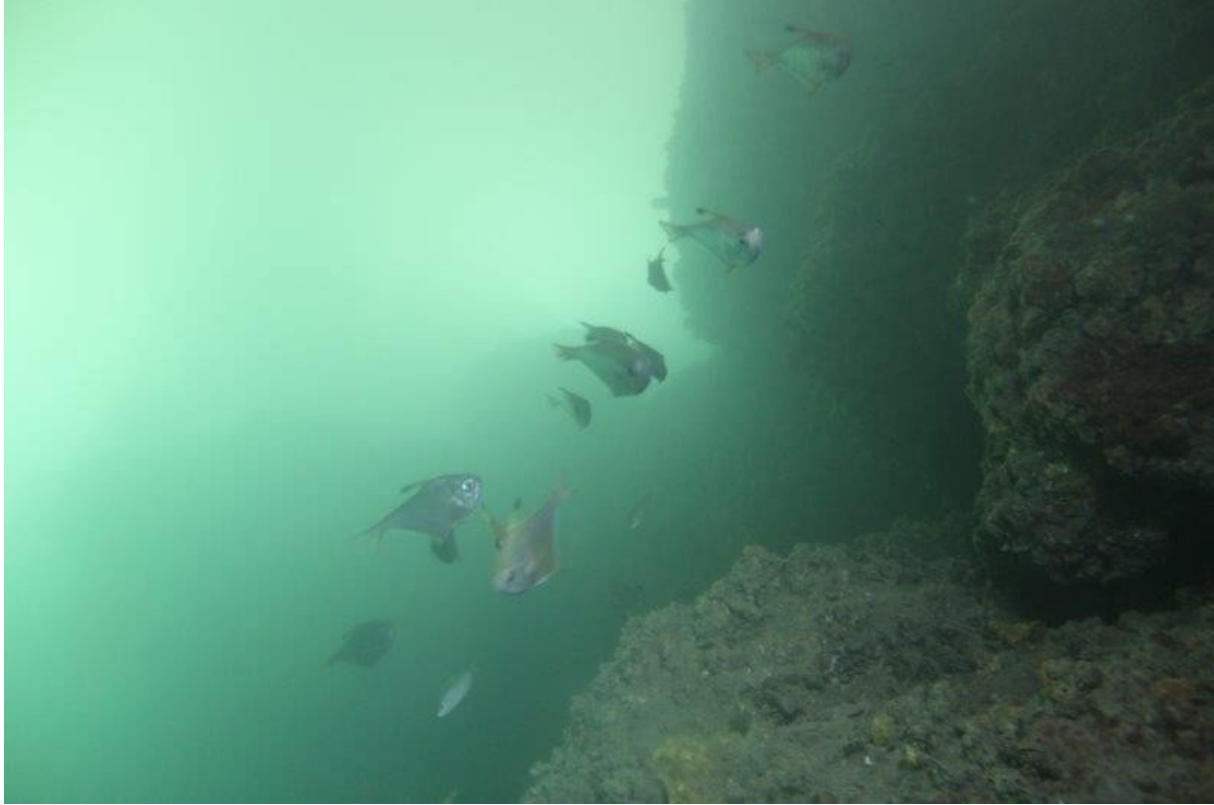


Photo 28. *Pempheris vanicolensis*



Photo 29. *Epinephelus aeneus*



Photo 30. *Pagrus caeruleostictus*



Photo 31. *Lithognathus mormyrus*



Photo 32. *Chelon aurata*



Photo 33. *Saurida undosquamis*



Photo 34. Sparus aurata



Photo 35. Solea solea



Photo 36. *Pagellus erythrinus*



Photo 37. *Uranoscopus scaber*



Photo 38. *Trachinus draco*



Photo 39. *Umbrina cirrosa*



Photo 40. *Sarpa salpa*



Photo 41. *Lichia amia*



Photo 42. *Upeneus moluccensis*

A total of 170 fish species have been identified according to the literature and the studies conducted in the project area and its immediate surroundings. Among the observed fish species, *Pempheris vanicolensis* Cuvier, 1831 and *Stephanolepis diaspros* Fraser-Brunner, 1940 are identified to be alien fish (non-indigenous) species. Alien fish infestation is a common phenomenon in the region.

As determined in the field studies, biotope differentiation is low in Mersin Port and its immediate surroundings. In addition, factors such as natural environment degradation, ship traffic, and intensive use previously added to this phenomenon have adversely affected biological diversity. Fish species were identified by catching and observation in the examinations made in Mersin Port and the marine area in its vicinity (Table 7). In addition, the vertebrate species whose existence in the area were determined by fishing are also given. A significant part of the identified species is of economic importance.

Within the project impact area, there is no special/productive area that is frequently used as a feeding, nesting and sheltering area for fish, but there are suitable areas around it.

Therefore, the project impact area boundaries considered to be not used effectively in terms of fisheries. However, immediate surroundings is used as a hunting ground by fishermen from time to time.

IUCN Red List data related to conservation statuses of fish species are shown below.

- 7 species of CR (critically endangered)
- 3 species of EN (endangered)
- 10 species of VU (vulnerable)
- 13 species of NT (near threatened)
- 118 species of LC (least concern)
- 15 species of DD (data deficient)
- 3 species of NE (not evaluated)

According to the Bern Convention, 6 species are included in the Annex III list.

Within the scope of the communiqués on the regulation of commercial and amateur fisheries No. 5/1 and 5/2, 4 species, identified in this study after data collection from the study zone and literature, are strictly prohibited to hunt.

International agreements and practices, on the other hand, are generally about the flora and fauna elements that are under protection, trade is prohibited and cross-border and/or migratory and their habitats, and aim to protect the regions where these species and/or their habitats are found. Institutions such as UN FAO, UNEP, EU and UCN are among the institutions that carry out binding studies on protection and use details. The criteria established to protect these species and their habitats should be taken into consideration.

Although they are under protection, these species have the ability to move at very high speeds and have the potential to leave the area in adverse conditions. The species in question use this area only as a feeding and crawling area. In this case, they are not expected to be adversely affected by the facility. As a matter of fact, it has been observed that fish species diversity is high.

4.3.3 Sea Turtles and Mammals

No sea turtles and mammals were encountered during the field studies. However, in the interviews with the company officials who supported the field studies, it was stated that they did not record any marine mammals in Mersin Port and that sea turtles were rarely encountered (the personnel of the sea cleaning companies monitor the sea 24 hours a day and take responsibility for sensitive species). In the field studies, the ship traffic in the port and the destruction of natural biotopes were determined, and it was estimated that this area would not have a place in the life cycle of marine mammals and turtles at any stage.

However, one of the most significant spawning grounds of *Chelonia mydas* species, also known as the green sea turtle, is Kazanlı Beach in the Mediterranean Region (Figure 12). Kazanlı Beach is located 10 km east of the project area and is being studied as the closest spawning area of this threatened species. *Chelonia mydas* is classified as "Endangered" by IUCN and is in Category II according to the BERN agreement.



Figure 13. The Distance between Project Area and Kazanlı Beach

No matter how unlikely it is to see them in Mersin Port, the literature information in this report has been evaluated based on the surrounding environment of the area since sea turtle and mammal species are vulnerable species regarding conservation measures.

Caretta caretta and *Chelonia mydas* species are common in the waters of Turkey. **Chelonia mydas** (Green Sea turtle) is categorized as "Endangered" by IUCN and is in Category II according to the BERN agreement. One of the most important spawning grounds of this species in the Mediterranean is Kazanlı Beach. Therefore, this threatened species is quite common even if they are unlikely to be seen in Mersin Port. Kazanlı beach is approximately 14 km away from the project area while Seyhan Delta is about 20 km away from it. It is at risk of being affected by accidents that may occur during construction and/or operation. Measures that can be taken in this regard will be presented in the following sections.

In addition, the threatened mammal species have been identified with the previous studies and literature reviews. Such mammal species have been previously recorded or identified nearby of the area by various researchers and they are dependent on the specified habitat types for reproduction, shelter, and nutrition. See Table 8 for such species. However, all these species can move away from the region quite fast in case of risks that may occur during construction and operation. However, they are still at risk of being affected by possible accidents during construction and/or operation. The related measures will be presented in the following sections.

All marine mammals have been forbidden to hunt in Turkey since 1983, and in this list, *Delphinus delphis*, *Stenella coeruleoalba*, *Tursiops truncatus* and *Balaenoptera physalus* are protected under Barcelona Convention - The Convention on the Protection of Pollution- and its sub-protocols on which Turkey is one of the parties (Barcelona, Annex-2 list). Furthermore, all these species are prohibited to hunt according to the circular note No. 5/2 (2020/2024) (last amendment dated 22/08/2020-31221).

According to IUCN criteria, *Delphinus delphis* is in “low risk” (LR-Lower Risk) while *Balaenoptera physalus* is in the "endangered" (EN-Endangered) category. These species are also protected under the CITES (Convention on the International Trade of Endangered Wild Plant and Animal Species) and Annex-II (ie "Absolutely Protected Species") list.

There are no endemic marine mammals in the project area and its surrounding environment.

Table 9. Sea Turtles and Mammals in the project impact area, immediate surroundings.

Latin	Turkish	English	Endemic	IUCN (ver.2021- 1)	Other
					Koruma Durumları
Clasis: REPTILIA					
Ordo: Testudines					
Fam: Cheloniidae					
<i>Caretta caretta</i> (Linnaeus, 1758)	İribaşlı Deniz Kaplumbağası	Loggerhead	--	LC	CITES, SÜS, Bern
<i>Chelonia mydas</i> (Linnaeus, 1758)	Yeşil Deniz Kaplumbağası	Green Turtle	--	EN	CITES, SÜS, Bern
Clasis: MAMMALIA					
Ordo: Cetacea					
Fam: Delphinidae					
<i>Tursiops truncatus</i> (Montagu, 1821)	Afalina (yaygın yunus)	Common bottlenose dolphin	--	VU	SÜS, Barcelona
<i>Stenella coeruleoalba</i> (Meyen, 1833)	Çizgili Yunus	Striped dolphin	--	VU	SÜS, Barcelona
<i>Delphinus delphis</i> (Linnaeus, 1758)	Tırtak	Short-baked common dolphin	--	EN	CITES, SÜS, Barcelona
Fam: Balaenopteridae					
<i>Balaenoptera physalus</i> (Linnaeus, 1758)	Oluklu Balina	Fin whale	-	VU	CITES, SÜS, Barcelona

5. COMPERATIVE EVALUATION OF BIOLOGICAL DIVERSITY WITH CONTROL STATIONS USING STATISTICAL METHODS

A field study was carried out in April and December 2021 to evaluate the biological diversity of the existing structures in the port comparatively with similar biotopes – in control stations - and to detect the existence of the existing species within the area. This is a comparative study in which the biotope types determined in the previous study (2018) in Mersin International Port and the similar ones located in the west of Mersin Marina are compared. During this study, not only the biodiversity indices has been used for such comparison but similarities are also evaluated. For this purpose, similarity-based cluster analysis has been carried out.

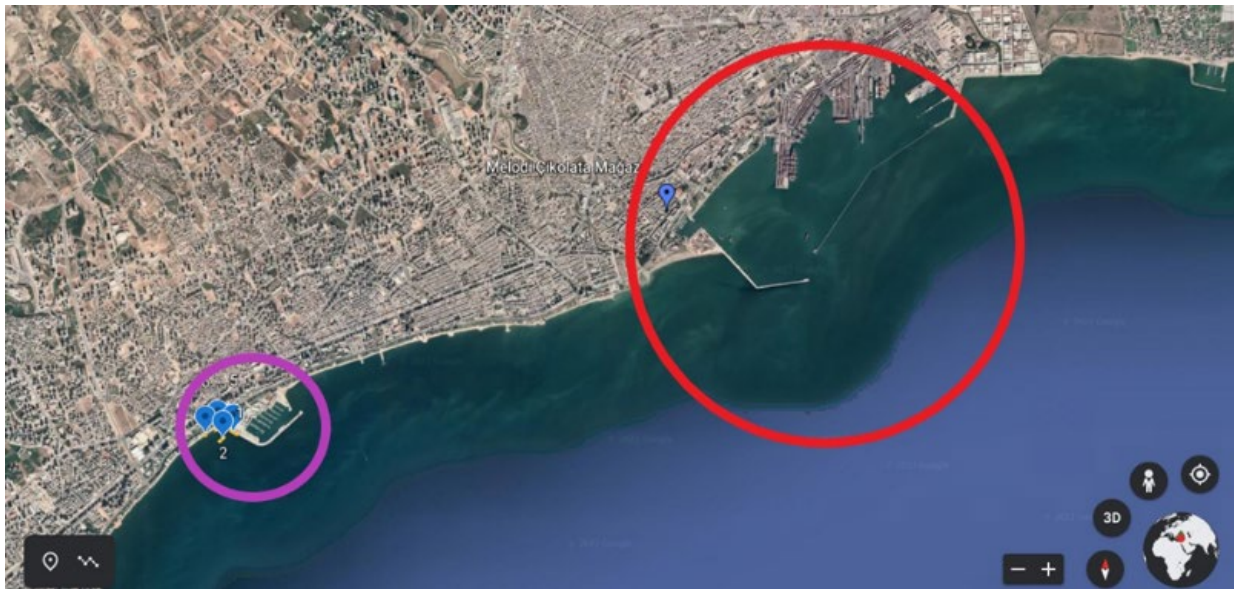


Figure 14: Locations of Underwater Visual Census (UVC) transects applied at survey area (Red circle) and control area (Purple circle).

The sampling process dated April and December 2021 was performed in a completely different study area which was designated as a control area. During this sampling period, a special attention has been paid to conduct the process in the transects of habitats which have similar specifications with the MIP study area, hence the sampling has been performed in the western parts of the Mersin Marina. In this region, four different study points (4 different transects) were selected and there were different types of habitats in such areas; moreover all living groups that create the food chain were sampled (Table 10, Figure 14 and Photograph 43-45).



Photo 43. L_1. Sampling Area (MIP)



Photo 44. L_2. Sampling Area (Mersin Marina)

Table 10. Control Study Area Sampling (Transect) Stations

Station	Middle Coordinate of the Transect	Definition/Description	Biotope
C_1	36,7683441 N 34,5663922 E	About 30 m inner side of coast	Sandy
C-2	36,7683747 N 34,5665175 E	Sampling area about 175 m away from the coast	Muddy
C-3	36,7683432 N 34,5661533 E	rock piles on the coast	Rocky
C-4	36,7683867 N 34,5637289 E	rock piles in the port	Rocky

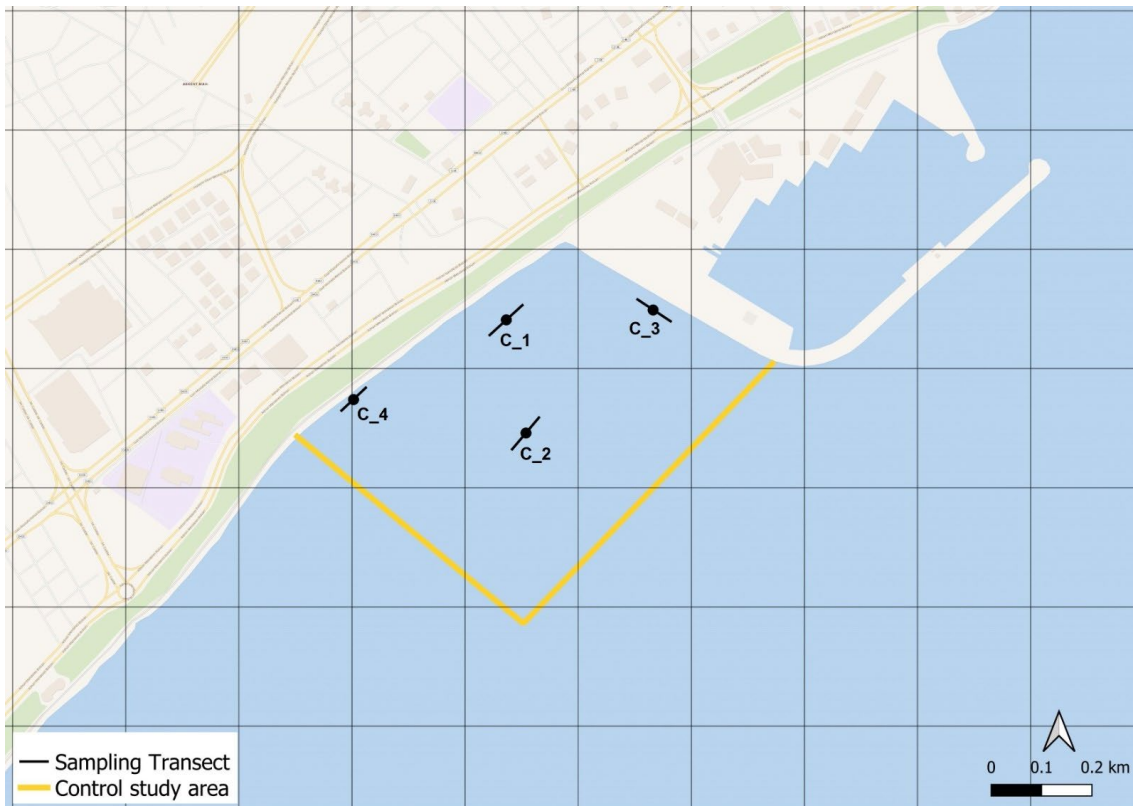


Figure 15. Underwater Visual Census (UVC) transects at control study

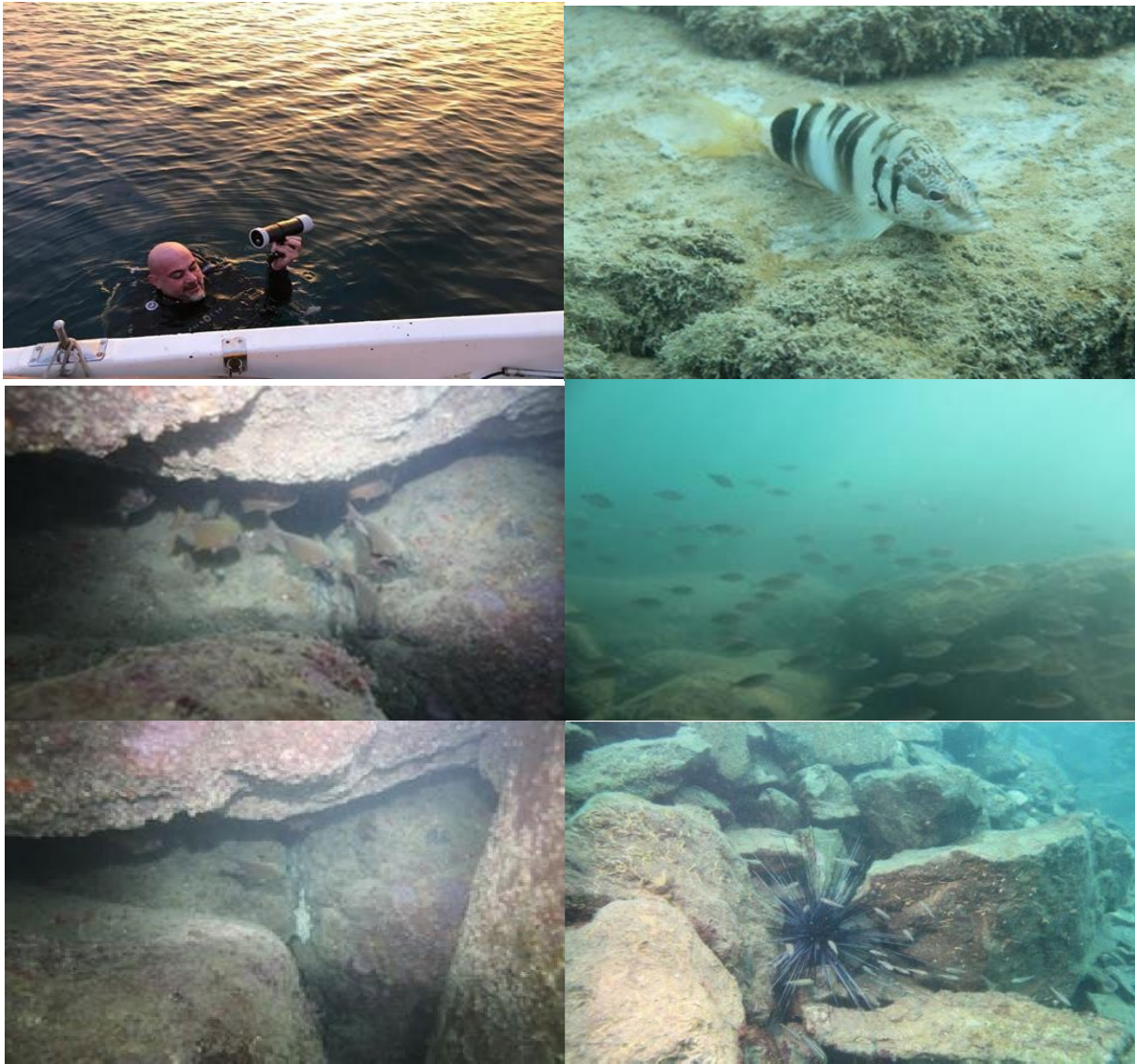


Photo 45. Diving Operations in Control Area and *Serranus scriba* (Linnaeus, 1758); *Pempheris vanicolensis* Cuvier, 1831; *Chromis chromis* (Linnaeus, 1758); *Diplodus* sp. Determined in Control Area, and One of the invasive species Long Pined Sea Urchin, *Diadema setosum* Leske, 1778.

Underwater Visual Census (UVC) was carried out with SCUBA as it was in 2018 to obtain biodiversity data. The technical details and study implementation methods have been stated in "Scope of Study" part. In biological diversity assessment studies, the SCUBA diving technique was applied in 100-meter transects (lines) in order to calculate the biodiversity values in contradistinction to the screening methodology for determining habitat boundaries. The tube volume was sufficient for 100-meter-transects on a shallow bottom, and an experienced diver, in standard practice, could finish the study in about 22 minutes. Moreover, snorkeling diving, instead of SCUBA, was performed in shallow coas lines. The length of the line (transect) was 100 meters in order to be able to record as many different types as possible. Since this data will be indicated in biodiversity index and cluster analysis, recording as many different species as possible is more

crucial than taxonomic features, which affects the sensitivity of biodiversity and cluster analysis. During the dive, a PVC waterproof notebook and a census book including the shapes of fast-floating species, which were supposed to be observed, were available next to the observer.

The control area in this study was the west of Mersin Marina, which would allow us to compare the species data in Mersin International Port. Although The Mersin Marina breakwater and coast rock piles perpendicular to the west breakwater are man-made, its habitat was estimated to be natural-like since it has been constructed previously.

Even though it was possible that the control area could have complete natural characteristics, the aim in this study is to compare the control area -no matter if it is man-made- with construction operations in terms of the most natural-like biotopes.

In this respect, the control area and the control stations are admitted to be natural structures, and the expression "natural" is used in the present text, tables and figures.

All figures, on-site visuals and coordinates related to this study are revealed in the “scope of study” part, so it is possible to have information about locations.

5.1 Indices and Data Evaluation

Microsoft Excel and PAST package programs were used to perform statistical evaluation of the identified and census conducted species in field studies and in the laboratory. Indices of diversity and cluster analysis were applied to evaluate the species identified in this study (Harper, 1999).

Indices of Diversity

In this study, Dominance, Shannon, Simpson, Evenness, Menhinick, Margalef, Equitability, Fisher alpha and Berger-Parker diversity indices were used to find diversity. These indices were calculated using the PAST package program as described by Harper (1999) (Hammer et al., 2004).

Dominance Index

The values of this index vary from 0 to 1. When the value is close to 0, all taxa are represented equally, and if the value is close to 1, a taxon dominates the whole community. This index is closely related to the Simpson index. If the value of Simpson index is subtracted from 1, the value of the Dominance index is found (Simpson, 1949).

$$D = \sum (n_i / n)^2$$

D: Dominance index

n_i: number of individuals belonging to the taxon i

n: total number of individuals

Simpson Index

Simpson's index is also used to measure the equality of the distribution within the community, between 0 and 1. Simpson index is calculated by subtracting the Dominans index from the value 1 (Simpson, 1949).

Simpson's index = 1 - dominance index

Shannon Index

After the mathematical theories developed in the second half of the 20th century, it was understood that species diversity could not be far from the concept of probability, and the species diversity formula developed by Shannon-Weaver (1949) became frequently used (Kocataş, 1994). The Shannon index considers the number of taxa and the number of individuals. Sampling consisting of only one taxon takes the value 0. As the number of taxa increases, the value increases and it is rarely seen to exceed 5 (Margalef, 1958).

$$H = - \sum ni / n \ln (ni / n)$$

H: Shannon index

n: Total number of individuals

ni: number of individuals belonging to type i

Meihinick Index

The Meihinick index is also known as the wealth index. It is the ratio of the number of taxa to the square root of the sample size (Hammer et al., 2004).

Margalef Index

It is one of the most widely used diversity indices. The Margalef index is useful for comparisons as it varies depending on the number of species (Margalef, 1958).

$$d = (S-1) / \ln N$$

d: Margalef index value

Q: Total number of taxa

N: Total number of individuals

Berger-Parker Dominance Index

The Berger-Parker dominance index can be reached by dividing the number of individuals of the dominant taxon in the sampling by the number of individuals in the taxa (Hammer et al., 2004).

Similarity and Cluster Analysis

The Sorensen index was used for the similarity analysis of the organisms observed at the stations. These indexes were calculated with the PAST package program (Hammer et al., 2004). Similarity coefficients obtained by this method are shown on the diagram.

$$S = 2c / (a + b)$$

S: Sorensen's index

a: number of organism species found in a sampling.

b: Number of organism species found in b sampling

c: number of common organisms between the two samples

The purpose of clustering analysis is to find hierarchical taxa in multivariate data sets (Hammer et al., 2004). In this study, it is aimed to reveal the similarity and distance between stations by using cluster analysis. The cluster analysis used in this study was carried out with the PAST package program. In determining the degree of similarity, Bray-Curtis similarity analysis was used and the results were shown by drawing the “Bray-Curtis Dendogram” (Harper, 1999).

UPGMA -Unweighted pair-group average- algorithm was applied to determine the average distance of cluster elements to each other (Hammer et al., 2004).

5.2. Findings Regarding Analysis

In field studies, in the impact area, in addition to the biotopes determined in the port in 2018 studies, biotopes with similar characteristics in the control area were used as control stations in terms of biological diversity. For this purpose, the data obtained from the transects taken at the stations visited are shown in Table 11.

Table 11 Distribution of Species Identified in the Study According to Habitats (Biotope).

Station	Control Station Sand	Control Station Mud	Mersin Port Mud	Mersin Port Rock Piles	Control Rock Piles	Control Rock Piles (Coast)	Dredging channel -Rocky	Dredging channel -Muddy
Station No	C-1	C-2	Ç-1	R-1	C-3	C-4	D - 1	D -2
Max. Derinlik (m)	3-7	9 - 12	15	10	10	2-4	12	18
Chlorophyta								
<i>Cladophora sp.</i>				X				
<i>Chaetomorpha sp.</i>						X		
<i>Ulva sp.</i>				X		X		
<i>Acetabularia acetabulum</i>				X	X	X	X	
<i>Udotea sp.</i>						X		
<i>Caulerpa prolifera</i>		X	X					X
<i>Dasycladus vermicularis</i>						X		
Rhodophyta								
<i>Corallina elongata</i>				X				
<i>Galaxaura cylindrica</i>				X				
<i>Pterocladia capillacea</i>						X		
<i>Corallina mediterranea</i>						X		
<i>Amphiroa rigida</i>				X		X		
<i>Jania rubens</i>				X		X		
<i>Pseudolithophyllum expansum</i>					X			
<i>Ceramium gracillimum</i>						X		
<i>Ceramium ciliatum</i>				X		X		
<i>Radicilingua thysanorhizans</i>				X	X	X		
<i>Vidalia volubilis</i>					X			
<i>Lithophyllum lichonoides</i>				X		X		
Phaeophyta								
<i>Ectocarpus sp.</i>				X				
<i>Halopteris sp.</i>				X	X	X		
<i>Sphacelaria sp.</i>						X		
<i>Dictyota dichotoma</i>				X				
<i>Dictyota divaricata</i>						X		
<i>Lobophora variegata</i>						X		
<i>Padina pavonia</i>				X	X	X		
<i>Dictyopteris membranacea</i>				X		X		

<i>Hydroclathrus clathratus</i>					X			
<i>Sphacelaria cirrosa</i>				X		X		
<i>Cystoseira fimbriata</i>				X		X		
<i>Cystoseira sp.</i>				X		X		
<i>Sargassum vulgare</i>						X		
Porifera								
<i>Crambe crambe</i>				X	X	X	X	
<i>Spirastrella sp.</i>					X			
<i>Ircinia sp.</i>				X	X	X	X	
<i>Ircinia spinosa</i>						X		
<i>Aplysina sp.</i>						X		
<i>Chondrilla sp.</i>						X		
<i>Clathrina coriacea</i>					X	X		
<i>Haliclona sp.</i>						X		
<i>Chondrosia reniformis</i>						X		
<i>Cliona sp.</i>						X		
<i>Sarcotragus sp.</i>					X			
Cnidaria								
<i>Aglaophenia sp.</i>					X	X		
<i>Actinia equina</i>				X	X	X		
<i>Caryophyllia inornata</i>					X	X		
<i>Aurelia aurita</i>	X							
<i>Rhizostoma pulmo</i>	X							
<i>Anemonia sulcata</i>		X						
<i>Cerianthus membranaceus</i>						X		
<i>Aiptasia mutabilis</i>						X		
<i>Condylactis sp.</i>	X		X					X
<i>Cerianthus sp.1</i>	X							
<i>Cerianthus sp.2</i>	X							
<i>Cerianthus sp.3</i>	X							
Bryozoa								
<i>Schizomavella mamillata</i>						X		
<i>Sertella septentrionalis</i>						X		
<i>Electra sp.</i>				X	X	X		
Ctenophora								
<i>Mnemiopsis sp.</i>	X	X				X	X	X
<i>Ctenophora sp.</i>	X		X			X		X
Plathelminthes								
<i>Leptoplana sp.</i>						X		
Annelida								
<i>Hermodice carunculata</i>		X	X	X	X	X		X
<i>Nereis diversicolor</i>						X	X	
<i>Hermione histrix</i>						X		
<i>Sabella pavonina</i>				X	X	X		
<i>Pomatoceros triqueter</i>						X		

<i>Myxicola infundibulum</i>		X			X			
<i>Polycirrus sp.</i>					X	X		
Mollusca								
<i>Spondylus gaederopus</i>					X			
<i>Mytilus galloprovincialis</i>					X			
<i>Brachidontes variabilis</i>						X		
<i>Cerithium vulgatum</i>	X	X	X			X		X
<i>Cerithium rupestre</i>	X			X		X	X	
<i>Rhinoclavis kochi</i>	X		X					X
<i>Bittium reticulatum</i>	X	X				X		
<i>Acanthocardia tuberculata</i>	X	X	X					
<i>Acanthocardia aculeata</i>	X							
<i>Parvicardium papillosum</i>	X	X	X			X		X
<i>Venus verrucosa</i>	X	X	X					X
<i>Irus irus</i>	X							
<i>Venerupis aurea</i>	X		X					X
<i>Dosinia lupinus</i>	X		X			X		X
<i>Chamelea gallina</i>	X	X	X					X
<i>Venus casina</i>	X							
<i>Arca noae</i>					X	X	X	
<i>Barbatia barbata</i>					X	X		
<i>Murex trunculus</i>	X	X	X	X	X	X		
<i>Cardites antiquata</i>	X							
<i>Charonia tritonis</i>			X					X
<i>Chlamys flabellum</i>					X			
<i>Chlamys hyalina</i>			X					
<i>Chlamys opercularis</i>	X							
<i>Pecten jacobaeus</i>					X			
<i>Chiton olivaceus</i>				X		X		
<i>Lepidopleurus cajetanus</i>						X		
<i>Conus ventricosus</i>	X	X	X	X	X	X		X
<i>Strombus decorus</i>	X	X	X			X		
<i>Cyprea lurida</i>					X	X		
<i>Cyprea spurca</i>						X		
<i>Dentalium inaequieostatum</i>	X	X						
<i>Dentalium dentalis</i>	X							
<i>Fustiaria rubescens</i>	X							
<i>Donax trunculus</i>	X	X	X		X			X
<i>Donax venustus</i>	X							
<i>Donax semistriatus</i>	X	X	X		X			
<i>Gibbula sp.</i>						X		
<i>Mondonta sp.</i>						X		
<i>Glycymeris sp.</i>	X	X						
<i>Haliotis tuberculata</i>				X		X		
<i>Laevicardium sp</i>	X							

<i>Lemintia arenaria</i>					X			
<i>Janthina sp.</i>	X							
<i>Lima lima</i>					X			
<i>Macra stultorum</i>	X		X					
<i>Mitra cornicula</i>						X		
<i>Vexillum ebenus</i>						X		
<i>Muricopsis cristatus</i>					X	X		
<i>Nassarius mutabilis</i>	X							
<i>Naticarius sp.</i>	X							
<i>Patella sp.</i>				X		X		
<i>Phalium undulatum</i>	X							
<i>Cassidaria echinophora</i>	X							
<i>Tonna galea</i>		X						
<i>Pinctata radiata</i>				X	X	X		
<i>Buccinum corneum</i>						X		
<i>Columbella rustica</i>						X		
<i>Solenomya sp.</i>	X							
<i>Tellina radiata</i>	X	X						
<i>Tellina planata</i>	X	X	X					
<i>Tellina tenuis</i>	X	X	X					
<i>Tellina sp.</i>	X		X					X
<i>Hypselodoris tricolor</i>					X			
<i>Elysia timida</i>				X		X		
<i>Aplysia fasciata</i>				X				
<i>Tethys sp.</i>	X							
Arthropoda								
<i>Chthamalus stellatus</i>				X		X		
<i>Palaemon sp.</i>				X		X		
<i>Scyllarides latus</i>				X				
<i>Paguristes sp.</i>	X							
<i>Clibanarius sp.</i>						X		
<i>Dardanus calidus</i>				X				
<i>Diogenes pugilator</i>	X		X	X		X		
<i>Pagurus sp.</i>	X							
<i>Callinectes sp.</i>	X	X	X					X
<i>Ilia nucleus</i>	X							
<i>Maja crispata</i>						X	X	
<i>Ocypode cursor</i>	X							
<i>Pachygraphus marmoratus</i>				X		X		
<i>Pachygraphus sp.</i>				X				
<i>Portunus sp.</i>					X			
<i>Pisa sp.</i>						X		
<i>Xanto poressa</i>						X		
Echinodermata								
<i>Arbacia lixula</i>					X	X		

<i>Paracentrotus lividus</i>				X	X	X		
<i>Diadema setosum</i>					X	X		
<i>Echinocardium cordatum</i>	X							
<i>Echinocardium mediterraneum</i>	X							
<i>Echinaster sepositus</i>			X					X
<i>Astropecten sp.</i>	X	X						
<i>Astropecten irregularis</i>	X					X		
<i>Holothuria forskali</i>				X		X	X	
<i>Holothuria tubulosa</i>			X	X		X		
<i>Synaptula sp.</i>					X	X	X	X
Hemichordata								
<i>Glossobalanus minutus</i>								
Chordata								
Tunicata								
<i>Holocynthia papillosa</i>				X				
<i>Clavelina sp.</i>						X		
<i>Distomus sp.</i>				X		X		
<i>Microcosmus sabetieri</i>					X			
<i>Botryllus sp.</i>						X		
<i>Diplosoma spongiforme</i>						X		
Pisces								
<i>Apogon nigripinnis</i>	X						X	
<i>Atherina sp.</i>	X			X		X		
<i>Blennius ocellaris</i>			X	X		X		
<i>Blennius sanguinentus</i>						X		
<i>Boops boops</i>					X			
<i>Chromis chromis</i>				X	X	X	X	
<i>Coris julis</i>				X	X	X	X	
<i>Diplodus annularis</i>				X		X	X	
<i>Diplodus cervinus</i>						X	X	
<i>Diplodus puntazzo</i>								
<i>Diplodus sargus</i>				X		X	X	
<i>Diplodus vulgaris</i>				X		X	X	
<i>Epinephelus marginatus</i>					X	X	X	
<i>Fistularia commersonii</i>						X		
<i>Gobius sp.</i>	X		X	X		X		X
<i>Lithognathus mormyrus</i>	X		X	X		X		
<i>Mugil sp.</i>				X		X	X	
<i>Mullus sp.</i>	X	X				X		
<i>Mullus surmuletus</i>	X	X	X	X		X		
<i>Oblada melanura</i>				X		X	X	
<i>Pemperis vanicolensis</i>				X				
<i>Salaria basilica</i>								
<i>Sargocentron rubrum</i>					X			
<i>Sarpa salpa</i>				X		X	X	

<i>Scorpaena sp.</i>				X		X		
<i>Serranus cabrilla</i>				X		X	X	
<i>Serranus scriba</i>				X		X	X	
<i>Siganus luridus</i>				X		X	X	
<i>Siganus rivulatus</i>			X	X	X	X		
<i>Solea sp.</i>	X							
<i>Sparisoma cretense</i>		X		X	X	X		
<i>Spicara maena</i>				X	X	X		
<i>Symphodus sp.</i>				X		X		
<i>Thalassoma pavo</i>	X			X	X	X		
<i>Trachinus draco</i>	X	X						
<i>Tripterygon melanurus</i>				X	X	X		
<i>Xyrichthys novacula</i>	X							X

Biodiversity index values at each station are given in Table 12. When we look at the the index values, it can be concluded that the highest biological diversity is in the coastline rock piles in the natural environment. The second highest value can be seen port rock piles characterized as "artificial reef". Evaluation index results shows that the natural mud biotope environment have almost same biological diversity values with the bottom structure of Mersin port. On the other hand, Mersin Port, the biotope formed by the port rock piles shows the feature of "artificial reef" which has been constructed later and integrated into the ecosystem. Furthermore, the sampling has been conducted in two different rock environments in the control area, one of which is located on deeper bottom – reaching max 21 meters and the first 10 and 11 meters have been studied in terms of compliance with the physical features of the impact area- and has a structure of rock on sea bottom on coastline, just like the port rocks. The biological diversity values reveal that port rocks have high biological diversity, not as much as the natural environment rocks though. On the other hand, it has higher biological diversity than the deep bottom rocky environment.

Table 12 Biological Index Values Determined Depending on the Species Presence in the Stations

Station	Control Station Sand	Control Station Mud	Mersin Port Mud	Mersin Port Rock Piles	Control Rock Piles	Control Rock Piles (Coast)
Station No	1	2	3	4	5	6
Max. Derinlik (m)	3-7	9-12	15	10	10	2-4
Taxa_S	66	28	32	69	52	122
Dominance_D	0,0152	0,0357	0,0313	0,0145	0,0192	0,0082
Shannon_H	4,19	3,332	3,466	4,234	3,951	4,804
Simpson_1-D	0,9848	0,9643	0,9688	0,9855	0,9808	0,9918
Menhinick	8,124	5,292	5,657	8,307	7,211	11,05
Margalef	15,51	8,103	8,945	16,06	12,91	25,19
Berger-Parker	0,0152	0,0357	0,0313	0,0145	0,0192	0,0082

The biodiversity index values can be used conveniently to compare similar biotopes. Moreover, the similarity of different biotopes can be evaluated by cluster analysis. Since the aim of cluster analysis is to reveal similar biological diversity, a clear evaluation is possible on the additional structure – rock piles- or reductions / hitches which can happen on the sand - mud biotope in the port because of the physical effect of the propellers, noise, turbidity(Figure 14).

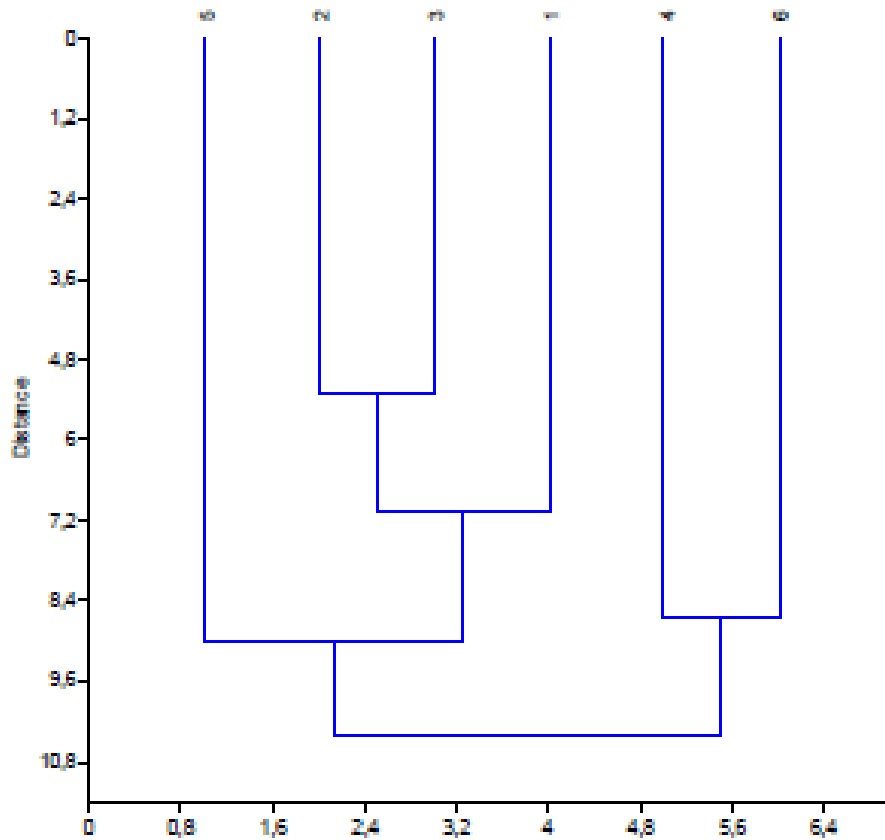


Figure 16. Similarity Index between Study Stations

The cluster analysis based on the biological diversity sampling and statistical evaluations in the field shows that the stations no 1, 2, 3 and 5 form different clusters from stations 4 and 6. The two stations forming a separate cluster are port rock piles and natural coastline rocks. Thus, it can be concluded that the rocks in the port are similar to the natural structure, even though they are man-made and have lower biological diversity. In addition, it has been estimated that the new port structures to be built from now on may likewise have the feature of "artificial reef".

Natural rock formation on the deep bottom is not included in this cluster, yet it creates a different cluster depending on the character of the biological diversity elements - deeper rocky forms- while it is close to the values of stations 2 and 3, which are in similar depth.

There are sand and mud biotopes in the other cluster where the natural mud biotopes in the port have similarities while they have different characteristics from the natural sand habitat due to their structure. As a result, it has been determined that the harbor mud biotope has properties remarkably close to the natural mud biotope.

6. GENERAL EVALUATION OF BIODIVERSITY

Inland water resources and seas are used to meet the water needs of increasing domestic and industrial areas and are under the threat of intense pollution. Necessary measures for the protection of water resources are possible with a detailed knowledge of the effects of pollutants in the aquatic environment.

Temperature is an important physical factor that plays a role in the biological structure and physico-chemical change of water. The temperature changes depending on the seasons, geographical location, depth, surface area, mineral salts dissolved in it, and absorbed sunlight. In this sampling period, which represents the winter months, the temperature was measured as 20.5 °C at the first station and 20.0 °C at the second station. These values are suitable and sufficient in terms of winter evaluations biologically.

Dissolved oxygen regulates and limits the life of aquatic plants and animals in the environment. The density of water changes depending on the temperature. The dissolved oxygen values in the area were 7.89 mg/l at the first station and 8.15 mg/l at the second station. Due to the limited water circulation in the port, the dissolved oxygen value at the first sampling point was measured slightly lower. Since the second sampling point is closer to the port mouth, a high value was measured for this parameter in relation to the open sea.

pH gives an idea about whether the water is acidic and basic. During the movement of water on the bottom, the pH level decreases as a result of the dissolution of humic acids in water and the aerobic and anaerobic decomposition of organic substances, and the water becomes acidic. However, marine waters are generally basic so, the pH values at the sampling point were 8.31 at the first station and 8.28 at the second station.

Surface water salinity is high in winter and spring, and low in summer and autumn. It was observed that the salinity reached its annual maximum during the winter months.

The salinity of the upper layers of water increases with the effect of strong winds in the winter months. Surface water salinity in Mersin port was measured 38.3‰ at both stations.

Depending on the suspended solids in the seas, the depth of sunlight differs. This situation is especially important for their phytoplanktonic development. At the sampling date, the depth of the sechhi disc was measured as 3.7 m at the first station and 4 m at the second station. This zone is a suitable depth for the development of phytoplanktonic organisms.

According to the on-site measurement values, we can say that the sampling site is in the clean water (oligotrophic) class. However, chemical analyzes are also required for clearer evaluations of water quality.

6.1 Phytoplanktonic Organisms and Macroalgae

Micro and macroalgae sampling and laboratory examinations were carried during the studies of Mersin Port marine ecosystem, which involves the project area. As a result, 151 micro and macroalgae species have been identified, and 66 taxa and the Bacillariophyceae group are dominant. They are followed by the Dinophyceae (47 taxa) and Rhodophyceae (13 taxa) groups.

The sampling results shows that the dominance of Bacillariophyta group algae is significant in terms of density. In Bacillariophyceae spp., the species of *Hemiaulus hauckii*, *Pleurosigma*, *Pseudosolenia calcar-avis*, *Chaetoceros affinis*, *C. tetrastichon*, *Guinardia flaccida*, *Ceratium furca*, *C. kofoidii*, *C. trichoceros*, *Protoperdinium steini*, *P. divergens* species belonging to the class Dinophyceae are dominant.

The micro and macroalgae species in the stations chosen for Mersin Port marine ecosystem studies have shown a healthy systematic and ecological development.

It is estimated that there will not be any negative impacts on algae species in the area due to the the planned port project.

6.2 Zooplanktonic Organisms

Among zooplanktonic organisms, 57 taxa including Cladocera, Copepoda and Other Groups, were identified. The most dominant group of these is the Copepoda and it has 18 species. *Acartia clausii* taxon belonging to the class Copepoda is the dominant organism. The *Evadne tergestina* is the most dominant taxon in Cladocera. These are true planktonic organisms and are called Holoplankton. In addition, there are also some species that spend only one period of their lives in water and then spend the other periods in different environments. These are called Meroplankton and are classified as other groups in the table.

According to the sampling results in the project area, 4 taxa belonging to Cladocera and 18 taxa belonging to Copepoda were identified, and they are called Holoplankton. 14 taxa belonging to other groups identified in the plankton.

Copepods, among all zooplanktonic groups, are significantly dominant in all stations because of both species number and density. Cladocera comes second while the number and density of the species belonging to other groups are quite low.

Zooplanktonic organisms in the marine ecosystem of project area are common and abundant species in the Mediterranean. Species numbers and densities of zooplanktonic organisms will not be adversely affected by port construction and operation.

6.3 Benthic Species

227 taxa belonging to 9 systematic groups were identified during the study conducted in Mersin Port expansion area.

In order to determine the effects of interventions to marine environment, it is necessary to know the current circumstance of the living life in that zone. Particularly the invertebrate bottom animals are widely used to monitor possible changes in the marine environment.

Because these species are in direct contact with the water column while most species live identifying themselves on a certain place; therefore, they immediately react to any impact that may occur in the environment.

The biological diversity of Arthropoda and Mollusca groups in the study area is significantly low. The reason of low diversity may be due to the current biotope structure of the environment as well as other ecological factors. However, any species known as pollution indicator of invertebrate species could not be detected in the region.

It was determined that none of the species identified as a result of benthic studies belong to polluted marine environments. When the study area is evaluated in terms of benthic species; It is possible to describe the region as an environment with an undisturbed ecosystem, where it is not under any pollution pressure. Although there are negative effects on benthic organisms in the construction works of the planned port, the environment will be restored in a short time and no negative effects will be observed during the operation period.

6.4 Fish and Other Marine Vertebrates Evaluation

According to the physical measurement values and general observations in the sea of the facility activity area, it is seen that the environment is clean water and has a medium level biological diversity. All of the organisms and fish identified are the common and abundant species of the Mediterranean.

Fish species are organisms that have the ability to avoid adverse effects. They immediately move away from the environment in case of turbidity and change of water temperature and other chemicals. As a conclusion, it is understood that the facility will not have a significant impact on the fish species and fishing activities in the region.

The impact area of Mersin Port involves predominantly sand and mud habitats as well as a small number of rocky areas where mobile invertebrates live. Vertebrates have the ability to move away from the environment if adverse conditions occur. In this respect, it is understood that the effect of the project operation is minimal.

It is thought that the planned Mersin Port activities will not create a significant pressure on the fish species determined in the area.

7. PRECAUTIONS FOR ENDANGERED SPECIES

It is concluded that marine vertebrates are the most prominent ones among the other protected species. Especially cartilaginous fish and mammals are in higher levels of threat.

Such species may rarely pass by or feed around the project area. These species are expected to avoid coming to these areas because of disruption during and after the filling and dredging activities, and they will possibly prefer to move away from the area especially during the construction.

Bern Convention Section II underlines the following issues for all party countries concerning the species included in Annex-II and Annex-III. Thus, in pursuance of Article 6 of the Convention,

- Acts of capturing, hunting, and killing especially wild fauna species included in Annex-II,
- Degradation or destruction of breeding zones of these species,
- Disturbing wild fauna species especially during breeding, feeding, and wintering periods,
- Damaging eggs belonging to these species is forbidden.

During all kinds of activities in the project area, the precautions stated above should be considered carefully regarding the wild animal species included in Annex-II and Annex-III of Bern Convention.

The amendments of the convention on the wild fauna species included in Annex-III are stated in Article 7, according to which, all party countries must take appropriate and necessary legal and administrative measures for the wild fauna species included in Annex-III. The precautions impose such conditions that all kinds of commercial activities related to the species included in Annex-III should be arranged in a way that does not endanger the populations of wild animal species.

Critical species among marine vertebrate animal species identified in the project area and its surrounding environment are evaluated since they are categorized as CR, EN, VU and NT in the IUCN lists and they are in the list of this project.

Considering the marine vertebrate species identified in the project area and its surrounding environment, "CR" refers to critically endangered species and "EN" refers to endangered species according to the European Red List of the IUCN.

The wild animals in the "VU" (vulnerable) category of this list mean that species that are in danger of extinction in the medium term in the future. Hence, any activities that may affect these species

directly or indirectly should be avoided. These species are not permanent residents of the project area, yet they probably pass by the area or use it for feeding.

The "NT" (Near Threat) categories list the species threatened in the near future. According to the criteria, a taxon is classified as Near Threatened if it is not fallen into the Critically Endangered, Endangered, or Vulnerable classes, but will probably fall into one of these classes according to the criteria.

However, the provisions of the relevant articles of the convention must be strictly followed in order to protect the species found in the IUCN and Bern Convention Annex Lists (Annex-II and Annex-III).

8. PRIORITY AQUATIC SPECIES OF PROJECT IMPACT AREA

To identify Priority Biodiversity Features of Mersin International Port, data were collected according to paragraph 6 of the EBRD (2014). The prominent elements of habitats and species have been identified accordingly, and critical species – fish only- consisting of Priority Biodiversity Features in the port Local Study Area and its surrounding environment. A situation assessment has been performed to find the niche, abundance and presence of PBF species identified regarding fish in the area, and the species are available-see Table 13.

Table 13. Species that are Important Biodiversity Features in the Project Area

Species	IUCN Categories	Endemic
<i>Carcharias taurus</i> (CR)*	CR	No
<i>Aetomylaeus bovinus</i> (CR)*	CR	No
<i>Gymnura altavela</i> (CR)*	CR	No
<i>Centrophorus granulosus</i> (CR)*	CR	No
<i>Oxynotus centrina</i> (CR)*	CR	No
<i>Squatina squatina</i> (CR)*	CR	No
<i>Anguilla anguilla</i> (CR)*	CR	No
<i>Raja radula</i> (EN)*	EN	No
<i>Rostroraja alba</i> (EN)*	EN	No
<i>Squalus acanthias</i> (EN)*	EN	No
<i>Monachus monachus</i> (CR)*	CR	No
<i>Delphinus delphis</i> (EN)*	EN	No
<i>Chelonia mydas</i> (EN)*	EN	No

The identified priority species are listed considering their conservation status and their presence determined from the literature. Thus, especially the cartilaginous fishes, among all fishes listed in the region, have been listed with a significantly high conservation status. Those species are estimated not to have an effective potential habitat in the project area, considering the evaluation

of an appropriate niche for them. Therefore, sharks and stingrays in this group are not listed as a factor of the PBF; however, only *Raja clavata* (Stingray) is listed to be monitored and observed.

The characteristics of habitat in the project area and the control sampling areas are along with the fact that if these areas have suitable habitat characteristics for the fish species.

According to this habitat and niche suitability, critical species with high potential of using the area and its surrounding environment are listed as Priority Biodiversity Features in this study. That means, some of the species classified critical species with high level of conservation status are not listed as PBF.

8.1. PRIORITY AQUATIC SPECIES (THREATENED) AS HAVING GLOBAL RANGES

Threatened species as having global ranges (accepted as region in this report) that overlap with the AoI are evaluated in this section. As scope of the area is extended, some of the species reevaluated in this section (i.e. sea turtles). Detailed information from literature is also given in addition to in situ findings.

8.1.1. Mediterranean monk seal (*Monachus monachus*)

Literature and General Information

Mediterranean monk seal (*Monachus monachus*) is one of the most endangered species in the world (Figure 15). It is listed by the IUCN as a critically endangered species (CR). This species is protected under the BERN, CITES, BARCELONA and Biological Diversity conventions which are ratified by our country.

In our country, the first scientific studies on these species started in the 1960s (Anonymous, 2015). Following these pioneering studies, which can be considered as individual studies, comprehensive studies including conservation studies have been continued effectively by institutions such as SAD-AFAG, IU-SUF and ODTU-DBE. Experts working on this subject have come together to prepare regional and national ACTION PLANS and NATIONAL STRATEGIC PLANS, as well as making individual publications on their field and subject. In addition, the NATIONAL MEDITERRANEAN SEAL COMMITTEE was formed by the experts mentioned (Kıraç, et al., 2013; Kıraç, Savaş, & Güçlüsoy, 1998; Güçlüsoy et al., 2004). In addition to these studies, SPECIES ACTION PLANS have been created to cover the regions where Mediterranean monk seals are common (Anonymous, 2015).

Mediterranean monk seal was widely available in the Mediterranean and the Atlantic until the last century. But today, in the world, it is only found on the coasts of Greece, Morocco, Mauritania and Madeira (Portugal) and our country. In recent studies, in addition to these countries, small populations have been found in countries such as Cyprus, Libya and Morocco (Kıraç, et al., 2013) It is estimated that the world population is around 600 (Kıraç, et al., 2013) and 700 (Kıraç, Savaş, & Güçlüsoy, 1998), and it is known that approximately 60 – 100 (Güçlüsoy et al., 2004) of them live on the coasts of our country. Although they tend to form colonies due to their normal behavior, they are often forced to choose the way of wandering and living individually instead of being together due to human pressure (Kıraç, Savaş, & Güçlüsoy, 1998).

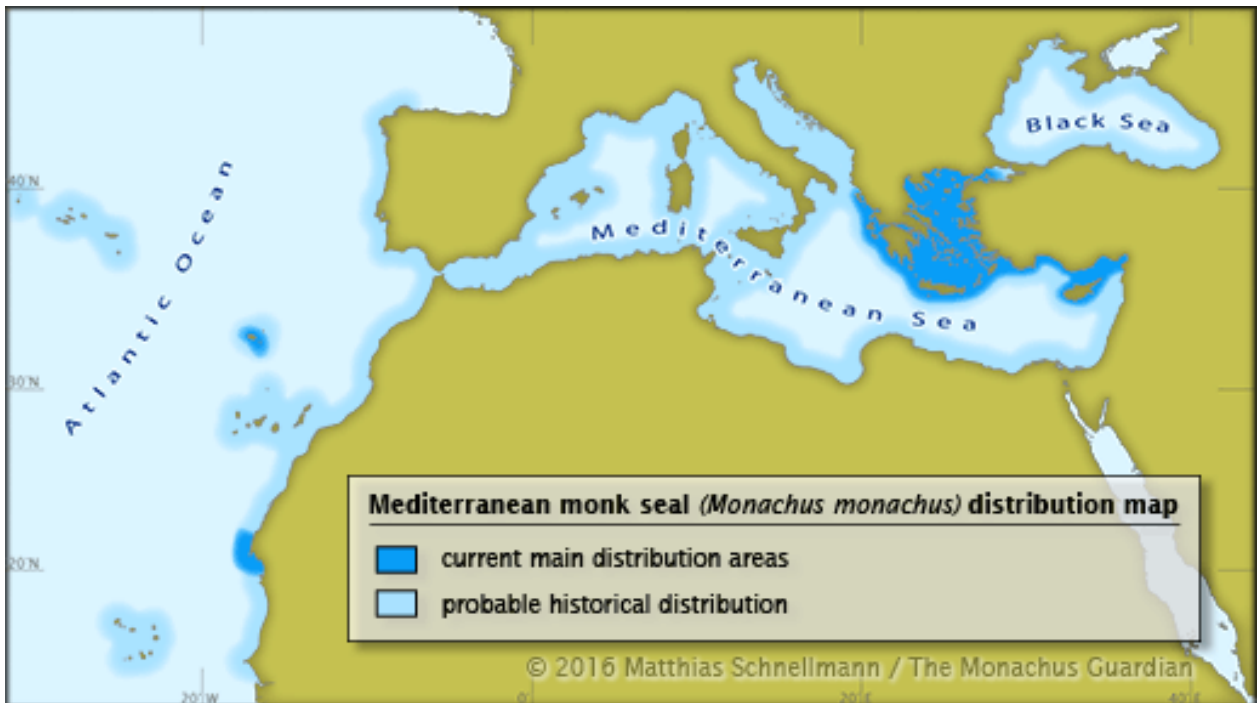


Figure 17. Geographical distribution of *Monachus monachus* (https://www.monachus-guardian.org/factfiles/image/ms_dist_map_2016.html)

Mediterranean monk seals prefer caves, cavities, cracks and deserted coasts that are suitable for sleeping (Kıraç, et al., 2013). The Mediterranean monk seal prefer coastal caves and cavities that are unstructured, inaccessible to humans or away from human activities, and preferably have reproductive and/or shelter functions; “quiet and secluded rocky beaches” as its habitat and are directly affected by the deterioration of these areas (Kıraç, Savaş and Güçlüsoy, 1998) (Photograph 46-50).

On the other hand, based on this definition, it cannot be concluded that Mediterranean monk seals do not use different types of beaches (for example, sandy shores and coastal settlements). It is known that the Mediterranean monk seal expands its circulation area by going out of the deserted

rocky beaches especially to feed, and also visits sandy, pebbly shores and estuaries (Kıraç, Savaş and Güçlüsoy, 1998).



Photo 46. The entrance of acave used by the Mediterranean Monk Seal for breeding, sheltering and baby care – Muğla coastline (Photo taken from the archive of Burak Ali Çiçek).



Photo 47. Example of cave structure used by seals for breeding and sheltering – Muğla coastline (Photo taken from Burak Ali Çiçek's archive).



Photo 48. Example of cave structure used by seals for breeding and shelter – Muğla coastline (Photo taken from Burak Ali Çiçek's archive).



Photo 49. An example of a cave structure used by seals for breeding and shelter. The passage seen in the photo passes into an inner chamber with a platform at the back where the atmospheric air is present – the Muğla coastline (Photo taken from the archive of Burak Ali Çiçek).



Photo 50. Mother seal observed in the cave mentioned in Photograph 8 – Muğla Coastline (Photo taken from the archive of Burak Ali Çiçek).

Behaviour

The Mediterranean monk seal is a timid and less social species compared to other pinniped species. Eastern Mediterranean individuals living on the coasts of our country generally travel alone and are rarely seen together. It is also known that researchers occasionally observe between 2 and 4 seals in Turkey, and even though this number is very rare, it goes up to 7-8. Like many of its features, complete information about its behavior is not available. There are assumptions that Mediterranean monk seals come together in certain periods and then dispersed again. Adult male individuals generally determine a region and live there (Kıraç, Savaş, & Güçlüsoy, 1998).

Although females are more wandering than males, they do not leave the breeding cave and its surroundings during the breeding period. Young seal individuals, on the other hand, may go to distant areas while growing. It is estimated that female Mediterranean seals travel long distances to mate and come near the male seals and then leave the male's territory. Mating takes place at sea. It is estimated that the female seal reaches sexual maturity at the age of 3 years. The female Mediterranean monk seal gives birth to a calf every year or 2 years after a gestation period of 10-11 months. For this reason, the Mediterranean monk seal is a species with a low reproduction rate and a low number of offspring. Birth takes place on a pebble beach or rocky platform where the waves can't reach easily, at the far end of an air-filled coastal cavern that humans can't visit (or reach). The mother nurses the young with her own milk for about 4 months on land inside the cave.

Mediterranean monk seals absolutely need land (and especially coastal caves) to give birth and raise their young (Kıraç, Savaş and Güçlüsoy, 1998).

Feeding

Mediterranean monk seal is a carnivorous species which is a common feature of pinnipeds. The majority of its food consists of fish, octopus and lobster, which it catches underwater by diving. When it catches its prey, it sometimes brings it to the surface. It shakes its head rapidly from side to side in order to kill its prey and eat it by shredding it. Meanwhile, it eats the piece left in his mouth and catches it by swimming after the big piece that has been thrown. It repeats the same movement until it finishes its prey. Since Mediterranean seals are mammals, they have lungs like humans and they breathe with air. They dive to the bottom by using the oxygen in the air they take into their lungs on the water and they do not breathe underwater. Mediterranean monk seals usually dive for 5-10 minutes and come back to the surface to breathe (Kıraç, Savaş, & Güçlüsoy, 1998).

Threats and causes of extinction

There are different factors that threaten the seal population. These can be listed as follows:

1. Habitat destruction
2. Mediterranean monk seal mortalities
3. Disturbances in the caves
4. Reductions in fish stocks
5. Marine pollution
6. Marine traffic

The most obvious among these reasons is the destruction of habitats. Mediterranean monk seals live in areas far from human activity. The absence of people in these desolate places is due to the absence of private property. Such areas exhibit a rocky and rugged morphology. -Settlements and infrastructure investments such as roads leading to these settlements, lighting, etc. cause habitat destruction.

8.1.1.1. Materials and Methods

The aim of this study is to take the necessary precautions regarding the Mediterranean Monk Seal (*Monachus monachus*) in Mersin International Port (MIP) and to minimize the possible effects of the project activities (both in the construction and operation phases) on this species. Within the

scope of this, studies were carried out to determine whether this species uses the project site and the nearby regions for breeding-sheltering-feeding etc.

In this context, during the pre-construction period on 20-21-22 December 2021, we were transferred to MIP to conduct field studies, and observations were made from land and sea in the project area and its immediate surroundings. In addition to the project area and its immediate surroundings, the habitats in the region were evaluated in terms of seals and seal habitats (Figure 18).

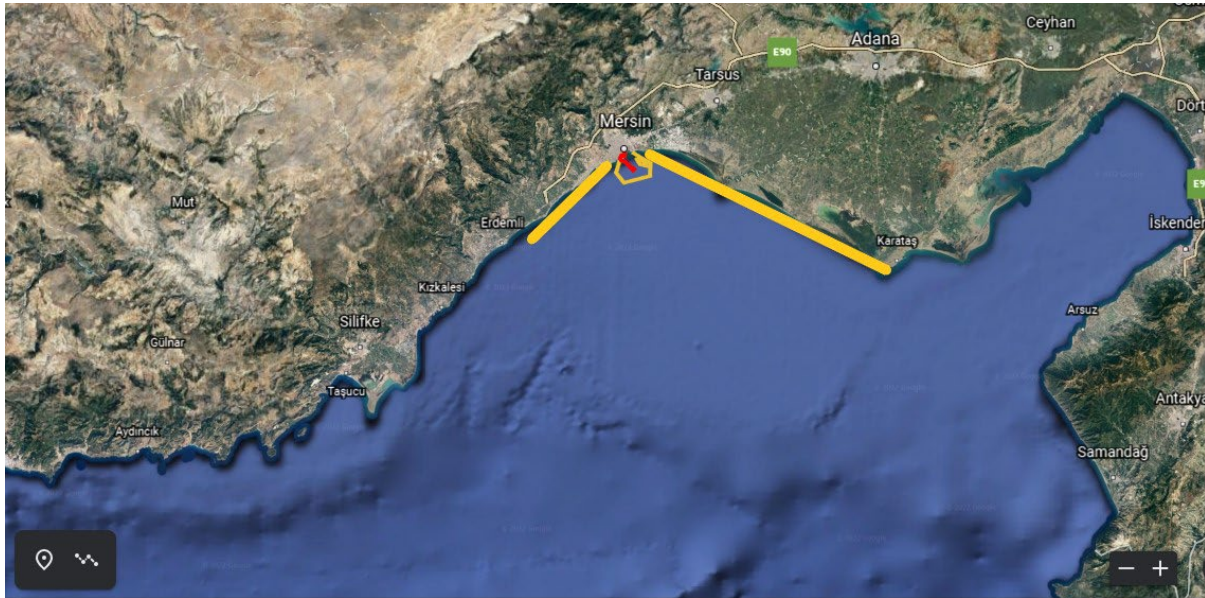


Figure 18. Scope of the study and literature search (Project area: MIP; project area immediate surroundings [the coastline scanned in the vicinity of the project area is marked with a yellow line] and the region [Mersin and Iskenderun Bays]).

In this study, approximately 101 km of coastline around MIP was scanned. In the screening and preliminary evaluation study, the approaches and methods used by Anonymous (2015) Güçlü et al., (2004) and Karamanlidis et al. (2004) were adopted. However, since the coastal formations that may form caves, caves or cracks were not determined in the first survey, the research direction was built on individuals that can be determined in the marine environment. As a result, in this study, observation-based monitoring study was carried out in terms of seal availability in the region where the project will be held and in the surrounding region. For this purpose, the coastline in the region where the planned project will take place has been scanned to cover the coastal area between the town of Erdemli in the Southwest and Karataş in the Southeast, by exceeding the seaside boundaries of the facility. This area, where the total length was recorded as approximately 101 km (yellow marked line in Figure 16), was examined in terms of possible individual presence in

accordance with the life cycle and behaviors of the seals. There are no caves, grottoes, cracks and cavities in the general area, in its specific area and in its impact area. The coastal area of the region has the characteristics of a low coast and a beach. However, there is a possibility of migrating, diurnal migratory and feeding behavior. In field studies, observation techniques from boat and land were applied in order to observe possible individuals in the region.

In the observation study made from the boat, it was taken into account that the seals watch the fishing boats (Sergeant et al., 1978) in order to benefit from the fish caught, which is a common behavior (during the placement and collection of fishing nets in the sea).

For the land observations, as in previous studies, the region was visited in the early morning hours (5:00). Observation studies with binoculars and cameras were continued until 08:00, (until the weather was getting brighter) (Güçlüsoy and Savaş, 2003).

Citizen Science methods were applied to understand the availability of seals in the study areas and to obtain comprehensive information about which region they use at which stage of their life cycle. This method involves scanning social media and conducting interviews/surveys with fishermen, divers and sailors who use the region effectively (Bundone et al., 2019; Mo et al., 2007; Mo, 2011; Sullivan et al., 2019). With this method, data collection studies were carried out on fishermen, and 18 fishermen of the region were interviewed..

In this study, biotope (habitat) structure and status information and macro biological diversity were evaluated by applying the Underwater Visual Counting (UVC) technique in order to support the observations made from boat and land and to determine the current status of the habitats and biological diversity of the region. During these studies, imaging techniques (photo - camera) were also applied.

Among the different sampling techniques used to assess the diversity of macro fauna and flora in the marine ecosystem, UVC has been adopted to study shallow and near-shore habitats (which may be with heterogeneous substrates such as artificial reefs, rocks or corals) (De Girolamo, Mazzoldi, 2000).

The regions visited during SCUBA and snorkeling dives (in accordance with the habitat map created in this study) were also evaluated in terms of the general condition of the marine environment and biodiversity. Underwater Visual Counting (UVC) technique was used in biodiversity assessment studies.

8.1.1.2. Findings

Evaluation of Habitats in Terms of Seals

No seal individuals were found in the observation study conducted from the boat (21 December 2021). In these studies, interviews were conducted with 3 fishermen who were on their boats and 15 fishermen in the harbor in terms of the availability of seals. As a result of the interviews made with the professional fishermen that have been hunting in the region for more than 10-15 years and go out hunting every day when the weather is suitable (at least 180 days/year), it was determined that no seals were observed by them near the project area (MIP) in the last 5 years (the longest used in terms of recall).

For the land observations, the region was visited in the early morning hours (5:00) and observation studies with binoculars and cameras were continued until 08:00, (until the weather was getting brighter) (Güçlüsoy and Savaş, 2003). However, no seal observations could be made during these observation studies.

Terrestrial Region

In the field studies carried out in the area where the project is planned, it has been determined that the coastal part of the coastal area has the "low coast" feature and the low coastal beach structure has a sandy habitat structure.

Marine Region

Considering the habitat structure of the marine region, different soil structures and the existence of biological life models associated with them were observed. From the coast to the open areas there are increasingly different types of habitats (breakwater reefs, hard ground consisting of mud, rocks and debris). However, in general, it was determined that the area where the field studies were terminated, 4 km from the shore and up to a depth of approximately 22 meters, has muddy bottom habitat type.

8.1.1.3. Evaluation of Biodiversity in the Area in Terms of Seals

Benthic Macro Invertebrates Identified in Field Study

Studies of the complex relationships among benthic animals have focused on their definition and distribution in relation to environmental variables. Although such studies are essential for initial assessments of populations, experimental studies of regulatory environmental variables of physiological origin have not been used among benthic communities as much as they are used in studies between planktonic communities. In the seas, the population, productivity and feeding relationships of benthic fauna are poorly understood; slightly better known in streams.

However, the distribution of benthic fauna in the seas is extremely important as seals have different requirements for feeding, development and reproduction. A nurturing environment can allow seals to be evaluated within the scope of their habitat, as it can at least respond to feeding-housing behaviour.

Marine benthic macroinvertebrates are greatly affected by changes in their habitat and seasonal variations, such as changes in oxygen content and the input of living or dead organic matter required for food. Benthic organisms either have adaptive mechanisms to cope with these changes and enter the stationary phase to await favorable conditions, or die. The distribution, development, productivity and reproductive potential of benthic organisms depend on their ability to adapt to environmental parameter changes.

Benthic animals are extremely diverse and are represented by almost all branches, from protozoa to large macroinvertebrates and vertebrates. This fact, combined with the heterogeneous habitat, feeding, development, reproduction, mortality and behavioral characteristics, makes it extremely difficult to handle these animals with a holistic and functional approach. The benthic organisms of the study area are given in the biodiversity sections of this report. When these species are examined in general, a significant population density was not observed in terms of large Crustacea members and Cephalopods such as octopuses, which constitute the main food of seals.

Fish Identified in Field Studies

Fish are important biological components in the upper ring of aquatic systems and they are among the main food sources of seals. In the UVC studies carried out in the region, it has been determined that the natural rocky habitats in a very limited area increase the biological richness relatively and can create suitable hunting grounds for seals when evaluated in general. The fish species identified in the region are given in the biodiversity sections of this report.

The general habitat structure and biological diversity of the study area were evaluated; Although it is not suitable for shelter and/or hiding, when evaluated in general, it has been determined that it can show wandering - hunting behavior and the area has sufficient biodiversity in terms of nutrition. However, a large-scale habitat that could come to the forefront in terms of nutrition was not found.

8.1.1.4. Results

In this study, the structural and current usage characteristics of the region were evaluated. In addition, the habitats in the region were examined in detail in order to determine the possible effects

of the planned changes in the MIP (the berthing canal) during the construction and usage phases. In summary:

During the studies carried out in the region, no nesting caves that seals can use as a nest or caves, cavities or cracks that seals can use for long-term or temporary hiding were encountered, and the existence of a habitat suitable for breeding and sheltering behaviors was not determined.

No seal observations were made during the studies carried out in the region. In addition, based on the citizen science study, it was determined that no seal observations were made in the region (study area) in the last 5 years.

Along with the planned berthing channel, it has been determined that the coastal area, which will be affected by the currently used port structures, is currently used intensively in terms of many commercial, industrial and recreational activities. Considering the usage principles, it has been determined that the "desolation" condition, which is the most important phenomenon necessary for the seals to continue their breeding, sheltering and feeding behaviors, has completely disappeared long ago. In addition, a priority hunting habitat was not determined in the detailed habitat map study. It is estimated that the dredging activities (approaching channel) and the introduction of the deepened channel will not cause any change in terms of seals.

One of the phenomena that can affect the availability of seals in any region is the inter-regional and regional migrations (Gücü et al., 2004) and the feeding/hunting behavior that it can display at points with a rich biodiversity in terms of target organisms that make up its food during these migrations. A detailed habitat map was created in the MIP project area. In this map, it was determined that the area mainly consisted of mud habitat. This habitat type is not the primary hunting area for seals. However, MIP and its immediate surroundings were predicted to be usable by seals in terms of feeding behavior. However, the deterioration of the "desolation" condition in MIP and its immediate surroundings and the fact that the fishermen of the region have not made any observations for many years are an indication that the hunting behavior for seals is not frequent in the region/the region is not a priority hunting ground. Even if they hunt in the region, seals can perceive changing environmental conditions very well, since they are mammals with high mobility. It is estimated that they will not use the construction area as a hunting ground during the dredging works to be carried out in the region, and they will be able to protect themselves from the newly developing situation.

8.1.1.5. Discussions and Suggestions

Field studies have been carried out in MIP and its immediate surroundings (a total of 101 km), but habitats (used for breeding, sheltering and protection) which are of primary importance for seals (caves, caves, hollows) have not been found.

The results obtained in this study coincide with the literature information and the information provided by researchers who have worked in the field before.

In Turkey, seals are found especially in Aegean and Mediterranean coasts where there are islands, islets, reefs and steep rocky coastlines. In our country, it has been reported that there are 17 important coastal regions containing Mediterranean monk seal habitat. Some of these are under protection and some do not have any protection status (Kıraç, et al., 2013). Mersin International Port and its immediate surroundings are not included in these areas. In this report, Anamur, Bozyazı, Aydıncık, Gülnar and Silifke districts are stated as important regions for Mediterranean Monk Seals, as regions close to MIP. Silifke is the closest of the regions with coordinates given in this report and is located approximately 78 kilometers to the west (Figure 19).



Figure 19. Important seal areas to the west of the MIP (according to Kıraç et al., 2013).

Also, the eastern part of the MIP (Cilician basin) has also been extensively studied by different researchers (Gücü et al., 2004; Güçlü et al., 2015; Gökoğlu et al., 2012). In these studies, regarding the existence of seals and the breeding and protection caves of primary importance in the region in

the Eastern Mediterranean, it is emphasized that especially the west of the Iskenderun Bay, (the regions within the borders of Mersin province) and the borders of Samandag and Syria are important for these habitats (Figure 18-19).



Figure 20. Important seal caves and camera traps to the west of the MIP (according to Gücü et al., 2015).

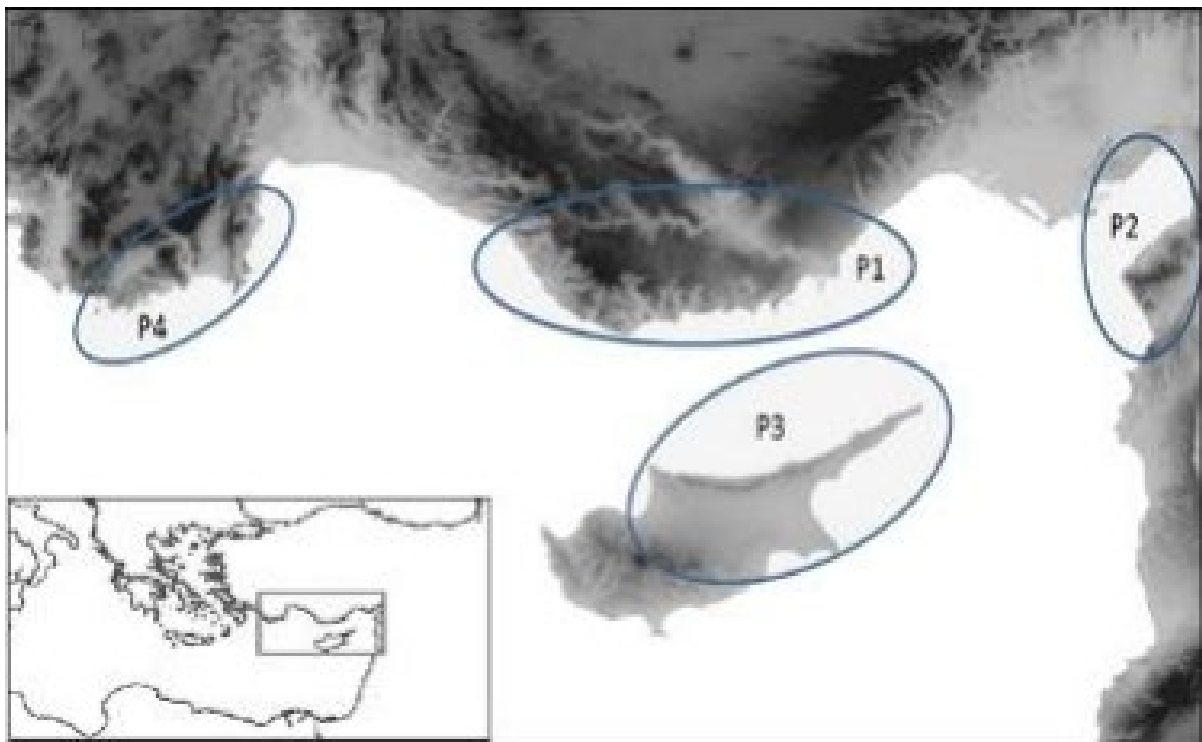


Figure 21. Populations of seals in the Eastern Mediterranean (according to Gücü et al., 2015).

In line with the findings obtained in this study, in all the studies presented in the literature, the MIP and its immediate surroundings were not specified as a region of any degree of importance in terms of the breeding/housing/feeding behaviors of the seals.

8.2. Sea Turtles (*Chelonia mydas* ve *Caretta caretta*)

8.2.1. Introduction

Literature and General Information

All sea turtle species living in the world's seas are in the "Endangered Species" category, which is in danger of extinction in all or a significant part of its range, or in the "Endangered Species" category that will likely be endangered in the near future. In the red list published by the International Union for Conservation of Nature (IUCN), two sea turtle species, *Chelonia mydas* and *Caretta caretta*, which regularly nest on Turkish coasts, are defined as "endangered" animals, while the Mediterranean population of *Chelonia mydas* is stated as critically endangered.

Countries have assumed legal responsibility for the protection of sea turtles and their breeding areas with various international conventions they have signed. With the studies carried out under the supervision of the United Nations Environment Program (UNEP), an action plan for the protection of the Mediterranean was approved in principle by 16 Mediterranean countries in 1975, under the name of the Mediterranean Action Plan (MAP). In 1976, the European Community and the same countries signed the Convention for the Protection of the Mediterranean Sea Against Pollution (Barcelona Convention) in Barcelona, bringing a legal dimension to the MAP. In addition, these countries signed the "Protocol on Special Protection Areas in the Mediterranean", which is one of the annex protocols of the Barcelona Convention, which aims to protect the endangered Mediterranean plants and animals and their habitats in 1982.

An action plan named "Action Plan for the Protection of Sea Turtles in the Mediterranean" was adopted and put into effect in 1989 by the countries that are party to the MAP, and the priorities to be considered in practice for the protection of sea turtles are listed under the following headings;

- Protection and management of nesting and wintering areas,
- Minimizing accidental catches and prohibiting the use that will arise for this reason,
- Investigation of new nesting areas,
- Investigation of nesting areas of species,
- More information about the behavior of the species.

The "Bern Convention" on the Conservation of European Wildlife and Natural Environments was signed in 1982 by the European Economic Community and 19 countries. The signatory parties are obliged to make a special effort to protect the natural flora and fauna populations, including sea turtles, and to protect all animals, including endangered species that arrive as migratory animals.

Caretta caretta and *Chelonia mydas* are two species of sea turtles that regularly nest on the Mediterranean coast. *Dermochelys coriacea*, *Eretmochelys imbricata* and *Lepidochelys kempii* are other sea turtles observed in the Mediterranean basin but whose regular nesting has not been determined. Therefore, Turkey bears an important responsibility for the future of sea turtle populations in the Mediterranean.

There are eight species of sea turtles (*Dermochelys coriacea*, *Eretmochelys imbricata*, *Lepidochelys kempii*, *Lepidochelys olivacea*, *Chelonia mydas*, *Chelonia agassizi*, *Natator depressus*, *Caretta caretta*) living in the world today. Five of these species, namely *Caretta caretta*, *Chelonia mydas*, *Dermochelys coriacea*, *Eretmochelys imbricata* and *Lepidochelys kempii*, are found in the Mediterranean. However, the species that regularly nest in the Mediterranean are *Caretta caretta* and *Chelonia mydas*. (Groombridge, 1990).

In adult individuals of *C. caretta* sea turtles, the carapace (back shell) is oval shaped and narrowed towards the back, on average 70-75 cm in length and 50 - 55 cm in width. The head is rather large and triangular. General coloration is reddish-brown dorsally and creamy-yellow ventrally. The distinguishing features from other sea turtles are; an intact shell, two pairs of prefrontal plates (in some individuals there may be a fifth plate in the middle of these plates) sandwiched between the eyes and nostrils, five pairs of costal plates on the carapace, three pairs of inframarginal plates on the plastron that are associated and wide with the carapace, two nails on each member, and typically can be listed as brownish-red coloration.

C. caretta is distributed in estuarine, lagoon, bay and near-shore seas in the temperate and subtropical waters of the Atlantic, Pacific and Indian Oceans. The largest nesting sites are Oman's Masirah Island (Ross and Barwani, 1982). Another nesting area with a very significant population is in Florida (Dodd, 1988). Important nesting sites in the Mediterranean are on the coasts of Greece and Turkey. A significant population is also found in Cyprus. Nesting is very rare in Tunisia, and

even less so in Israel. Sometimes nesting occurs in Lampedusa (Italy), Sicily and even Sardinia. Data for Egypt and Libya are insufficient (Groombridge, 1990). *C. caretta* nesting areas in Turkey are Ekincik, Dalyan, Dalaman, Fethiye, Patara, Kumluca, Belek, Kızılot, Demirtaş, Gazipaşa, Anamur, Göksu Delta (Baran and Kasparek, 1989).

There is conflicting information about the size dimorphism between sexes. Adult males, however, have a longer tail (3:1) than females, and longer back-curved claws. It is not possible to distinguish sexes with external examinations in hatchlings, juveniles and pre-adult individuals.

According to Caldwell (1962) and Uchida (1967), the age to reach sexual maturity of *C. caretta* reared in captivity is estimated as 6-7 years (Nelson, 1988). According to Mendonca (1981), the age of sexual maturity for individuals living freely in nature is 10-15 years; According to Zug et al. (1983) 14-19 years; According to Frazer (1983), 22 years; According to Frazer and Ehrhart (1985), it is estimated to be 12-30 years with the information obtained from the data curves (Nelson, 1988).

Mating of *C. caretta* may occur a few weeks before the start of nesting near the nesting beach or in private gathering areas. Tightly clinging pairs are mostly visible on the surface, although underwater splices have also been reported (Dodd, 1988, according to Limpus 1985).

The nesting season generally covers May-August in the northern hemisphere and October-March in the southern hemisphere. Spawning occurs mostly at night. Approaching the beach to lay eggs, the female occasionally raises her head and watches the beach. During this period, the female is very sensitive to external stimuli and returns when disturbed. Then the female, who climbs towards the beach, begins to look for an area where she can lay her eggs. In some cases, they can cover significant distances before nesting or returning to the sea, they can dig a shallow and deeper trunk hole on the back where they can hide their carapace, the anterior members do not do much in the nesting event, while the hind members do mutual work. While the egg pit is being opened, the first of the rear members removes the sand from the pit, while the other removes the sand that has been removed from the nest. After this process, which continues sequentially, the egg pit is opened. Following this, the spawning process begins. Eggs can be laid one by one, or in groups of two, three or four. The female, which is highly sensitive until the onset of egg laying, is less affected by

stimuli at the time of egg laying. After the eggs are laid, the eggs are covered with moist sand removed from the nest using the rear members and the sand is compacted. Then, while the female moves forward, the front members throw sand backwards and the nest pit is hidden. Following the completion of this process, the female quickly returns to the sea.

Some of the female individuals' exit to the beach may result in a nest (nest exit-nest), while some may not result in a nest (nest exit-false exit). Evaluation of such outlets can give important clues about the suitability of the beach for nesting and environmental factors.

Sea turtles may nest more than once during the same nesting season. The time between two nestings in the same season is about two weeks. In addition, sea turtles generally nest every 2-3 years.

Newly laid *C. caretta* eggs are usually spherical, white, soft, covered with mucus and the size of a ping-pong ball (approximately 40 mm in diameter and 40 g in weight). Small, oval-shaped or double eggs can also be found among the eggs. The number of eggs laid in the nests is about 100, and their incubation period is 1.5-2 months.

Egg predation can be done by fox, dog, sand crabs, etc. Wind erosion, wave erosion, sand intake, vehicle traffic are other factors that can cause deaths in the egg phase.

After breaking the egg shells, the hatchlings remain motionless in the nest for up to 26 hours in order for their carapaces to recover. Leaving the nest occurs 1-7 days (average 2.5 days) after hatching, when the hatchlings climb to the surface with the help of each other. (According to Demmer, 1981 and Miller, 1982, Dodd, 1988). The hatching of the young usually occurs at night when the sand surface temperature drops. All the offspring in the nest may not come out at the same time, in this case, the hatching continues in groups in the following nights. The hatchlings that come out of the nest head towards the sea by using the brightness of the horizon. In this case, any light source behind the beach may cause the offspring to disorient and die. When the hatchlings reach the sea, they swim non-stop in a period called "swimming frenzy", which lasts about 20 hours. (Salmon and Wyneken, 1987).

Hatchling mortality is considered high after hatching and in the first few days of swimming. Crabs, foxes, dogs, near shore fish and sharks are the most important predators. Besides their natural predators, hatchlings can be exposed to additional sources of mortality as a result of misdirection with beach lighting (Dodd, 1988).

There is no documented life expectancy estimate for *C. caretta* living in the natural environment. However, Frazer (1983) estimated the reproductive life span of adult females to be 32 years and the time to reach sexual maturity as 15-30 years (Frazer, 1986). It has been stated that the maximum life span under these conditions can be 47-62 years (Dodd, 1988).

Juvenile and young *C. caretta* feed on macroplanktonic prey collected in streamlines on the surface (Carr, 1987). Adult individuals are carnivores that feed on mollusks. With a broad head and highly developed jaw muscles and strong beaks, they are well-adapted to tear apart hard-shelled prey.

Because they mostly nest in warm and subtropical regions, *C. caretta* is thought to migrate between breeding habitats and wintering grounds, and little is known about male migrations. Group migration is unknown in *C. caretta*. They can stay in offshore waters year-round, and in Florida some individuals have been found to enter muddy bottoms. Some populations live near nesting beaches throughout the year and may inhabit cracks and holes between nesting periods. There is no indication that *C. caretta* forms "groups" in the classical sense. However, they can form local gatherings at sea or near nesting beaches. (Dodd, 1988).

Due to the scarcity of information about males of *C. caretta*, the sex ratio of their populations is not known exactly. There is also no comprehensive information on the age composition and size composition of the populations. In addition, Henwood (1987) stated that the compositions in the population change with each season, thus making it complicated to obtain information about the size of the population. Due to the incomplete information about the population structure and sex ratio, and the lack of knowledge of the biological population of sea turtles, it is difficult to predict population abundance and density. However, some estimates are made by the direct count of the females coming to the nesting beaches or the number of nests.

Factors affecting productivity rates of *C. caretta* vary regionally and there are significant variations within the population. These variations preclude determining the productivity status on certain beaches. Dominant general environmental factors such as heavy rains, wind erosion, wave erosion, temperature affect productivity. The amount and quality of food in the feeding areas are also effective factors in spawning in different numbers. The chemical structure of the sand, humidity, temperature, gas exchange, predators affect the success of the brood in the nest. The presence of humans on the spawning beaches, the presence of visitors, and the surrounding light sources disturb the nesting females and may cause them to return to the sea (Dodd, 1988).

C. caretta hatchlings are mostly hunted by sand crabs, sharks, predatory bony fishes foxes and dogs. Various birds also prey on the hatchlings during daylight hours. Illness, severe hunger and cold stupor can undoubtedly cause death. However, the effects on specific populations are unknown. Deaths can also occur from ingestion of tar, oil residue and plastic waste. Hatchling, pre-adult and adult individuals are hunted especially by sharks. In addition, these groups die or are injured from ingesting tar and plastic. In addition, ship crashes, deliberate hunting and being caught in various nets are other factors that cause death (Canbolat, 1997; 1999; 2003).

Although *C. caretta* is not the primary catch of the fishing industry in some countries, they are caught where they are seen. Most people do not eat its meat because of its alleged unappealing taste. However, it is still consumed by people living on the coasts of India, Madagascar, Mozambique. Although *C.caretta* is not valuable in terms of meat, shell and skin compared to *Chelonia mydas*, *Eretmochelys imbricata*, *Lepidochelys kempii* and *Lepidochelys olivacea*, their eggs are consumed in many parts of the world. The use of *C. caretta* eggs for protein purposes, as in the coastlines of Mozambique, Madagascar and Oman, has led to a decline in their populations (Canbolat, 1997; 1999; 2003).

Sea turtles, including *C. caretta*, have been tried to be protected by laws that prohibit their capture and sale and ensure the protection of their habitats as the status and importance of these species are understood. *C. caretta* is listed in Appendix 1 of the International Congress of Endangered Species (CITES). The species in this list are prohibited from being sold in any way to generate income. They are also included in the Annex 2 list, where international protection is essential in the preparations for the migratory species conference. The IUCN has classified this species as

"endangered". Although they are protected by some regulatory laws, insufficient or unwilling security forces in some regions and differences in the economic levels of countries are not sufficient for the protection of *C. caretta* and other sea turtles and make it difficult to implement the measures. (Canbolat, 1997; 1999; 2003; 2004).

For the continuity of *C. caretta*, it has been necessary to focus on all important nesting, feeding, migration and wintering habitats and to apply protections based on biological data. Different conservation and management alternatives (Mrosovsky, 1983; Dodd, 1988) are applied in different regions for the protection of sea turtles.

There is not much demand for the skin and shell of *C. caretta* and international trade is not very good either. Eggs and meat are generally consumed locally. CITES applications will be successful in preventing international trade. International trade has been halted by law with varying degrees of success. For example, egg consumption in the USA and Australia has thus been stopped. However, poaching still continues. Eggs are still collected in Colombia, Madagascar and Mozambique. In regions where there are no conservation laws, enactment and enforcement of laws seems to be necessary for the continuity of the species. (Canbolat, 1999; 2003).

Due to the importance of females in productivity and being very sensitive at the time of spawning, females coming to the beach should not be disturbed. This can happen by minimizing human activity during the spawning season and minimizing artificial lighting so that the hatchlings can find their way. Nests should also be protected from vehicles entering the beaches since they can compact the sand or leave traces that the hatchlings cannot get out of. In addition, the use of these vehicles at night may prevent females from coming to these beaches. Heavy mechanized cleaning vehicles used in beach cleaning should not be used during the spawning season on spawning beaches or should be operated in a size that will not harm them (Canbolat, 2003).

In areas with high egg poaching, predation and erosion, newly made nests can be moved to protected hatches, reburied in nests opened there, or incubated in boxes filled with moist beach sand. In cases where such applications will be made, careful planning and execution is required due to some risks of the method (Canbolat, 2003).

Another method used in the protection of sea turtles is to bring the hatchlings to a size where they can be protected from high predations in their first period. It is argued by the researchers on the subject that this method should be used after habitat protection. This method has been used in different parts of the world especially to increase the populations of *Chelonia mydas*, *Eretmochelys imbricata*, *Lepidochelys kempii* (Canbolat, 2004).

For the protection of hatchlings, it is necessary to reduce predation, prevent misdirection caused by beach lighting, and prevent pollutants and plastics which can be perceived as food items from reaching the sea (Canbolat, 2003; 2004).

The use of "Turtle Exclusion Devices (TED)" in areas where accidental catches and deaths are high with the nets used in fishing is a method to reduce deaths caused by fishing. This method has been used especially in the USA in regions where fisheries-related deaths are high, and it has saved adult and pre-adult turtles (Canbolat, 1997).

8.2.2. Methods

The aim of this study is to take the necessary precautions regarding sea turtles at Mersin International Port (MIP) and to minimize the possible effects of the project activities (both in the construction and operation phases) on this species. Within the scope of this, studies were carried out to determine whether *Caretta caretta* (Loggerhead turtle) and *Chelonia mydas* (Green turtle) uses the project site and the nearby regions for the purposes of breeding-sheltering-feeding-migration etc.

In this context, during the pre-construction period on 20-21-22 December 2021, we were transferred to MIP to conduct field studies, and observations were made from land and sea in the project area and its immediate surroundings. In addition to the project area and its immediate surroundings, the habitats in the region were evaluated in terms of sea turtles and their habitats (Figure 20).

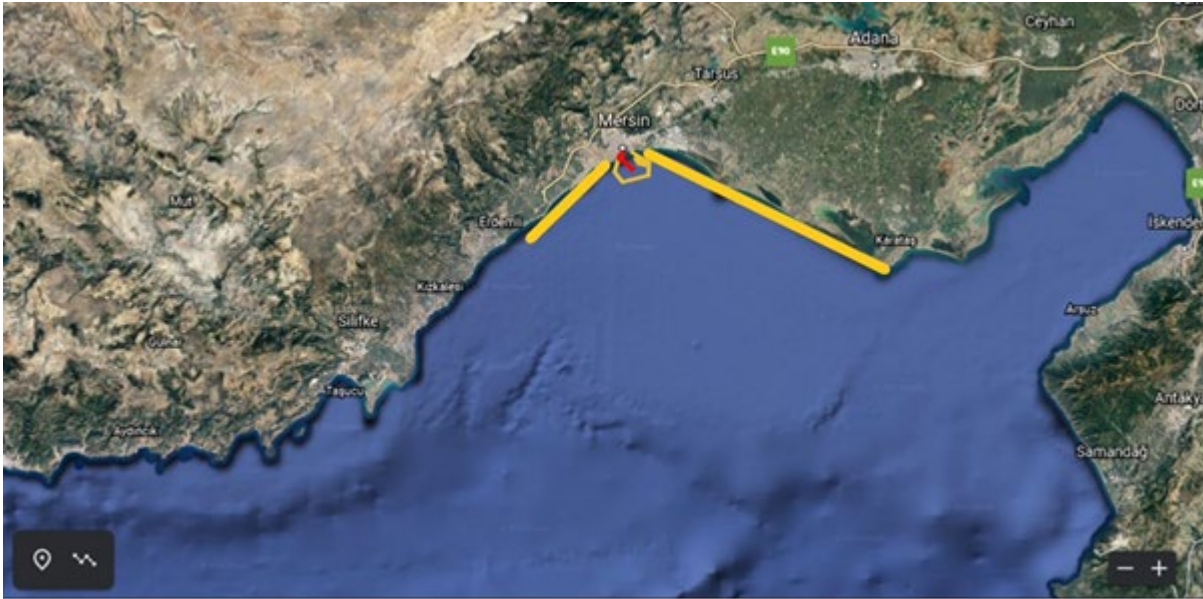


Figure 22. Scope of the study and literature search (Project impact area: MIP; project area immediate surroundings [the coastline scanned in the vicinity of the project area is marked with a yellow line] and the region [Mersin and Iskenderun Bays]).

This study was conducted in order to examine the project area, its immediate surroundings and the region in general (Figure 20) in terms of sea turtles [*Caretta caretta* (Loggerhead turtle) and *Chelonia mydas* (Green turtle)] nesting behavior and feeding, sheltering and migration behaviors in the marine environment outside the nesting season. Although we were transferred to the area on 20 December 2021, no turtle nest was found because it was the winter period, but the points where the beach structure in the coastal area of the project area and its immediate surroundings are important for the life cycle and egg-laying behavior of sea turtles were determined. The potential of the beaches and marine areas in the region in terms of nesting, feeding, shelter and migration has been supported by literature studies.

In this study, approximately 101 km of coastline in the project area (MIP) and its immediate surroundings was scanned. As a result, in this study, observation-based monitoring study was carried out in terms of the availability of sea turtles in the region where the project will be held and in the surrounding region. For this purpose, the coastline in the region where the planned project will be located has been scanned to cover the coastal area between the town of Erdemli in the Southwest and Karataş in the Southeast, by exceeding the seaside boundaries of the facility. This area, where the total length was recorded as approximately 101 km (line marked in yellow in Figure

20), was examined for possible individual presence in accordance with the life cycle and behavior of the sea turtle. The coastal area of the region has the characteristics of a low coast and a beach. This structure is suitable for sea turtles to lay eggs. Literature studies also support this phenomenon. Citizen Science methods were applied to understand the availability of sea turtles in the study areas and to obtain comprehensive information about which region they use at which stage of their life cycle. This method involves scanning social media and conducting interviews/surveys with fishermen, divers and sailors who use the region effectively (Bundone et al., 2019; Mo et al., 2007; Mo, 2011; Sullivan et al., 2019). With this method, data collection studies were carried out on fishermen, and 18 fishermen of the region were interviewed.

Among the different sampling techniques used to assess the diversity of macro fauna and flora in the marine ecosystem, UVC has been adopted to study shallow and near-shore habitats (which may be with heterogeneous substrates such as artificial reefs, rocks or corals) (De Girolamo, Mazzoldi, 2000).

The regions visited during SCUBA and snorkeling dives (in accordance with the habitat map created in this study) were also evaluated in terms of the general condition of the marine environment and biodiversity. Underwater Visual Counting (UVC) technique was used in biodiversity assessment studies.

8.2.3. Findings

Evaluation of Habitats in Terms of Sea turtles

No sea turtle individuals were found in the observation study from the boat and SCUBA dives. However, in these studies, 3 fishermen who were on their boats and 15 fishermen in the harbor were interviewed for the availability of sea turtles. Interviews were made with the professional fishermen that have been hunting in the region for more than 10-15 years and go out hunting every day when the weather is suitable (at least 180 days/year). According to the information given by the fishermen, they have observed sea turtles in every season in the project area (MIP) and its immediate surroundings, and that this number is higher in winter and spring months.

During the interviews, fishermen stated that they observed sea turtles especially in the southeast of the MIP and especially around Karataş Cape. This case is also supported by the literature. In their

study, Alessandro et al. (2010) found that the southeast of the MIP was a demersal accommodation area for *Caretta caretta*, especially in winter (Figure 21).

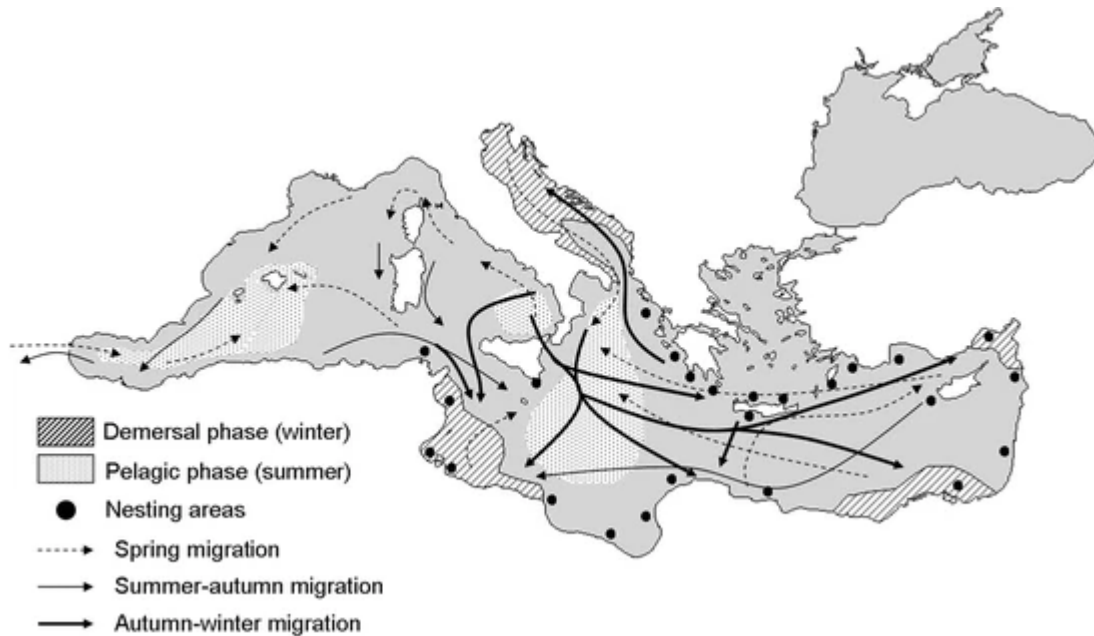


Figure 23. Availability of *Caretta caretta* in the region according to Alessandro et al. [Alessandro, Lucchetti, and Sala Antonello. "An overview of loggerhead sea turtle (*Caretta caretta*) bycatch and technical mitigation measures in the Mediterranean Sea." *Reviews in Fish Biology and Fisheries* 20, no. 2 (2010): 141-161].

In the interviews with the fishermen, the causes of death of adult sea turtles were also emphasized and information was sought on death cases by collision with sea vessels. According to the statements of the fishermen, it was determined that dead adult sea turtles found in the sea or washed ashore were caused by drowning as a result of accidental catch (by-catch) rather than cuts by the propellers of watercrafts (Figure 22). Again, studies by researchers stated that heavy trawling, especially in the southeast of the MIP, may be the cause of these deaths (Alessandro et. Al., 2010).



Figure 24. *Caretta caretta* by-catch shapes in the region according to Alessandro et al. [Alessandro, Lucchetti, and Sala Antonello. "An overview of loggerhead sea turtle (*Caretta caretta*) bycatch and technical mitigation measures in the Mediterranean Sea." *Reviews in Fish Biology and Fisheries* 20, no. 2 (2010): 141-161].

Terrestrial Region

In the field studies carried out in the immediate vicinity of the project area, it has been determined that the coastal part of the coastal area has the "low coast" feature, while the low coastal beach structure has a sandy habitat structure and sea turtle spawning potential.

In the literature studies, the beaches in the northwest of the project area were not officially designated as turtle spawning grounds. However, according to the Circular No. 2009/10 on the Protection of Sea Turtles prepared by the General Directorate of Nature Conservation and National Parks and published in the Official Gazette, Kazanlı in the southeast direction (approximately 8 km) is an official nesting area, especially for *Chelonia mydas*.

In addition, when the region is evaluated in general, the beaches of Göksu (Taşucu) in the northwest and Kazanlı, Akyatan, Karataş, Ağyatan, Yumurталık, Sugözü and Samandağ in the southeast direction are official nesting site according to the Circular No. 2009/10 on the Protection of Sea Turtles, prepared by the General Directorate of Nature Conservation and National Parks and

published in the Official Gazette. Also, although many beaches such as Burnaz Beach in the southeast direction are not officially registered, they are important breeding areas for sea turtles at different scales (Candan and Kolankaya, 2016; Candan, 2018).

Important *Chelonia mydas* nesting sites in the eastern Mediterranean have been extensively described by Stokes et al (2015) (Figure 23).

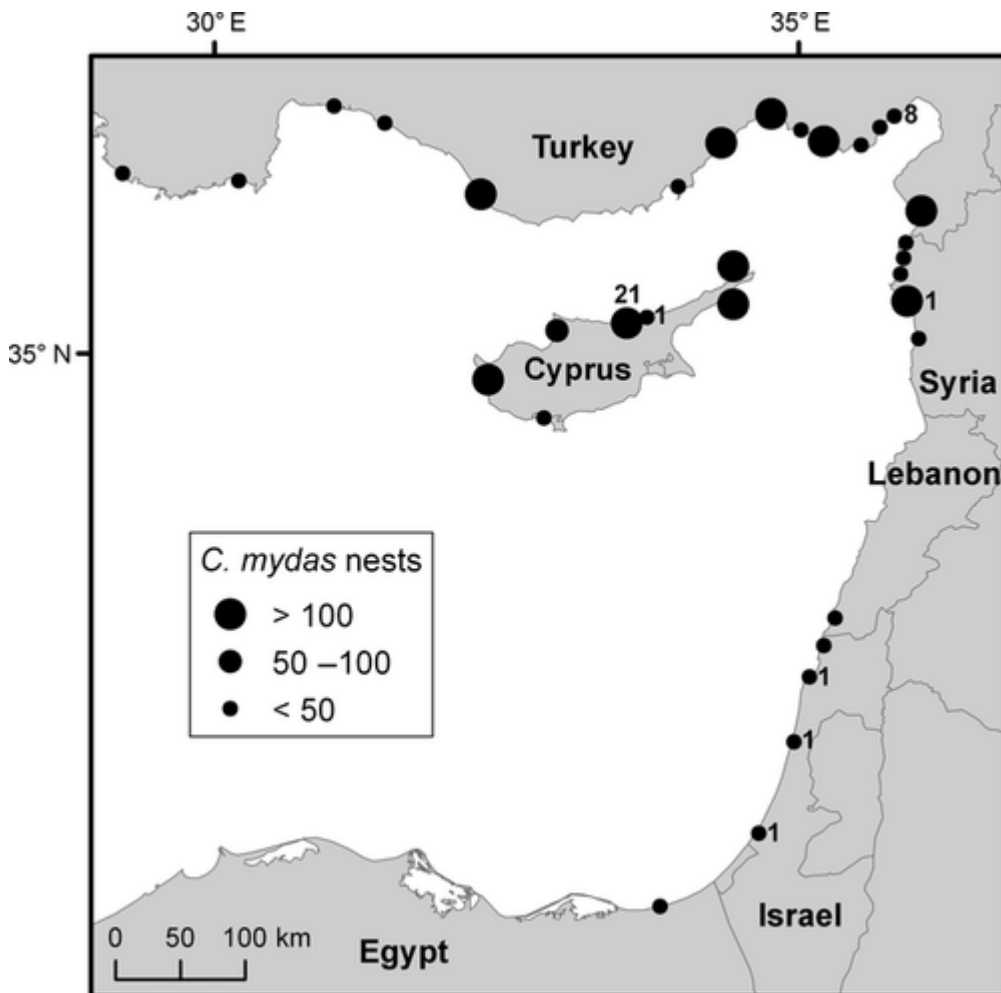


Figure 25. Important *Chelonia mydas* nesting sites in the eastern Mediterranean [Stokes, K. L., A. C. Broderick, A. F. Canbolat, O. Candan, W. J. Fuller, F. Glen, Y. Levy et al. "Migratory corridors and foraging hotspots: critical habitats identified for Mediterranean green turtles." *Diversity and Distributions* 21, no. 6 (2015): 665-674].

According to the Circular No. 2009/10 on the Protection of Sea Turtles, prepared by the General Directorate of Nature Conservation and National Parks and published in the Official Gazette, the closest official nesting area to the project area is Kazanlı. Kazanlı beaches are one of the important nesting areas for green sea turtle (*Chelonia mydas*) in our country (Canbolat et al., 2005).

Marine Region

Considering the habitat structure of the marine region, different soil structures and the existence of biological life models associated with them were observed. From the coast to the open areas there are increasingly different types of habitats (harbour cliffs, muddy, rocky and littered hard ground). However, in general, it was determined that the area where the field studies were terminated, 4 km from the shore and up to a depth of approximately 22 meters, has muddy bottom habitat type.

8.2.4. Evaluation of Biodiversity in the Field in Terms of Sea Turtles

Macro Invertebrates Identified in Field Study

Studies of the complex relationships among benthic animals have focused on their definition and distribution in relation to environmental variables. Although such studies are essential for initial assessments of populations, experimental studies of regulatory environmental variables of physiological origin have not been used among benthic communities as much as they are used in studies between planktonic communities. In the seas, the population, productivity and feeding relationships of benthic fauna are poorly understood; slightly better known in streams.

In addition, the distribution of benthic fauna in the seas is extremely important as sea turtles have different requirements for feeding, development and reproduction. A nurturing environment can allow sea turtles to be evaluated within the scope of their habitat, as it can at least respond to feeding-housing behaviour.

Marine benthic macroinvertebrates are greatly affected by changes in their habitat and seasonal variations, such as changes in oxygen content and the input of living or dead organic matter required for food. Benthic organisms either have adaptive mechanisms to cope with these changes and enter the stationary phase to await favorable conditions, or die. The distribution, development, productivity and reproductive potential of benthic organisms depend on their ability to adapt to environmental parameter changes.

Benthic animals are extremely diverse and are represented by almost all branches, from protozoa to large macroinvertebrates and vertebrates. This fact, combined with the heterogeneous habitat, feeding, development, reproduction, mortality and behavioral characteristics, makes it extremely

difficult to treat these animals with a holistic and functional approach. Benthic organisms of the study area are given in the biodiversity sections of this report. Of the sea turtles, *Caretta caretta* is carnivorous, while *Chelonia mydas* is herbivorous. Based on the information obtained from the studies conducted in the field, *Posidonia oceanica* and other seagrass habitats suitable for the feeding behavior of *Chelonia mydas* were not found. In this respect, it has been estimated that the project area (MIP) and its immediate surroundings are not suitable for *Chelonia mydas* feeding behavior. When the habitats determined in the project area and its immediate surroundings and the biodiversity they contain are examined in general, it has been determined that there are cephalopods such as large Crustacea members, sponges and octopuses that make up the main food of the *Caretta caretta* and are suitable for the feeding of this species. However, a significant population density was not found in terms of food-forming species. In addition, although fish are important biological components in the upper ring of aquatic systems, since they are not among the main food sources of *Chelonia mydas* and *Caretta caretta*, they were not evaluated in terms of the feeding behavior of sea turtles.

8.2.5. Results

In this study, the structural and current usage characteristics of the region were evaluated. In addition, the habitats in the region were examined in detail in order to determine the possible effects of the planned changes in the MIP (the berthing canal) during the construction and usage phases. In summary:

In the studies carried out in the region, it has been determined that there is no beach in the project area that sea turtles can use for nesting purposes.

In the immediate vicinity of the project area, Kazanlı beach has been determined to be an important nesting area for sea turtles, especially *Chelonia mydas*.

With that being said, when the region is evaluated in general, the beaches of Göksu (Taşucu) in the northwest and Kazanlı, Akyatan, Karataş, Ağyatan, Yumurtalık, Sugözü and Samandağ in the southeast direction are official (important) nesting site according to the Circular No. 2009/10 on

the Protection of Sea Turtles, prepared by the General Directorate of Nature Conservation and National Parks and published in the Official Gazette. In addition, although many beaches such as Burnaz Beach in the southeast direction are not officially registered, they are important breeding areas for sea turtles at different scales (Candan and Kolankaya, 2016; Candan, 2018).

Although there are no spawning beaches and habitats suitable for feeding behavior in the marine environment in the project area, there are important spawning, feeding and wintering areas in the vicinity of the project area and in the region for Turkey and the Mediterranean. In this respect, it brings with it the formation of migration corridors and hot spots (Migratory corridors and foraging hotspots), which are important for the life cycles of sea turtles. This phenomenon has been studied by different researchers (Snape et al., 2016; Rees et al., 2017; Tessa et al., 2016; Stokes et al., 2015).

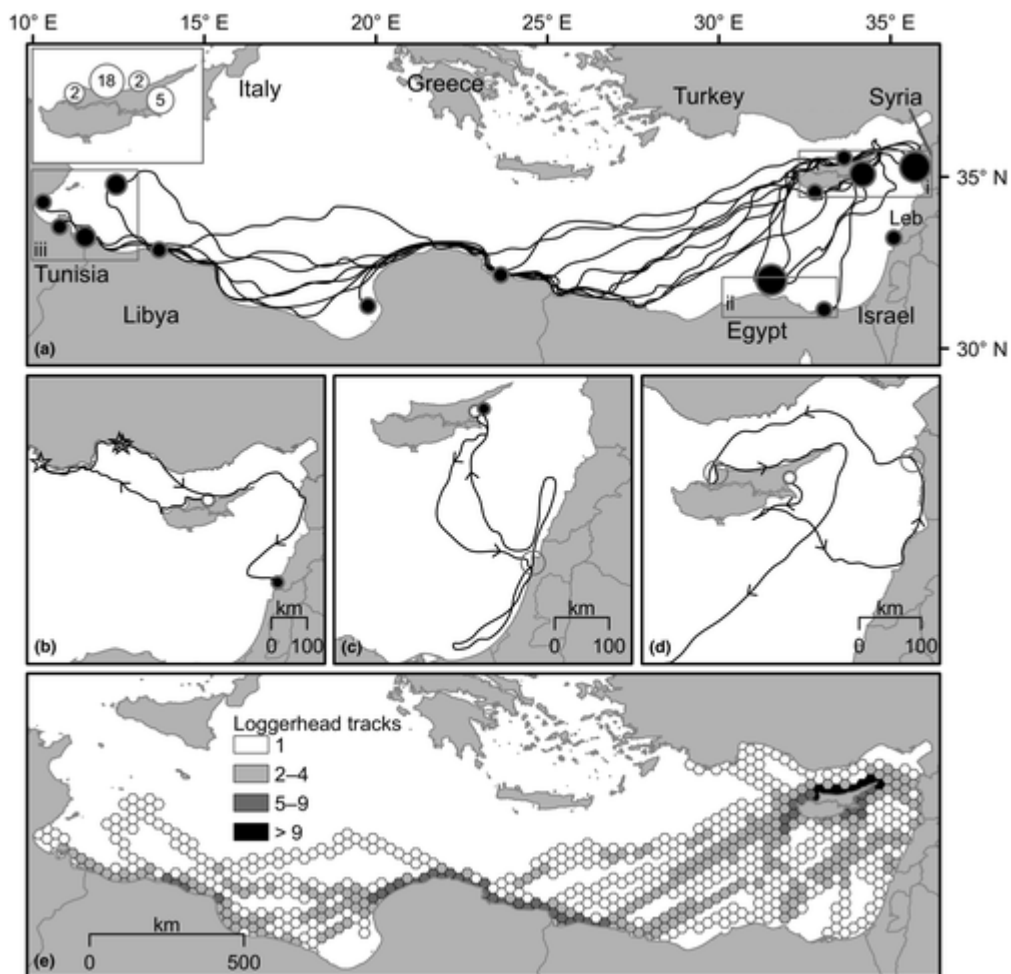


Figure 26: Snape, Robin TE, Annette C. Broderick, Burak A. Çiçek, Wayne J. Fuller, Fiona Glen, Kimberley Stokes, and Brendan J. Godley. "Shelf life: neritic habitat use of a turtle population highly threatened by fisheries." *Diversity and Distributions* 22, no. 7 (2016): 797-807.

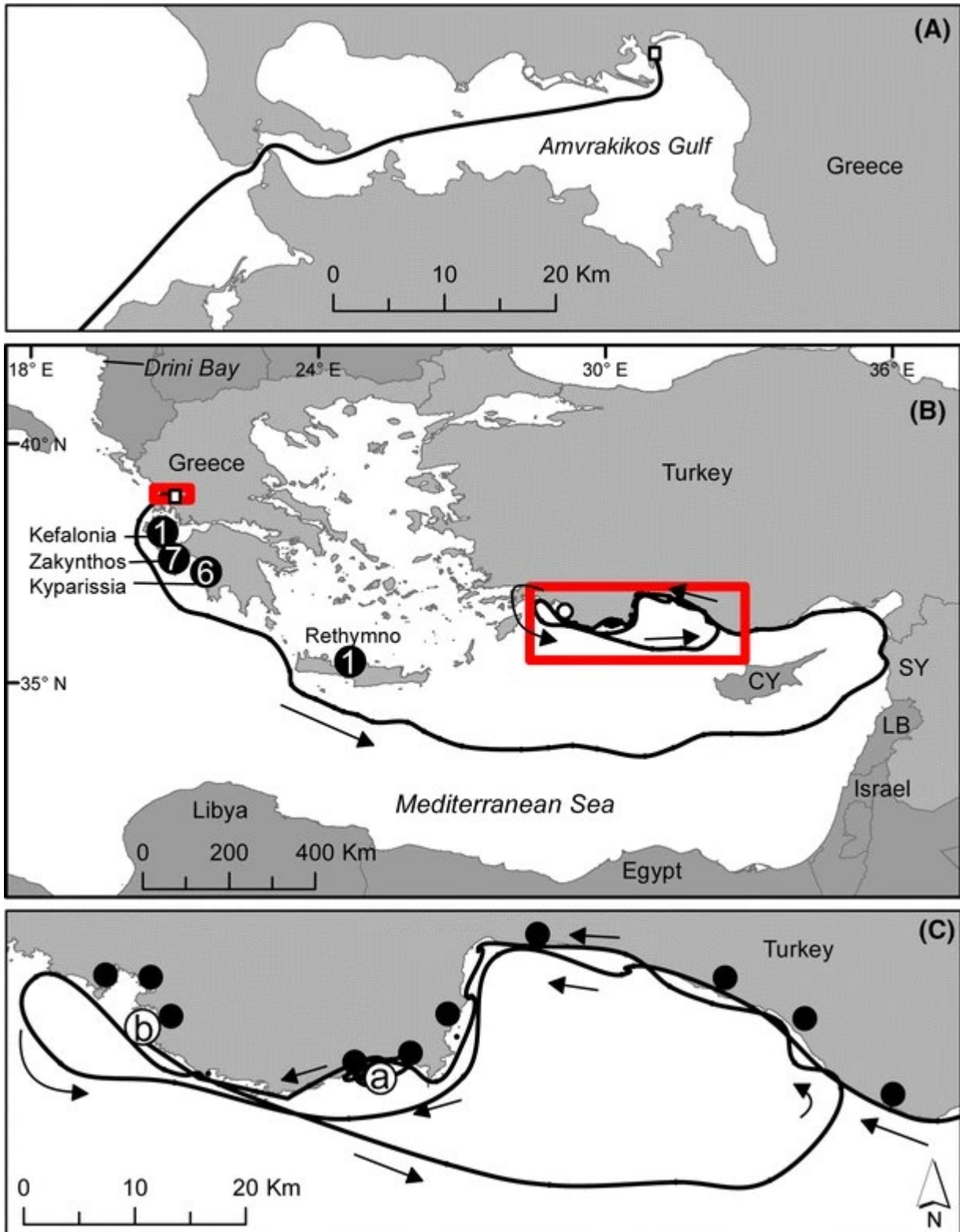


Figure 27: Rees, Alan F., Carlos Carreras, Annette C. Broderick, Dimitris Margaritoulis, Thomas B. Stringell, and Brendan J. Godley. "Linking loggerhead locations: using multiple methods to determine the origin of sea turtles in feeding grounds." *Marine biology* 164, no. 2 (2017): 1-14.

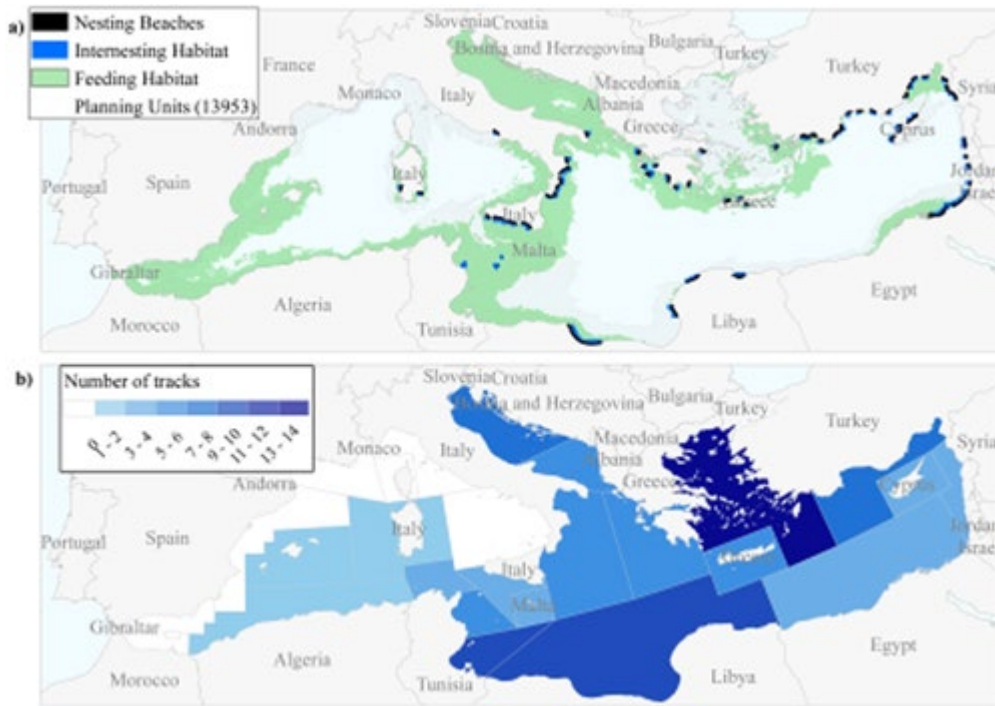


Figure 28: Mazor, Tessa, Maria Beger, Jennifer McGowan, Hugh P. Possingham, and Salit Kark. "The value of migration information for conservation prioritization of sea turtles in the Mediterranean." *Global Ecology and Biogeography* 25, no. 5 (2016): 540-552.

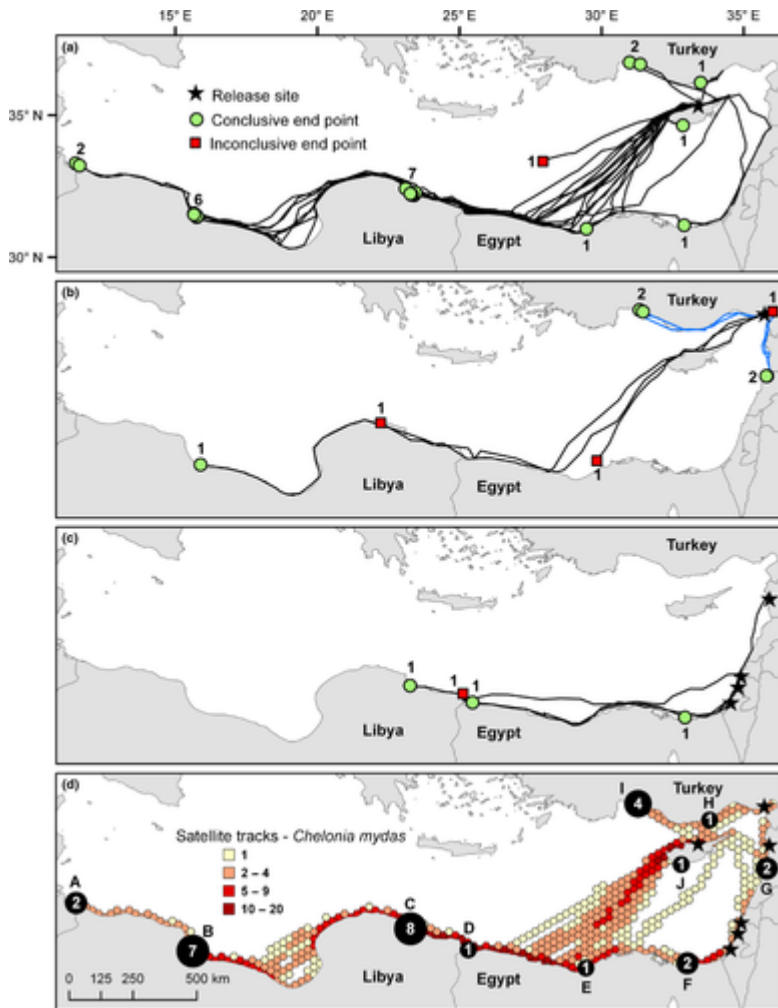


Figure 29: Stokes, K. L., A. C. Broderick, A. F. Canbolat, O. Candan, W. J. Fuller, F. Glen, Y. Levy et al. "Migratory corridors and foraging hotspots: critical habitats identified for Mediterranean green turtles." *Diversity and Distributions* 21, no. 6 (2015): 665-674.

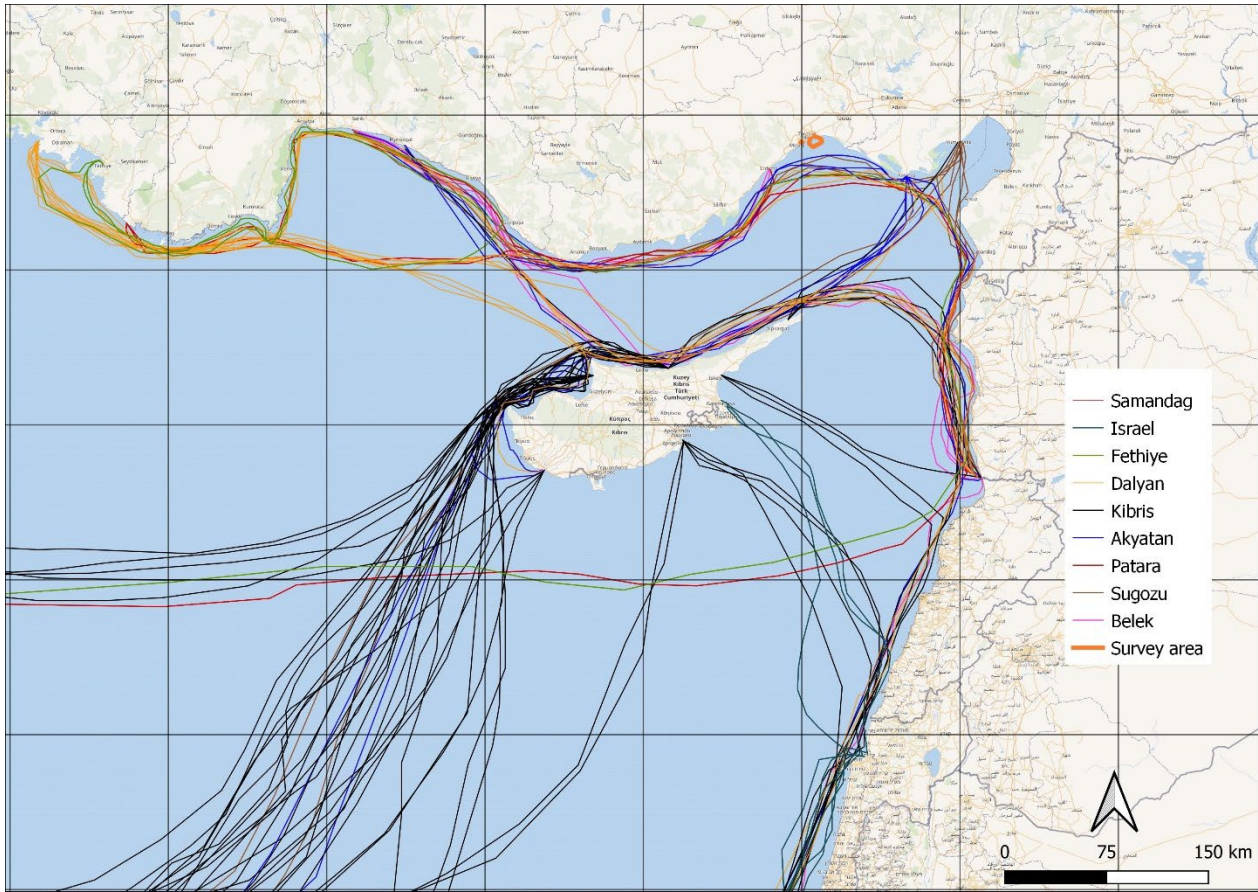


Figure 30: sea turtle migration routes depending on satellite tracking data derived from transceivers attached on different beaches (indicated in different colors) by turtle research groups including above mentioned studies [Please note that these routes are converted from scattered tracks (coordinates) to ordered “main routes” manually on a GIS map].

As a result, it has been determined that the currently used port structures are heavily used in terms of many commercial, industrial and recreational activities. Considering the usage guidelines, it has been estimated that the sea turtles are likely to have been affected to some extent by the activities carried out (maritime traffic) to date. With that being said, no adverse effects of maritime transport and other activities related to MIP on sea turtle migration routes and hot spots in the region have been reported. In these studies, the negative effects of fishing activities (drowning as a result of by catch, injuries, deliberate killing, etc.) were emphasized. (Snape et al., 2016; Rees et al., 2017; Tessa et al., 2016; Stokes et al., 2015).

8.2.6. Discussion and Suggestions

Field studies were carried out in MIP and its immediate surroundings (a total of 101 km), and the region was evaluated in general. No reports, studies or publications have been found that the marine transportation based on the currently used port adversely affects the migration corridors and foraging hotspots formations, which are important for the life cycles of sea turtles.

Sea turtles are common in the region. There are two ways they can be found in the region. The first is migration between breeding beaches and wintering areas, and the second is their availability in the wintering area (Figure below).

Mersin International Port is intertwined with both migration routes and wintering area as a location. However, the port has been in operation for many years and no negative impact on migration routes has been reported (no signal interruptions from satellite transmitters have been identified, and deaths due to large vessels have not been reported).

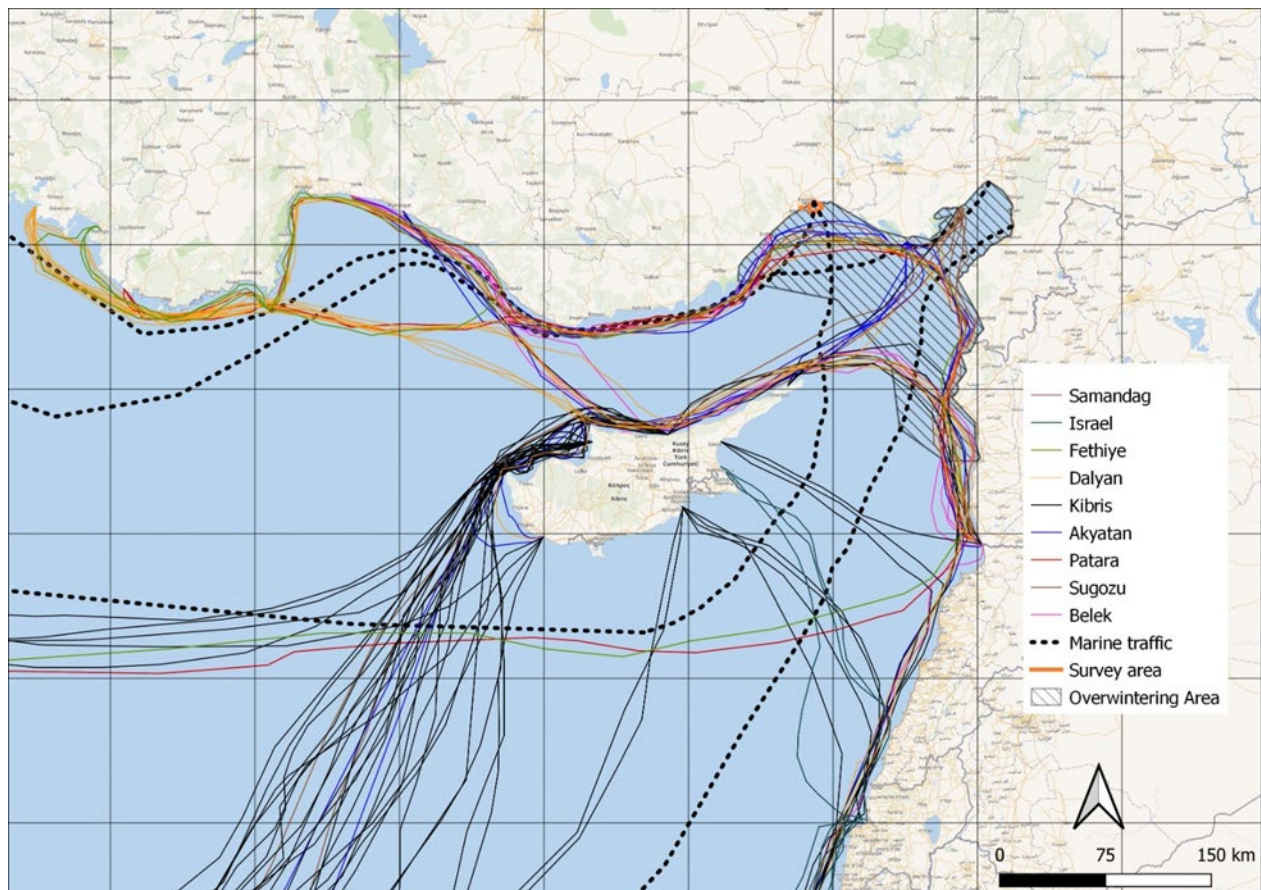


Figure 31: sea turtle migration routes and wintering area locations depending on satellite tracking data derived from transceivers attached on different beaches (indicated in different colors) by turtle research groups and main transportation routes from MIP and dispersed terminals in Iskenderun Gulf [Please note that these routes are converted from scattered tracks (coordinates) to ordered “main routes” manually on a GIS map. Main transportation routes are derived from Marine Traffic (marinetraffic.com) and WWF].

However, the physical effects, turbidity and noise that will occur during the construction period will adversely affect the sea turtles in the nearby area. Because sea turtles are fast-swimming

animals, they will move away from the immediate area, but mitigating factors should still be considered.

With the berthing channel planned to be built, ships with a deeper draft will be accepted to the port. These ships are planned to be larger in size than those currently using the port. However, there is no study showing that larger tonnage ships will have a negative impact on sea turtle mobility and migration routes. On the contrary, it has been shown that small-scale and fast-moving watercraft are the ones that occur in the marine environment and cause injury or death to sea turtles (Work et al.,2010).

In this respect, in order to minimize sea turtle injuries and deaths, speed limit should be applied for small vessels (utility boats, recreational boats, etc.) rather than large tonnage vessels approaching the port.

It should be mandatory to have an injury prevention cage in front of the propellers of fast watercraft.

It should be ensured that the activities to be carried out to open a berthing channel do not coincide with the period of intense migration.

Even if they show feeding behavior in the region, sea turtles have high mobility and can perceive changing environmental conditions very well. It is estimated that they will not use the construction area as a feeding area during the dredging works that will take place in the region, and they will be able to protect themselves from the newly developing situation.

Mitigation measures:

During the construction period, at least two observers depending on the operation area should be present at the construction site.

Sea turtles have to come to the surface of the water to breathe because they have lungs. In this respect, they are easy to detect by observation from the surface. In this case, sea turtles should be removed from the area by being frightened or caught with nets (with a boat and adequate number of personnel).

During the construction period, anti-turbidity curtains should be considered by the Dredging Contractor as outlined in the Dredging Management Plan to prevent turbidity in the vicinity of dredging area if the turbidity levels reach unacceptable levels and the conditions are suitable for deployment.

Migration of adults between the nesting beaches and the wintering area takes place in the summer months (May – October). There may not be much danger in this period, as migratory adults can

get away from the tools/vessels that cause sound and physical effects, but during the wintering period, juveniles and adults may be buried in the sand or lying on the ground. However, since the project involves dredging only in deep waters this would not be a concern.

8.3 Fishes

Evaluations were made based on previous studies (literature) and field observations. Although no critically endangered or endangered species were observed during the field studies, evaluations were also made about the species' possible habitats that they are likely to be found in the study area and impact area. In addition, it is requested to be examined within the scope of "Term of References".

As a result of the evaluations, the existence of *Raja radula* and *Anguilla anguilla* in the project area and area of influence were determined based on the literature.

Since other species were not observed and not listed in the literature regarding the project area and area of influence, and habitats were found as not suitable, their evaluations were not made within the scope of this report. The priority species are given below (Table 14).

Table 14. Priority fish species

Ecosystems	Critically Endangered and/or Endangered species	Endemic and/or restricted-range species
	<i>Carcharias taurus</i> (CR)*	--
	<i>Aetomylaeus bovinus</i> (CR)*	--
	<i>Gymnura altavela</i> (CR)*	--
	<i>Centrophorus granulosus</i> (CR)*	
	<i>Oxynotus centrina</i> (CR)*	
	<i>Squatina squatina</i> (CR)*	--
	<i>Anguilla anguilla</i> (CR)*	--
	<i>Raja radula</i> (EN)*	
	<i>Rostroraja alba</i> (EN)*	
	<i>Squalus acanthias</i> (EN)*	--

9. THE EFFECTS OF INTERNATIONAL MERSIN PORT CAPACITY INCREASE ON THE MARINE ECOSYSTEM AND MEASURES

Aquatic life and habitat of the project area does not have a unique habitat characteristics in terms of related algae and phytoplankton, zooplanktonic organisms, benthic fauna and fish species considering other environments in the surrounding environments.

Although the water circulation in the operation areas and around them is limited due to the fact that the area is a port, algae explosions do not occur in terms of related algae and phytoplankton; nevertheless, phytoplankton species diversity is high.

The planning activity areas have similar characteristics with other regions in terms of species diversity and densities of zooplanktonic organisms at the second level in the aquatic food chain.

One of the most important factors affecting the existence and distribution of benthic fauna is the dissolved oxygen value. It is possible to see some Mollusca and Annelida species in the operation areas and coast nearby. Habitat diversity of the sea bottom structure especially near the shore causes an increase in benthic species diversity. When the distribution of benthic species are evaluated, Polychaeta class members belonging to the Annelida phylum are dominant on muddy and sandy bottoms which creates Mersin Port habitat while the Mollusca phylum is dominant in the rocky areas closer to the shore.

The marine habitat structure in the areas to be filled and dredged within the scope of the expansion works of the port does not contain a feature different from the general coastal habitat structure of the Eastern Mediterranean. In other words, although it is important for fisheries, it does not have a distinctive habitat structure separate from other areas in its near and far surroundings. The activity covers a very small surface area considering the entire Mediterranean coast. Due to the filling and pier works in this area, a habitat loss will occur in terms of macroalgae and microalgae, zooplanktonic organisms, benthic organisms and fish. With that being said, habitat degradation in these areas may regain its former character in a short period of time.

The benthic flora and fauna living on and in the sediment will also be damaged during the filling and bottom excavation in the zone. The benthic species will be gone along with the sediment in the excavation and filling areas. Benthic species in closer areas that have not been exposed to the

operation may be adversely affected by the sediment cloud. The sediment cloud in the bottom of the activity area during the filling may block the species and prevent them from feeding through filtration and respiring with their gills. After such impact, benthic species will move away from the environment and find more suitable areas for them.

Shortly after the end of the activities in the project area, the basic elements of the aquatic ecosystem will be seen again. Microalgae communities connected to rock on the bottom will show up first. These microalgae will allow many zooplanktonic and benthic invertebrates to come to the area to feed, and then the fish species will start using these areas again.

The excavation works will destroy the bottom of the project area, yet once the activity ends, the flora - fauna elements and abiotic factors that will come to the region will begin to reconstruct the old habitat structure.

The bottom habitat in the project area is abundant in many places in its immediate surroundings and along the entire Mediterranean coast. The ground habitat structure in the region where the port works will be carried out will be adversely affected. However, there are also large areas with similar ground structure in the immediate vicinity of the area, which will not be adversely affected by the project.

According to the biological findings from the study area, the species diversity of the environment is high. All of the identified algae, zooplanktonic organisms, benthic organisms and fish contain cosmopolite species. However, there are also species that are not in the study area but can be observed in closer parts and require protection. The commitments included in the annexes of the relevant conventions for these types will also apply to this project.

Therefore, the content of the material used in the filling is very important. As such, the stones should be hard enough to be resistant to external effects. Large rock blocks should be nonsoluble in water and analyzes should be available to show that they do not include toxic heavy metals and certain chemicals. Otherwise, the results of the project will be negatively impacted, and the marine ecosystem might get polluted as well.

The clouding of sea water during filling can create undesirable conditions especially for fish and planktonic species. For this, for any filling work to be done on land, first the fillings in the sections forming the sea boundaries of the filling area should be completed and a barrier should be drawn

and then the section between this barrier and the coastal part should be filled. Thus, the turbidity effect that will occur during the filling will disappear as the connection with the sea is cut off.

The bottom structure of the Project Area shows that there is a thick layer of sand and silt. Increasing turbidity in the water during the filling and excavating works will cause a change in the water quality values. In this case, many pollutants that have accumulated in the sediment can be mixed with the water. Finally, these substances that will mix into the environment from the sediment will physically and chemically change the environmental conditions and may cause undesirable results on marine species. In addition, sediment mixed with the water can adhere to the gill systems of aquatic organisms, especially fish, and negatively affect their respiratory mechanisms.

Increased turbidity will prevent the light from reaching the bottom parts -macro and micro algae which may harm these organisms in long term. However, such affects of filling and excavation operations in this project will not be long-lasting. Considering the activities previously performed with similar effects near the study area, all marine biota, especially macro and micro algae, were able to survive. Considering the sediment dimensions and duration in this study, the impact will be extremely limited.

Fish species will move away from the environment where turbidity occurs. For this reason, the fish will also be affected by the sediment cloud at a limited level. When all of these effects are evaluated, it is thought that there will not be a significant impact on the sediment, fish species and fishing activities of the region.

The following precautions are recommended to minimize the effects of sediments mixing in the aquatic system.

- Filling should be done in the least limited area possible and unnecessary interventions should not be allowed.
- Spring period (March, April, May and early June) is known as the breeding period when marine biological activity is in the highest level. During these periods, the filling and operations should be kept at minimum levels. Noise, turbidity, and mechanical effects may adversely affect the presence and quantity of eggs, young and mature individuals in this period when the abundancy of marine species start to increase. Performing such activities in the late autumn and winter months, when biological activity is lowest, will cause a minimal impact on the marine ecosystem.

- Filling and excavation works should not be done in unsuitable wind and wave conditions. Otherwise, sedimentary clouds can spread rapidly over distant points.

During the operation phase of the activity, factors that will adversely affect the dynamics of the marine ecosystem should not be allowed. It is necessary to fully implement the control and regulation of both the wastes in the terrestrial environment and the wastes of the ships in the quay. Due to the minimum flow in the port, it is inevitable to control solid and liquid wastes according to the relevant regulations. The following practices should be considered in order to protect the water quality and biota of the marine ecosystem during the construction and operation phases of the project.

Sea bottom dredging will be carried out in the project area, except for the filling sections. It is inevitable that there will be destructions on the ground during this process. Although these works will have an impact during the construction phase, the organisms in the environment that are damaged in these parts of the marine ecosystem during the operation phase will be able to come back to the environment after a short while and create suitable habitats for themselves.

Benthic invertebrates and macroalgae on the bottom will be impacted during marine construction works. The sand habitat is observed to be dominant, especially in the areas where filling and excavation work will be executed. Although no macroalgae communities are seen on this sand, filling and excavation activities will have an impact on the ecosystem within the port.

The variety of benthic species in the rocky habitat of area where the filling process will be carried out is higher than the mud habitat. Especially Annelida phylum members and Bivalvia and Gastropoda species belonging to the Mollusca group are abundant and common. Among these species, there is no species that is endangered or can be defined as rare. Although the entire ecosystem in the filling area in the sea will deteriorate, the consequences of this effect will be in a small area considering the entire Mediterranean coast.

When the construction activities finish, the impacted species in the system will be able to survive in other suitable areas. After the construction, especially the filling areas will be an important nesting, feeding and breeding area of biological life. The material covering the large filling blocks after they have been placed should be the same material which has been taken from the same spot and it should be insoluble.

After the filling works end, first algae will settle on and between the rock blocks; as such, many invertebrates will find shelter and feeding opportunities among the algae. Especially Polychaeta and Mollusca members will use them to hide themselves and to hold on to it. Fish will come to the area where these species are found to find food and the aquatic system will start a dynamic again. This process may take less than a year, depending on biotic and abiotic factors.

Effects on the Areas Where Dredging Will Be Performed and Related Precautions

Dredging is the process of carrying out works such as the protection of sea routes, the construction / deepening of port basins, the opening / deepening of channels, the arrangement of coasts and the opening of new channels. The purpose of dredging is to increase the depth in the water areas, open new waterways, expand the ports, arrange the coasts and clean the bottom.

Within the scope of Mersin Port Expansion studies, dredging will be carried out in the port entrance corridor, in front of the quays and in the ship maneuvering area in order to ensure the draft depth of the ships with larger tonnage that will dock at the port. This process is planned on a total area of 2,120,000 m². As a result of the dredging, 3.283.046 m³ of dredging material will be extracted (Figure 24). The material extracted after dredging will be analyzed and disposed of in an area suitable for the analysis result. Studies related to the marine area where this dredging material will be dumped have been evaluated within the scope of another report within the scope of the EIA Report. For this reason, in this report, evaluations regarding the area to be dredged are given.

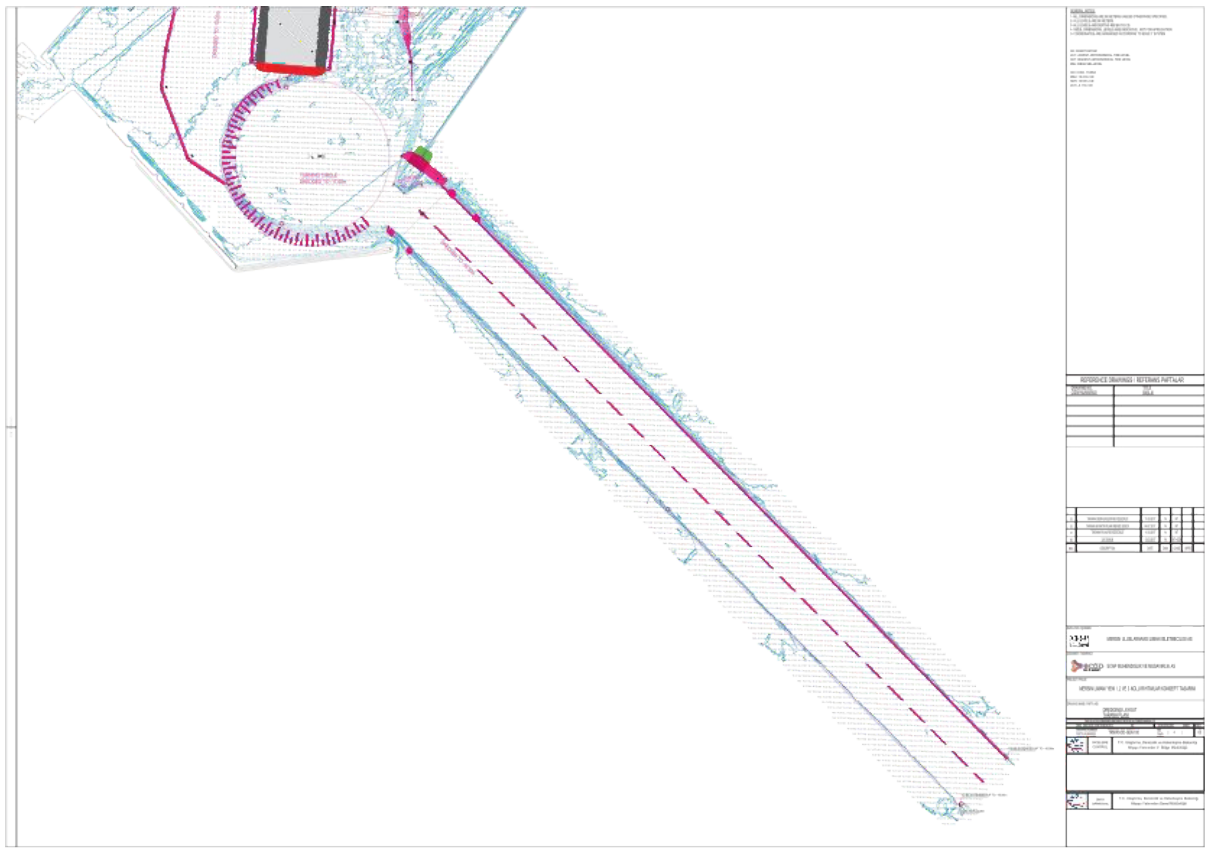


Figure 32. Dredging Area

Since the main idea of the dredging process is to remove sediment from the sea bottom, some related environmental effects of the process also occur naturally. Some effects of the dredging process can be listed as follows;

- The sediment in the bottom has a certain physical and chemical composition and this composition can be changed by dredging and mixes into the water mass.
- Plants and animals living in the bottom and their habitats are impacted by dredging.
- Increase in suspended solids and turbidity directly affects flora and fauna.
- Depending on the nature of the substance in the dredging area, pollutants, nutrients and organic substances may possibly spread into the environment.
- The sedimentation of suspended solids created by dredging may cause the bottom fauna and flora in the activity area to be covered and destroyed.

In addition to these negative effects, dredging activities also have positive aspects. Although all the above mentioned issues are the disadvantages that arise with the dredging of clean bottom particles, sometimes dredging is also done to remove the pollutants accumulated in the sediment from the aquatic environments.

A table has been prepared showing the temporal and spatial scales at which various environmental effects can be realized. Accordingly, it is defined as near-field effects (less than approximately 1 km) and far-field effects occurring more than approximately 1 km (Bray, 2008).

The effects of the planning dredging in the Mersin International Port area and related measurements are described below.

- During all dredging operations, the taking material from the seabed also make animals - benthic animals- living in the sediments move far away. Dredging may result in complete removal of animals from the excavation area, except for some benthic bottom animals or mobile surface animals that may survive after dredging. Some marine species are more susceptible to the effects of dredging than others. For example, a dredging in the environment of species such as seagrass can cause irreversible damage to these slow-growing species. Restoration of habitats during the period after dredging depends on the nature of the new sedimentation in the area as well as the characteristics of the re-colonized animals. In soft sediments, the restoration of animal communities usually occurs relatively quickly and restoration is more quickly (ICES 1992). This is also consistent with the previous Dredging activity of EMH1 project monitoring results.

Many studies have been conducted regarding when benthic organisms started to use the area in the period after dredging works conducted in coastal regions worldwide (Table 16). Re-establishment rates of benthic communities after dredging in various habitats vary at a wide scale (Nedwell and Elliot 1998; Nedwell, Seiderer and Hitchcock 1998).

Table 17. Re-Arrival Time of Benthic Living Things Based on Soil Structure

Location	Habitat Type	Restoration Period
Coos Bay, Oregon	Fjord Mud	4 weeks
Gulf of Cagaliari, Sardinia	Channel Mud	6 months
Mobile Bay, Alabama	Channel Mud	6months
Goose Creek, Long Island	Lagoon Mud	>11 months
Klaver Bank, North Sea	Sand-Gravels	1-2 years
Chesapeake Bay	Mud-Sand	18 months
Lowestoft, Norfolk	Gravels	>2 years

Dutch coastal waters	Sand	3 years
Boca Ciega Bay, Florida	Shells and sand	10 years

The rates of resettlement speed of benthic organisms in environments after dredging occur is fastest in sediments in fjord muds dominated by opportunistic species. Generally, restoration period of benthic species after dredging need quite a long time in gravel and sand habitats consist of perennial components with complex biological interactions that dominate community structure.

These findings are supported by such studies concluding that silt and clay sediments have a short-term effect on animal populations. Although the complete removal of organisms happens during dredging process, restoration begins within 1 month, and benthic communities are reported to reach pre-dredging conditions within 2 months (Stickney and Perlmutter 1975). This is also consistent with the previous Dredging activity of EMH1 project monitoring results.

Considering that the bottom of the dredging area in Mersin International Port is mud, it is estimated that the benthic species in the area will begin to resettle again and use the area intensively within 1 year after the dredging effects occur. In fact, Table 16 shows the dredging and following monitoring studies in the regions, and it is understood that benthic species started to be seen quite abundantly in the environments in the muddy within 4 weeks to 11 months.

- During dredging and disposal of uncontaminated fine materials, the amount of suspended solids and turbidity is increased. All dredging methods spread the sediment all over the water column during excavation. The increase in turbidity in the water column can physically cause adverse effects on marine animals and plants. Environmental impacts are limited with the operation area and they are generally temporary, lasting only for the period of the dredging operation is in progress.
- Suspended solids impact the feeding and respiratory organs by blocking and damaging the food intake ways of species feeding with the filter system, such as shellfish (Brehmer 1965). Therefore, suspended substances that cause turbidity can accumulate in the gills, causing the death of young fish while the adult fish can escape from these effects by moving away from the turbid environments. Increases in turbidity temporarily reduce the productivity

and growth rates of living organisms in the marine environment, preventing light from reaching seagrass and other plants.

How long the sediment mixed into the water column remains in that environment depends on factors such as the size of the swept sediment, the method of dredging, the hydrodynamic regime in the area, and the current water quality. However, dredging activities do not cause more turbidity than suspended solids during severe storms. In addition, natural events such as storms, floods and high tides can increase suspended sediments in larger areas for longer periods than dredging operations (Environment Canada 1994). For this reason, it is often exceedingly difficult to separate the environmental impacts of dredging from the natural circumstances.

It is very unlikely that sea dredging in closed zones such as ports, where current effect does not occur, the material will be carried to a wider environment and affect the biological, physical and chemical structure of the sea.

The effects of suspended sediments and turbidity are usually short-term (<1 week after activity) and in the near field (<1km from activity). In general, if there is a sensitive species in the immediate area that needs protection, there will be situations for concern and countermeasures may need to be taken.

The sedimentation and turbidity are expected in Mersin port, therefore, some measures must be taken. Silt curtains should be considered by the Dredging Contractor to prevent or reduce the effects of sand cloud during dredging. Typically, the perimeter of the dredging vessel is covered circularly with these silt curtains. The curtains from the sea bottom up to the surface block the turbidity that occurs during dredging, and are effective in this limited area and prevent spreading to the environment (Photo 51).



Photo 51. Silt Curtains to Prevent Turbidity

- During dredging, organic substances in the sediment can mix with the water. As a result, the consumption of oxygen can rapidly increase in the process of degradation of organic matter, causing the asphyxiation of marine animals and plants in the impact area or prevent the movement of migrating fish or mammals.

Moreover, it is important to emphasize that the removal of oxygen from the water is only temporary, as the need for oxygen from the immediate surroundings will quickly replenish.

Therefore, oxygen depression due to dredging in open coastal waters or closed areas such as Mersin Port, the project area, will have little effect on marine life.

Generally, material accumulated in sediment in dredging areas is contaminated. Various harmful substances including heavy metals, oil, TBT, PCBs, and pesticides can effectively contaminate sea bottom sediments in ports. Dredging processes release these pollutants into the water column and may cause animals and plants to consume such pollutants and results in contamination or poisoning. After released into the water column during the dredging, low-level pollutants can accumulate in marine animals and plants and they can be transferred via bioaccumulation through the food chain to fish and marine mammals.

However, according to the results of the analysis conducted in the dredging area in Mersin International Port, it is stated in the relevant sections of the EIA report that the mentioned

pollutants are not at a level that will negatively affect marine species. Therefore, it is estimated that sediment pollutants because of dredging activities in the port will not have a negative impact on the marine ecosystem.

- Sediments floating during dredging can settle on animals and plants living on the sea bottom again. As a result of this, benthic animals and plants may be covered by them which cause suffocation, reducing growth or reproductive rates (Bray, Bates & Land 1997).

Marine animals and plants are immediately moving away from areas with high natural suspended sediment clouds. Relatively small increases in siltation are generally thought to have adverse effects on benthic populations. Animals with sensitive feeding or respiratory patterns, such as shellfish, may be intolerant to increased siltation. Dredging in spawning or growing zones which is important for fish and other marine animals can result in suffocation of eggs and larvae.

The bottom structure in dredging area, Mersin Port, is covered completely with mud habitats, which is associated with low species diversity, so no adverse situation is expected due to siltation. Although Mersin Port Expansion works will impact the marine ecosystem, these impacts can be minimized within sustainable and natural ecosystem if the measures mentioned above are taken. The fact that there are similar facilities in wide span, even near the Project area, shows that there are sufficient marine habitats to meet the ecological demands of all aquatic organisms, especially fish species.

10. CONCLUSION

In the marine ecosystem studies of Mersin Port's field of activity, the results of the examinations made about the presence of macro and micro algae, zooplanktonic organisms, benthic organisms and fish species in the area, their densities and the general condition of the ecosystem are given below.

- Physical measurement values and general observations shows that the environment is clean water. All of the identified algae, zooplanktonic organisms, benthic organisms and fish are widespread and abundant species of the Mediterranean region.

- There are no sea turtle spawning zones in the area, therefore, protection measures are not required to be taken.
- Mediterranean monk seals do not use the region even for feeding. The project area do not involve any rocky area or sea caves that they can use as breeding zones, and there is no negative circumstance for them.
- After the negative impacts on the sea bottom of the project area during construction, particularly benthic invertebrates, macro algae, zooplankton and fish attached to the ground will start to use the area again.
- In the sampling studies conducted in the project area, it has been observed that the densities of aquatic system organisms are high and they are taxa that are widely distributed in the Turkish seas.
- It is recommended that the monitoring studies of the impacts that may occur in Mersin Port area be performed twice a year – especially in spring and autumn periods. Thus, in case of an impact in the ecosystem, it will be detected in a short time leading necessary and fast intervention. The monitoring studies of the impacts that may occur in Mersin Port Sea area is recommended to be supervised by a Ph.D. Hydro biologist, twice a year during the construction period and two years after the start of operation period, in the spring and autumn. Thus, in case of an impact in the ecosystem, it will be detected in a short time leading necessary and fast intervention.

As a result; although the Mersin Port Expansion works will have impacts on the marine ecosystem, if the above-mentioned precautions are taken, there will be a situation where the minimum impact on the sustainable and natural ecosystem will occur. The presence of similar quality sites in a very large area, including the immediate surroundings of the project site, indicates that there are sufficient marine habitats to meet the ecological demands of all aquatic organisms, especially fish species. When this activity is completed, a highly diversified ecological habitat will be able to regenerate spontaneously in the affected area in a short time.

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12. PROJECT TEAM

1. Family name : **AKBULUT**
2. First names : **AYDIN**
3. Date of birth : **08.06.1969**
4. Nationality : **TURKISH**
5. Civil status : **ACADEMIC FELLOW**
6. Education :

Institution [Date from - Date to]	Degree(s) or Diploma(s) obtained:
2012- present	Prof. , Hacettepe University, Faculty of Education, Department of Mathematics and Science Education, <u>Biology Education</u>
2012- 2014	Prof. , Hacettepe University, Faculty of Engineering, Department of Environmental Engineering
2004 - 2012	Assoc. Prof. , Gazi University, Science Faculty, Department of Biology
1995-2001	PhD , Hacettepe University, Science Faculty, Department of Biology, Hydrobiology
1991- 1994	M.Sc. , Hacettepe University, Faculty of Science, Department of Biology, Hydrobiology
1987 - 1991	B.Sc. , Hacettepe University, Faculty of Science, Department of Biology.

7. Language skills: Indicate competence on a scale of 1 to 5 (1 - excellent; 5 - basic)

Language	Reading	Speaking	Writing
English	4	4	4

8. E-mail: akbulut@hacettepe.edu.tr
akbulut1969@gmail.com

9. Membership of professional bodies:

- The Turkish Society of Biology
- The Society of Conservation of Turkish Nature
- Ecological Research Society

10. Other skills: (e.g. Computer literacy, etc.)

Windows, Microsoft Office 2003; Excel, Word, Power Point, Acrobat Reader, Open Ofis, Internet

11. Present position:

Academic Fellow (Prof.) in Hacettepe University, Faculty of Education, Department of Mathematics and Science Education, Biology Education

12. Years within the firm: ---

13. Key qualifications: (Relevant to the project)

- Freshwater algae, specially systematic of diatoms
- Seasonal succession of freshwater algae, their biomass and interactions with other aquatic organisms
- Organisms of aquatic ecosystems
- Conservation and management of wetlands
- Distribution of medicinal leeches (*Hirudo medicinalis*) in Turkey and their sustainable usage
- Taxonomy and Ecology of Turkish Scorpiones
- Natural environmental programs
- Natural History Museums

14. Specific experience in the region:

Country	Date from - Date to
Turkey	1993- present

15. Professional experience

1. Biology and Conservation of Sea Turtles (*Caretta caretta*), General Directorate of Environment, 1989
2. Biological and Ecological Investigations of Five Wetlands having International Importance (Akşehir Lake, Karamuk Lake, Beyşehir Lake, Hotamış Marshes, Ereğli Marshes), Turkish Environmental Foundation, 1992-1993
3. Stock Assessment of Çıldır Lake, The Scientific and Technical Research Council of Turkey, 1991-1993
4. Management Plan of Sultan Marshes, United Nations (UNEP), 1993-1994
5. Evaluation of Limnological Parameters of Mogan Lake, Hacettepe University Research Fund, 1995-1997
6. Vertebrate Fauna of Turkey, Ministry of Environment, 1995-1997
7. Management Plan of Manyas Lake, Ministry of Environment, 1995-1997
8. Sustainable Utilisation of the Medicinal Leech, *Hirudo medicinalis*, in Turkey, Sanofi SA/AG, 1997-1999
9. Greater Istanbul Water Supply Project, Stage II Melen System, Ecological Survey, Istanbul Drinking Water Partnership, 1997-1998
10. Biological and Ecological Investigations of Wetlands having International Importance, Stage III (Salt Lake Basin), Ministry of Environment, 1997-1999
11. Systematic Investigation of the Planktonic Bacillariophyceae (Diatom) in Some Lakes (Tuz Lake, Uyuz Lake, Çöl Lake, Tersakan Lake, Hirfanlı Dam Lake) of Tuz Lake Basin, Hacettepe University Research Fund, 1995-2000
12. Limnologic Investigations of Uluabat Lake, Ministry of Environment, 2000- 2001
13. Systematical and Biological Investigations of Scorpionidae Fauna of Turkey, Ministry of Environment, 2000- 2001
14. Limnologic Investigations of Uluabat Lake, The Scientific and Technical Research Council of Turkey, 2001-2004
15. Aquatic Survey of Gebze-İzmir Motorway (Phase I), Otoyol A.Ş., 2012
16. Systematical Investigations of Algal Flora of Important Wetlands of South-East Anatolia, The Scientific and Technical Research Council of Turkey, 2001-2004
15. Method Statement for Opencut River Crossing (Altıgoz Creek At Km 1045.82), Monitoring Study, Çınar Engineering, 2004
16. Method Statement For Opencut River Crossing (Ceyhan River At Km 1037+132.47), Monitoring Study, Çınar Engineering, 2004
17. Method Statement for Hasankale River Crossing, Monitoring Study, Çınar Engineering, 2004
18. Environmental Appraisal Report Of The Water Supply Line From Erzin Yanık Değirmen Well To Cmt, Monitoring Study, Çınar Engineering, 2004
19. Method Statement For Opencut River Crossing (Mercin River At Km 1055.318, Monitoring Study, Çınar Engineering, 2004
20. Method Statement for Posof River Crossing, Monitoring Study, Çınar Engineering, 2004
21. Method Statement for Kura River Crossing, Monitoring Study, Çınar Engineering, 2004
22. Project of Biological Diversity, Sultan Marshes, GEF-II, Republic of Turkey Ministry of Forestry, 2002-2005
23. Database Study of CITES Species in Turkey, Ministry of Environment, 2003- 2005
24. Determination of Kaz Mountain Fauna (Balıkesir), The Scientific and Technical Research Council of Turkey, 2004-2006
25. Determination of Biodiversity of Kemaliye (Erzincan), The Scientific and Technical Research Council of Turkey, 2005-2008
26. Hydrobiological Researches for River Crossing on the Samsun-Ceyhan Crude Oil Pipeline, ENVY, 2007
27. Aquaculture Studies of *Barbus esocinus*, The Scientific and Technical Research Council of Turkey, 2006-2009
28. Hydrobiological Researches for River Crossing on the BTC Crude Oil Pipeline, ENVY, 2008

29. Ecological Studies within Isparta, Kızıldağ Natural Park, 1/25.000 Analytical Etude Project, 2003
30. Ecological Studies within Kovada Gölü Natural Park, 1/25.000 Analytical Etude Project, 2003
31. Ecological Studies within Gölcük Natural Conservation Area, 1/25.000 Analytical Etude Project, 2003
32. Hydrobiological Studies of Ergene Basin (Edirne) Environmental Management Master Project, 2004
33. Hydrobiological Studies of Ilisu Dam Biological Richness and Conservation, 2008-2009
34. A Scientific Journey to the Museum of Nature, The Scientific and Technical Research Council of Turkey, 2008-2010
35. Determination of the Biological Resource Use and Conservation Environmental Education in Kaz Lake (Tokat), The Scientific and Technical Research Council of Turkey, 2005-2008
36. Examination of algal flora of important wetlands in Southeastern Anatolia (Dicle Basin), The Scientific and Technical Research Council of Turkey, 2006-2009
37. Wetland Managment Plan of Kızılırmak Basin, Ministry of Environment, 2005-2006
38. Biological Monitoring Studies Using Diatom Indexes in Delice River and its tributaries (Kızılırmak Basin), Hacettepe University, Central Anatolia
39. Investigation of Paleoclimatic Perspective of Lacustine Archives of Sünnet Lake (Bolu-NW Anatolia) by using sedimentological, geochemical and paleoecological Instruments, Eskişehir Osman Gazi University, 2009-2010
40. Current Fisheries Status of Marine and Coastal Protected Areas in Five Special Environmental Protection Area and Ayvalik Islands Natural Park and Monitoring of Fisheries Restricted Areas of Gokova Bay (SPA), Ministry of Environment, 2010
41. Determination of the Diversity of Heterotrof Benthic Flagellate of Gala and Çıldır Lakes, The Scientific and Technical Research Council of Turkey, 2010-2012
42. Akdeniz İklim Kuşağındaki Sığ Göllerde Su içi Bitkilerin Yapısal Rolü ile Gelişimini Etkileyen Faktörlerin Geçmişte, Günümüzde ve Daha Sıcak Isınan Koşullarda Belirlenerek Uyum ve Azaltma Stratejilerinin Oluşturulması, Danışman, TÜBİTAK 110Y125, Danışman, (2010-2014).
43. Systematic and Ecological Investigation of Flagellates in Kozanlı Saz, Lake Meke and Acı Göl, Hacettepe Üniversitesi Bilimsel Araştırma Birimi, 4809 no'lu proje, Yardımcı Araştırmacı, (2010-2014).
44. Paleoclimatological Investigation of Mogan and Eymir Lakes (Ankara), TÜBİTAK 114Y557 4809 no'lu proje, Yardımcı Araştırmacı, (2015-2018).

16. Other relevant information (eg, Publications)

Publications

1. Tuncer, A., Karayigit, A.I., Oskay, R.G., et al., Tunoğlu, C., Özer, M.S.K., Gümüş, B. A., Bulut, Y., Akbulut, A., 2022, A multi-proxy record of palaeoenvironmental and palaeoclimatic conditions during Plio-Pleistocene peat accumulation in the eastern flank of the Isparta Angle: A case study from the Şarkikaraağaç coalfield (Isparta, SW Central Anatolia), International Journal of Coal Geology, <https://doi.org/10.1016/j.coal.2022.104149>.
2. Ocakoğlu, F.; Akbulut, A., Oybak D. E., Tuncer, A., Tunoğlu, C., Açıkalin, S., Erayık, C., 2022, Lowstand lake conditions in NW Anatolia during the Little Ice Age: Multi-proxy evidence from Lake Sünnet, Holocene Volume 32, Issue 9, Pages 935 – 949.
3. Ocakoğlu F., Kuzucuoğlu, C., Akbulut, A., Çilingiroğlu, Ç., 2022, Lake level changes and paleoprecipitation estimations based on colluvial stratigraphy of Holocene sediments in West Anatolia (Simav Graben), Palaeogeography, Palaeoclimatology, Palaeoecology, Volume 597.
4. Acıkgöz-Erkaya, İ., Bayramoğlu, G., Akbulut, A., Arica. M.Y., 2021, Immobilization of *Candida rugosa* Lipase on Magnetic Biosilica Particles: Hydrolysis and Transesterification Studies, Biotechnology and Bioprocess Engineering 26: 827-840
5. Bayramoğlu, G., Acıkgöz, İ.E., Akbulut, A., Özalp, V.C., Arica, Y.A., 2021, Production of algal oil from hot spring isolate of *Kamptonema formosum*: Biodiesel synthesis using immobilized lipase on magnetic diatomic particles, Chemical Engineering Research and Design (Accepted)
6. Dönmez, E.O., Ocakoğlu, G., Akbulut, A., Tunoğlu, C., Tunver, A., Görüm, T., Tün, M., 2021, Vegetation record of the last three millennia in central Anatolia: Archaeological and palaeoclimatic insights from Mogan Lake (Ankara, Turkey), Quaternary Science Reviews 262 (2021) 106973.
7. Pehlivan, H., Akbulut, A., Varol, E., 2021, Investigation of heavy metal pollution in sediments of southern Marmara Sea (The Kocasu Delta), Journal of the Faculty of Engineering and Architecture of Gazi University 36:3 (2021) 1271-1288.
8. Aghaalipour, E., Akbulut, A., Güllü, G., 2020, Carbon dioxide capture with microalgae species in continuous gas-supplied closed cultivation systems, Biochemical Engineering Journal, 163, 107741

9. Bayramoglu G, Akbulut A, Arica MY, 2021, Utilization of immobilized horseradish peroxidase for facilitated detoxification of a benzidine based azo dye, *Chemical Engineering Research and Design*, 2021, 165, pp. 435–444
10. Akbulut, A., 2019, Prof. Dr. Ali Demirsoy Doğa Tarihi Müzesi (Kemaliye-Erzincan), *Mavi Gezegen*, Sayı 27:31-38.
11. Reza Rezaei & Aydın Akbulut & Selim Latif Sanin, 2019, Effect of algae acclimation to the wastewater medium on the growth kinetics and nutrient removal capacity, *Environ Monit Assess* (2019) 191:679
12. Bayramoğlu, G., Salih, B., Akbulut, A., Liman, G., Arica, M.Y., 2019, Biodegradation of Cibacron Blue 3GA by insolubilized laccase and identification of enzymatic byproduct using MALDI-ToF-MS: Toxicity assessment studies by *Daphnia magna* and *Chlorella vulgaris*, *Ecotoxicology and Environmental Safety*, *Ecotoxicology and Environmental Safety* 170 (2019) 453–460
13. Bayramoglu, G., Akbulut, A., Acikgoz-Erkaya, I., Arica, M.Y., 2018, Uranium sorption by native and nitrilotriacetate-modified *Bangia atropurpurea* biomass: kinetics and thermodynamics, *Journal of Applied Phycology*, 30(1), pp. 649-661
14. Bayramoglu, G., Akbulut, A., Liman, G., Arica, M.Y., 2017, Removal of metal complexed azo dyes from aqueous solution using tris(2-aminoethyl)amine ligand modified magnetic p(GMA-EGDMA) cationic resin: Adsorption, isotherm and kinetic studies., *Chemical Engineering Research and Design*, 124, pp. 85-97.
15. A. Evren Yapıcıoğlu, S. Atmaca, A. Akbulut, G. D. Ceyhan, Y. Durmus, G. Akaydın & A. Demirsoy, Journey To Natural History Museum In Perspective Of Children, *European Journal of Science and Mathematics Education*, 2017, 1231231, 5, 4, 365-375..
16. Bayramoglu, G., Akbulut, A., Arica, M.Y., 2016, Aminopyridine modified *Spirulina platensis* biomass for chromium(VI) adsorption in aqueous solution, *Water Science and Technology*, 74(4), pp. 914-926
17. Ocakoğlu, F., Dönmez, E.O., Akbulut, A., Tunoğlu, C., Kır, O., Açıkalin, S., Erayık, C., Yılmaz, İ.Ö., Leroy, S.A.G, 2016, A 2800-year multi-proxy sedimentary record of climate change from Lake Çubuk (Göynük, Bolu, NW Anatolia), *Holocene*, 26(2), pp. 205-221.
18. Özgür, M.E., Akbulut, A., Demirsoy, A., 2016, Characterization of the embryonic and larval development of wild pike-barb (*Luciobarbus esocinus*) biological parameters, and the possibility of breeding, *Israeli Journal of Aquaculture - Bamidgeh*, 68
19. Bayramoglu, G., Akbulut, A., Arica, M.Y., 2015, Study of polyethyleneimine- and amidoxime-functionalized hybrid biomass of *Spirulina* (*Arthrospira*) *platensis* for adsorption of uranium (VI) ion, *Environmental Science and Pollution Research*, 22(22), pp. 17998-18010
20. Bayramoglu, G., Akbulut, A., Ozalp, V.C., Arica, M.Y., 2015, Immobilized lipase on micro-porous biosilica for enzymatic transesterification of algal oil, *Chemical Engineering Research and Design* 95, pp. 12-21
21. Acıkgöz E.I., Arica, M.Y., Akbulut, A., Bayramoğlu, G., 2014, Biosorption of uranium (VI) by free and entrapped *Chlamydomonas reinhardtii*: kinetic, equilibrium and thermodynamic studies, *J Radioanal Nucl Chem* DOI 10.1007/s00449-013-0990-7
22. Bayramoğlu, G., Akbulut, A., Arica, M.Y, 2013, Immobilization of tyrosinase on modified diatom biosilica: Enzymatic removal of phenolic compounds from aqueous solution, *Journal of Hazardous Materials*, 244-245: 528-536
23. Baykal, T., Akbulut A., Acıkgöz, İ., Udoh, A.U., Yıldız, K., Şen, B., 2012, New Records for the Freshwater Algae of Turkey, *Turk J Bot*, 33: 141-152.
24. Özgür, M.E., Akbulut, A., Demirsoy, A., 2012, Some Quality Parameters of Surface Water of Karasu River in Upper Part of Euphrates Basin, Turkey, *Carpathian Journal of Earth And Environmental Sciences*, 7 (3): 183 – 192
25. Özer, T.B., Erkaya, İ.A., Udoh, A.U., Duygu, D.Y., Akbulut, A., Bayramoğlu, G., Arica, Y., 2012, Biosorption of Cr (VI) by free and immobilized *Pediastrum boryanum* biomass: equilibrium, kinetic, and thermodynamic studies, *Environ Sci Pollut Res*, 19 (7): 2983-2993.
26. Tunoglu, C., Ocaoglu, F., Acikalın, S., Yılmaz, Ö., Dönmez, E.O., Akbulut, A., Kir, O., Tuncer, A., 2011, Ostracoda, and other fauna and flora assemblages of the lake Çubuk (Göynük/Bolu, NW Anatolia): Palaeolimnologic and palaeoclimatologic analysis of the 1400 years-old record, *Joanea - Geologie und Palaontologie*, (11), pp. 212-213

27. Duygu, D.Y., Udoh, A.U., Ozer, T.B., Akbulut, A., Erkaya, İ.A., Yıldız, K., Guler, D., 2012, Fourier transform infrared (FTIR) spectroscopy for identification of *Chlorella vulgaris* Beijerinck 1890 and *Scenedesmus obliquus* (Turpin) Kützing 1833, *African Journal of Biotechnology*, Vol. 11 (16): 3817-3824.
28. Akbulut, A., Özdikmen, H., 2012, To The Memory of Dr. Bobb Schaeffer, *Schaefferus Nom. Nov.*, A New Name for the Preoccupied Genus *Marquesia* Schaeffer, 1990 (Osteichthyes: Actinopterygii: Palaeonisciformes), *Mun. Ent. Zool.*, 7 (2): 1272-1273.
29. Akbulut, A., Durmuş, Y., Çalışkan, M., Akbulut, N., Demirsoy, A., 2012, Monitoring Studies for the *Hirudo medicinalis* Populations in Turkey (2003-2006), *Mun. Ent. Zool.*, 7 (2): 988-997.
30. Akbulut, A., Özdikmen, H., 2012, *Thurmondella* Nom. Nov., A New Name for the Preoccupied Genus *Paramicrodon* Thurmond, 1974 (Osteichthyes: Actinopterygii: Pycnodontiformes), *Mun. Ent. Zool.*, 7 (2): 1280-1281.
31. Erkaya, İ.A., Özer, T.B., Akbulut, A., Udoh, A.U., Yıldız, Y., 2011, The Abundant and Wide-Spread Species of Algae in the Algal Flora of the Lower Euphrates Basin Wetlands, *Turkish Journal of Fisheries and Aquatic Sciences* 11: 55-62.
32. Çelik, K., Akbulut, N., Akbulut, A., Özatlı, D., 2010, Macro zoobenthos of lake uluabat, turkey, related to some physical and chemical parameters, *Pan-American Journal of Aquatic Sciences*, 5(4), pp. 520-529.
33. Akbulut A., Akbulut N.E. 2010, The study of heavy metal pollution and accumulation in water, sediment, and fish tissue in Kızılırmak River Basin in Turkey, *Environ Monit Assess*, 167: 521-526.
34. Özdikmen, H., Akbulut, A., 2010, *Nuraya* Nom. Nov., A Substitute Name for the Preoccupied Genus *Microtrigonia* Nakano, 1957 (Bivalvia: Trigonidae), *Mun. Ent. Zool.*, Vol: 5 (1): 299-300.
35. Baykal, T., Akbulut A., Açıkgöz, İ., Udoh, A.U., Yıldız, K., Şen, B., 2009, New Records for the Freshwater Algae of Turkey, *Turk J Bot*, 33: 141-152.
36. Akbulut, A., 2009, The Diatom Composition in the Salt Lake Basin and its Relationship with Salinity, *Ecology* 19 (74): 150-159.
37. Akbulut, N.E., Akbulut, A., Park, Y.S., 2008, Relationship between zooplankton (Rotifera) distribution and physico-chemical variables in Uluabat Lake (Turkey), *Fresenius Environmental Bulletin* 17 (8b) 142-156
38. Akbulut A., Dügel, Muzaffer, 2008, Planktonic Diatom Assemblages and Their Relationship to Environmental Variables in Lakes of Tuz Lake Basin, Central Anatolia-Turkey, *Fresenius Environmental Bulletin* Vol: 17 (2): 154-164
39. Zaray G, Kröpfl K, Szabo K, Taba G, Acs E, Berlinger B, Dogan M, Salih B, Akbulut A, 2005, Comparison of freshwater biofilms grown polycarbonate substrata in Lake Velence (HU) and Lake Mogan (TR), *Microchemical Journal* 79, 145-148
40. Akbulut N., Akbulut, A., Dügel, M., 2004, The Determination of Relationship between Zooplankton and Abiotic Factors Using Canonical Correspondence Analysis (CCA) in the Ova Stream (Ankara/Turkey), *Acta hydrochim. hydrobiol.*, 32 (6) : 434-441 [Err.: 33 (2005) 4]
41. Akbulut, N.E., Akbulut, A., 2004, "Phytoplankton and Zooplankton Structure of Sultan Marshes in Central Anatolia", *Hacettepe Bulletin of Natural Sciences and Engineering*, Vol. 33: 31-40
42. Akbulut, A., Gündüz, E., 2004, *Bacillariophyceae* (Diatom) Species: New Records for Turkey from the Salt Lake Basin", *Hacettepe Bulletin of Natural Sciences and Engineering*, Vol. 33: 41-53.
43. Akbulut, A., 2003, The Relationship Between Phytoplanktonic Organisms and Chlorophyll a in Sultan Sazlığı, *Turkish Journal of Botany*, 27 (5): 421-425.
44. Akbulut, A., 2003, Planktonic Diatom (*Bacillariophyta*) Flora of Sultan Sazlığı, *Turkish Journal of Botany*, 27: 285-301.
45. Spaulding, S. A., Akbulut, A., 2003, *Kociolek*, J.P., A New Species of *Aneumastus* Mann and *Stickie* from Central Turkey, *Diatom Research*, Vol: 18 (1), 149-160.
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18. Books

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- Antalya, Manavgat, Şahap Köprü Dam, Environmental Impact Assessment Report, Hydrobiological Section.
- İzmir, Bergama, NEWMONT Mining Extensional Area Environmental Impact Assessment Report, Hydrobiological Section.
- Determination of Biological Inventory of Çayeli Bakır İşletmeleri, Cerattepe Copper Mining and Surrounding Area
- NABUCCO Natural Gas Pipeline, Hydrobiological Studies within the scope of Biological Studies.
- Samsun – Ceyhan Crude Oil Pipeline Baseline Study, Hydrobiological Section
- Ankara-Niğde Highway, Hydrobiological Studies
- BTC Oil Pipeline, Pre-construction ecological survey about aquatic organisms of Rivers and Creeks
- Üzümdere Wild Life Development Area (Akseki-Antalya) In the Region Where the Tunnel Exits and Viaduct Structures Are Located on the Railway Crossing Route, Hydrobiological Studies
- Ankara İstanbul High Speed Train Line (İstanbul-Gebze), Hydrobiological Studies
- İstanbul-İzmir Highway (Yalova-Bursa), , Hydrobiological Studies
- Acıçay Project, Koyunbaba Dam and Irrigation, Environmental Impact Assessment Report, Hydrobiological Section.
- Kızılırmak, Hamzalı Project, Environmental Impact Assessment Report, Hydrobiological Section.
- Kahramanmaraş, Pazarcık, Kartalkaya Dam Basin Management Plan Hydrobiological section.
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23. Pirinçlik Regulator (Karabük) and HPP Project Hydrobiological Section.
24. Aksu Regulator-Kayabaşı Regulator-Baybakan Regulator and Doruh HPP Project Environmental Impact Assessment Report, Hydrobiological Section.
25. Tepe 1-2 Regulator and Tepe HPP Project Environmental Impact Assessment Report, Hydrobiological Section.
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27. Determination of the Hydrobiological Structure of Kaplan Gold Mining (İzmir) Project Area (According to IFC Performans Standart and the Equator Principles)
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31. Determination of the Hydrobiological Structure of Gediktepe Gold Mining (Balıkesir) Project Area (According to IFC Performans Standart and the Equator Principles)
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36. Pervari HES Kalker Ocakları ve Kırma-Eleme Tesisi ÇSED Raporu (According to IFC Performans Standart and the Equator Principles)
37. Dağpazarı RES Kapasite Artışı PTD (According to IFC Performans Standart and the Equator Principles)
38. İncir Barajı ve HES Revize PTD (According to IFC Performans Standart and the Equator Principles)
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41. Dağdelen HES-Kalealtı TM EİH ÇSED+ÇYP (According to IFC Performans Standart and the Equator Principles)
42. Hacımınoğlu Regülatörü- Hacımınoğlu HES ÇSED+ÇYP (According to IFC Performans Standart and the Equator Principles)
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46. ACACIA Hanönü EBRD Biodiversity Monitoring Studies (2018-still)
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49. Balya ESAN, Biodiversity Monitoring Studies (2021-still)
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51. Çukuralan KOZA Madencilik, Biodiversity Monitoring Studies (2019-2020)
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Military Service	Completed
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EDUCATION

September 1999 - February 2006

Hacettepe University, Institute of Science, PhD.,
February 1996 - September 1999

Hacettepe University, Institute of Science, MSc.,
September 1991 - June 1996

Hacettepe University, Biology Department, BSc.,

PROFESSIONAL EXPERIENCE

2013 – present

Director, Biosphere Environmental Consultancy

2011 – present

Senior Instructor, Eastern Mediterranean University, Department of Biological Sciences, TRNC
2007 – present

Director, Underwater Research and Imaging Center, Eastern Mediterranean University, TRNC
2009 – 2010

Senior Instructor, Eastern Mediterranean University, Department of Psychology, TRNC
2008 - 2009

Senior Instructor, Eastern Mediterranean University, Department of General Education, TRNC
2005 - 2008

Part - time Instructor, Eastern Mediterranean University, Faculty of Education, TRNC
1997 - 2005

Research Assistant, Hacettepe University, Faculty of Science, Biology Department, Ankara/Turkey
1999 - 2000

Consulter, Ekoba Environmental Consultancy
1995 - 1996

Researcher, Research Council of Turkey (TÜBİTAK), Elazığ/ Turkey
1995 - 1997

Translator ISO 9000, ISO 14000 Standards Section, Turkish Standards Institute (TSE), Ankara/Turkey

PROJECTS

2017

Marine Expert - TANAP Offshore Pipeline & Fibre Optic Cable Installation Project, Çanakkale. Encon Consultancy Ltd., Project owner: SAPURAKENCANA PETROLEUM BERHAD

2017

Marine Expert - Yalova Ship Repair and Docking Expansion Project EBRD ESAP (PR1) Studies; Encon Consultancy Ltd., Project owned by: TERSAN Shipyard Inc.

2017

Marine Expert - Kinali – Tekirdag – Canakkale – Savastepe Motorway Project: Malkara – Canakkale Section including 1915 Canakkale Bridge; Encon Consultancy Ltd., Project owner: COKIYI A.S.

2016

Marine Expert - Monitoring Marine Environment of İstanbul 3rd Airport Construction, Project owned by IGA

2017 – Present

Project Manager, Integrated Coastal Zone Management Of Famagusta Bay – Cyprus, Supported by Famagusta Municipality

2013

Project Coordinator – Datça (Selimiye-Orhaniye) and Gokova Bay Marine Protected Areas (Muğla/Turkey) Monitoring Project, Supported by General Directorate of Specially Protected Areas of Turkey

2010

Expert, Environmental Monitoring of 870 MWe SAMSUN NATURAL GAS COMBINED CYCLE PLANT, Encon Consultancy Ltd., Project owned by OMW, Samsun, Turkey

2010

Project Coordinator – Gokova Bay Marine Protected Areas Management and Monitoring Project, Supported by General Directorate of Specially Protected Areas of Turkey

2009 – Present

Project Manager – Sustainable Fisheries and Artificial Reefs in İskele – North Cyprus, Supported by European Commission.

2008 – 2010

Area Coordinator for Karpaz Peninsula, Technical assistance for management and protection of potential Natura 2000 sites in the northern part of Cyprus, Supported by European Commission.

2008 - 2012

Project Manager - Research and Monitoring of Sea Turtles Nesting at İskele and Famagusta Bays of TRNC, Supported by TRNC Ministry of Education and Eastern Mediterranean University.

2009

Expert (Marine Ecology, Marine Biodiversity), “Marine Surveys in Potential Natura 2000 Sites”, Technical assistance for management and protection of potential Natura 2000 sites in the northern part of Cyprus, Supported by European Commission.

2008 - 2009

Nature Specialist, Preparation of a Environmental Impact Assessment and a Preliminary Environmental Review for waste management installations in the northern part of Cyprus,

EUROPEAID Framework (REQUEST FOR SERVICES N° 2008/148-843/1), Supported by European Commission.

2008 – 2009

Marine Ecology Expert, “Marine Survey in the area of Kumkoy”, Service for Preparation of Conceptual and Detailed Designs for Priority Projects on Water and Wastewater Management in Northern Part of Cyprus Europeaid/125029/D/SER/CY, Supported by European Commission.

2007

Project Manager - Research and Monitoring of Sea Turtles Nesting at Karpaz Peninsula of TRNC, Supported by TRNC Ministry of Education and Eastern Mediterranean University

2007

Project Coordinator, Coastal Zone Expert - Classification of Habitats at Karpaz Peninsula of TRNC, Supported by TRNC Ministry of Environment and Natural Resources

2007 - 2009

Project Coordinator (for Biologists Association), Recycling on Cycles, Project Supporter: UNDP - ACT.

2006 - 2008

Project Coordinator (for Biologists Association), Increasing Environmental Awareness among Civil Society Organizations (No. 47398_06_006), Implementing Agency: Biologists Association, in collaboration with European Community Biologists Associations (ECBA), and CYMEPA, Project Supporter: UNDP - ACT.

2006

Consultant - Sea turtle conservation and monitoring project of Belek, Antalya, Supported by: BETUYAP, Turkey.

2002 – 2005

Project Manager - Evaluation of Marine Biodiversity and Habitats of North Cyprus Coastal Zone, North Cyprus. Supported by Ministry of Environment, Turkish Republic of Northern Cyprus.

2005

Researcher - Sea turtle conservation and monitoring project of Belek, Antalya, Supported by: BETUYAP, Antalya, Turkey.

2004

Consultant - Researcher - Environmental Impact Assessment of Çandarlı Bay Port, Dolsar Engineering Company, İzmir, Turkey (Founded by World Bank).

2004

Researcher - Sea turtle conservation and monitoring project of Belek, Antalya, Supported by: BETUYAP, Antalya, Turkey.

2003

Researcher - Sea turtle conservation and monitoring project of Belek, Antalya, Supported by: BETUYAP, Antalya, Turkey.

2002

Researcher - Sea turtle conservation and monitoring project of Belek, Antalya, Supported by: BETUYAP, Antalya, Turkey.

2000 - 2001

Researcher, Long Term Development Plan of Ayvalık Islands Natural Park, Ege Plan A.Ş., Supported by Ministry of Environment, Turkey.

1998 - 2000

Researcher - Toxic effects of pollutants on fishes living in the Sarıyar Dam Lake and its creeks, Beypazarı/Ankara. Supported by Technical Research Council of Turkey (TÜBİTAK).

2000

Researcher - Sea turtle conservation and monitoring project of Belek, Antalya, Supported by: BETUYAP, Antalya, Turkey.

2000

Scientific Consultant – Preperation of Middle/High School Multimedia Education CD-ROM Series (Kidsplus), Project owner: Meteksan Sistem, Ankara/Turkey.

1995-1999

Researcher - Keban Dam Reservoir Limnology and Fisheries, Elazığ-Malatya-Tunceli/Turkey. Supported by Scientific and Technical Research Council of Turkey (TÜBİTAK), State Hydraulic Works, Hacettepe University, Middle East Technical University.

1997-1999

Consultant-Researcher (for ENCON Environmental Consultancy Company - Investigation of Biological and Ecological Aspects of Wetlands Having International Importance Project, Sub Project II, Kırşehir-Kayseri-Sivas-Adana/Turkey. Supported by Ministry of Environment.

1998

Researcher - Principles of Management Plan for Protection of Sea Turtles in Specially Protected Areas. Supported by Ministry of Environment, Turkey.

1997-1998

Consultant-Researcher (for ENCON Environmental Consultancy Company), Environmental Impact Assessment of Artvin Dam and Hydroelectric Power Plant Project, Artvin/Turkey. Project Owner: SPIE Batignolles, France and DOĞUŞ Construction, Turkey,(Founded by World Bank).

1997-1998

Consultant-Researcher (for ENCON Environmental Consultancy Company), Environmental Impact Assessment of Yusufeli Dam and Hydroelectric Power Plant Project, Yusufeli - Artvin/Turkey. Project Owner: SPIE Batignolles, France and DOĞUŞ Construction, Turkey (Founded by World Bank).

1997-1998

Consultant-Researcher (for ENCON Environmental Consultancy Company), Environmental Impact Assessment of Aslancik Dam and Hydroelectric Power Plant Project, Dogankent-Giresun/Turkey. Project Owner: DOĞUŞ Construction and Trade Corp., Turkey (Founded by World Bank).

1997-1998

Researcher - Principles of Management Plan for Protection of Sea Turtles in Western Coast of Mediterranean, Supported by Ministry of Environment, Turkey.

1995-1998

Consultant-Researcher (for ENCON Environmental Consultancy Company), Environmental Impact Assessment of Boyabat Dam and Hydroelectric Power Plant Project, Boyabat - Sinop/Turkey. Project Owner: DOGUS Construction and Trade Corp., Turkey (Founded by World Bank).

1996-1997

Researcher - Determination of Natural Criteria for Eastern Mediterranean Management Plan, Supported by Scientific and Technical Research Council of Turkey (TÜBİTAK).

1995-1997

Assistant Researcher - Wetland Management Plan of Manyas Lake Project, Supported by Ministry of Environment, Turkey.

1995-1997

Researcher - Management Plan for Protection Purposes of Sea Turtles, Supported by Ministry of Environment, Turkey.

1995

Assistant Researcher - Important Limnological Parameters of Mogan Lake, Supported by Hacettepe University Research Fund.

1993

Field Trainer and Team Leader (Volunteer) - Population Biology of Sea Turtles (*Caretta caretta*) in Dalyan and Patara Beaches, Supported by Specially Protected Areas.

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2009

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Çiçek, B.A., 2007, Coastal Settlements, Cities, and Nature Conservation Problems: Wetlands Trapped in Famagusta: Gülseren Marsh Example, 2nd International Gazimagusa Symposium.

Çiçek, B.A., Gündüz, Ş., Alkan, İ., 2007, Coastal Settlements, Cities, and Nature Conservation Problems: Naturally Important Areas Under Threat of Developing Cities: Management Plan for Ayluga Lake (Famagusta), 2nd International Gazimagusa Symposium.

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Çiçek, B.A., 2007, Evaluation of Vertebrate Species of North Cyprus Coastal Zone According to National and International Protection Regulations, International Symposium on Underwater Research, 22 – 24 March 2007, Famagusta, TRNC.

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CD – ROM

Kidsplus Multimedya Education Series, Meteksan System, 2000, Ankara.

OTHER ACADEMIC ACTIVITIES

Editor, Proceedings books of the International Symposia on Underwater Research, Famagusta, TRNC. Organising and Scientific Committee Member, International Symposia on Underwater, Famagusta, TRNC.

Assistant Editor, Turkish Journal of Aquatic Life, Special Edition for National Water Days Symposium, 2003, Ankara, Turkey.

Symposium Organisation Committee Member, National Water Days Symposium, 2003, Ankara, Turkey.

Lecturer, Fish Stock Management and Computer Applications for Fish Stock Management; Organized by Ministry of Agriculture and Rural Affairs, Bodrum, Turkey.

AWARDS

“Jale İNAN Underwater Archaeology Photography Competition – Digital Category” First Place, 4 th International Kemer Underwater Days, 16-19 May 2005, Kemer, Antalya.

“Jale İNAN Underwater Archaeology Photography Competition – Digital Category” Second Place, 4 th International Kemer Underwater Days, 16-19 May 2005, Kemer, Antalya.

“Jale İNAN Underwater Archaeology Photography Competition – Digital Category” Third Place, 4 th International Kemer Underwater Days, 16-19 May 2005, Kemer, Antalya.

First International Eastern Mediterranean Underwater Photography and Film Festival – Digital Photography Category, Third Place, 24-26 March 2005, TRNC.

“Jale İNAN Underwater Archaeology Photograph Competition – Digital Category” Second Place, 3 rd International Kemer Underwater Days, 16-19 May 2004, Kemer, Antalya.

“Nurdoğan ÖZKAYA Underwater Nature Photograph Competition – Digital Category” Second Place, 3 rd International Kemer Underwater Days, 16-19 May 2004, Kemer, Antalya.

“Nurdoğan ÖZKAYA Underwater Nature Photograph Competition – Digital Category” Youth Award, 3 rd International Kemer Underwater Days, 16-19 May 2004, Kemer, Antalya.

COURSES TAKEN

2008

Introduction to GIS, Organised by John Moores University, Liverpool and TEKNOPARK, Famagusta, North Cyprus.

2006

Ecological Management in Natura 2000, Organised by UNDP-PFF, Nicosia, TRNC.

2003

Introduction to ArcGIS I and II, Organised by İşlem GIS, Ankara in the name of Environmental Systems Research Institute Inc.

1998

Advanced Methods in Systematics; Organised by Imperial College of Science, Technology and Medicine, London; Cumhuriyet Universty, Sivas; Natural History Museum, London; Sivas, Turkey.

1998

Fish Stock Management and Computer Applications for Fish Stock Management; Organized by Ministry of Agriculture and Rural Affairs, Bodrum, Turkey.

1997

Photography Course; Organized by Photography Society of Hacettepe University.

1996

Hydroacoustic Methods; Organized by State Hydraulic Works, SIMRAD-Norge; Elazığ, Turkey.

1993

Amateur Seamanship Course; Organized by Middle East Technical University-CEC; Ankara, Turkey.

1991

CMAS Diving Course; Organized by Underwater Sports Society of Hacettepe University, Ankara and Bodrum, Turkey.

SCHOLARSHIP

1997-1998

Scientific and Technical Research Council of Turkey (TÜBİTAK).

EDUCATIONAL ACTIVITIES

Course Code	Course Title	Position	Institution
BIOL 316	Environmental Management	Instructor	Eastern Mediterranean University
BIOL 119	Ecology and Environment	Instructor	Eastern Mediterranean University
BIOL 121/122	General Biology	Instructor	Eastern Mediterranean University
BIYO 201/202	Biology	Instructor	Eastern Mediterranean University
BIYO 111	General Biology (Turkish)	Instructor	Eastern Mediterranean University
BIO 201	Human Biology	Instructor	Eastern Mediterranean University
PCON 203	Human Environment	Instructor	Eastern Mediterranean University
BIYO 205	Introduction to Anatomy and Physiology	Instructor	Eastern Mediterranean University
BIO 422	Ecology	Research Assistant	Hacettepe University
BIO 101	General Biology I	Research Assistant	Hacettepe University
BIO 102	General Biology II	Research Assistant	Hacettepe University
BIO 209	Invertebrates	Research Assistant	Hacettepe University
BIO 210	Vertebrates	Research Assistant	Hacettepe University
BIO 240	Protozoology	Research Assistant	Hacettepe University



Türkiye Cumhuriyeti
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Diploma No: 06-FB-019



Bilim Doktorluğu Diploması

Burak Ali Çiçek

Eğitim öğretim programının mezuniyet için
gördüğü koşulları 28.03.2006 tarihinde başarı ile tamamlamış
ve *Bilim Doktorluğu* derecesi almaya hak kazanmıştır.

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Tarih : 22.01.2001



Diploma No.

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Hacettepe Üniversitesi

Fen Bilimleri Enstitüsü
Bilim Doktorluğu Diploması

BIYOLOJİ (HİDROBİYOLOJİ)

Anabilim Dalında Bilim Doktorluğu Öğretim Programı İçin Gerekti
Teorik ve Pratik Çalışmaları ve Sınavların Başarıyla Tamamlayan

AYDIN AKBULUT

Tamamen Bütün Hak ve Yetkileri ile Birlikte Bilim Doktorluğu Derecesini Almıştır.

Rektör-President

Prof. Dr. Tunçalp ÖZGEN

Müdür-Director

Prof. Dr. Seyfi KULAKSIZ

OFFICIAL TRANSLATION OF THE DIPLOMA (SEE OVERLEAF)

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APPENDIX I - Stakeholder engagement correspondences

Stakeholder engagement correspondences are gathered according to specific groups. Texts are kept in original language:

Fish

Prof. Dr. Deniz AYAS (ayasdeniz@gmail.com)

Uluslararası Limanı tesisine gelen ve gelecek gemilerin uygun draft derinliğinin ve manevra kabiliyetlerinin artırılarak güvenli bir şekilde tesise ulaşmalarını sağlamak amacıyla, tesisde faz-II çalışmaları kapsamında, dip taraması faaliyeti planlanmaktadır. Planlanan faaliyetin amacı sadece ulaşım güvenliğini sağlamak olup faaliyet sonunda gemi trafiği artışının öngörülmediği şekilde belirtilmektedir. Bunun sebebi olarak mevcut rıhtımın en fazla 368 metre uzunluğunda tek bir konteyner gemisine ve bunun yanı sıra çok sayıda daha küçük gemilere hizmet verirken, yeni rıhtım ise 2 tane 400 metre boyunda konteyner gemisine aynı anda hizmet verebileceği şeklinde ifade edilmektedir. Bu faaliyet ile limana gelen konteynerlerin eski nesil bir çok gemi yerine daha yeni nesil (büyük ve modern) bir gemide konsolide edilerek tek seferde taşınmaları sağlanacaktır.

Şekil 1. Dip taraması yapılacak alan

Bulanıklık:

Deniz ortamında yapılacak olan dip taraması faaliyetleri esnasında bulanıklık meydana gelmesi kaçınılmazdır. Bulanıklık (= türbidite), su kolonunun askıda katı madde içeriğindeki artışa bağlı olarak ışık geçirgenliğinin azalması olarak değerlendirilebilir. Sucul ekosistemlerde rastlanılan bulanıklığın nedenleri arasında fitoplanktonik organizmaların mevsimlere bağlı hızlı artışları, akıntı ve dalgaların etkisiyle dip sedimentinin hareket etmesi, kıyısız inşaat faaliyetleri, evsel atıkların deniz ortamına ulaşması vb. faktörler yer almaktadır.

Mersin Uluslararası Limanı tesisi deniz alanının güney kesiminde planlanan söz konusu dip taraması faaliyeti kapsamında oluşacak bulanıklığın kısa veya orta süreli etkilere neden olacağı (mevsim, denizdeki akıntı ve dalga durumuna göre süreç değişiklik gösterebilir), ve askıdaki katı madde yükünün dibe çökmesi sonrasında etkisinin yok olacağı düşünülmektedir.

Mersin Uluslararası Limanı tesisinin deniz alanında dip taraması faaliyeti öncesinde batimetri, mühendislik sismiyi, geoteknik ve fiziksel oşinografik örnekleme, ölçüm ve değerlendirmeleri içeren "Hidrografik, Oşinografik, Jeofiziksel ve Jeolojik Değerlendirme Raporu" yapılması ve bölgede hakim akıntının doğrultusunun bilinmesi gereklidir.

Hakim akıntının kıyı hattına paralel batı istikameti doğrultusunda olabileceği düşünülürse; faaliyet sırasında alanda oluşan bulanıklığın körfezin batı kıyılarına paralel olarak körfezin güney batısına doğru hareket edeceği ve dolayısı ile körfezin batısında lokalize olan geniş bir alanı kaplaması beklenebilir. Bulanıklığın hakim akıntılar nedeni ile dar bir alan yerine geniş bir alanda çökmesi bu sürecin biyoçeşitlilik üzerine en az etki ile sonuçlanmasını sağlayacağı değerlendirilmiştir.

Habitat Kaybı ve Türlerin Etkilenmesi:

Mevcut liman sahasında iki temel denizel habitat mevcuttur:

- Kayalık Habitat (anroşman kayalar),
- Kumluk habitat.

Söz konusu habitatlar, kendilerine has birer fauna ve flora ev sahipliği yapmaktadır ve dip taraması faaliyetlerinden farklı şekillerde etkilenmeleri beklenmektedir.

Makrozoobentik formların yaşantılarında, substratımla olan ilişkileri büyük rol oynar. Bu özellikleri bakımından dip omurgasızlarını 7 grupta incelemek mümkündür (Geldiay ve Kocataş, 1988):

- Sesil formlar: Sert bir substratum üzerine kendilerini tespit ederek yaşantılarını sürdüren organizmalardır.

- Pivotal formlar: Kum ve çamur gibi yumuşak substratında yaşayan hareketsiz organizmalardır.
- Sedenter formlar: Küçük mesafelerde yer değiştirme yeteneğine sahip bentik organizmalardır.
- Kazıcı formlar: Yumuşak substratı kendi olanaklarıyla kazıp yerleşebilen formlardır.
- Delici formlar: Sert substratında mekanik veya kimyasal olarak delikler açarak içinde yaşayan organizmalardır.
- Serbest formlar: Bu gruba dahil olan bentik türlerin hareket organelleri yoktur; dalga ve diğer su hareketleriyle suda pasif yer değiştirirler.
- Vajil (hareketli) formlar: Çok uzun mesafelerde yer değiştirme yeteneğine sahip bentik hayvanlardır.

Özellikle anroşman kayalık alanda supra ve mediolittoral zonlarında sesil ve sedenter formlara rastlanmaktadır; ancak saptanan türlerin tamamı Akdeniz kıyılarının geniş dağılımlı yaygın türleri olup, koruma altında herhangi bir temsilcileri bulunmamaktadır. Ortamdan uzaklaşma veya göç etme yeteneği olmayan bu formların dip taraması sırasında olumsuz etkilenecekleri kesindir. Yukarıdaki maddeler arasında sadece vajil formlar (örneğin decapod krustaseler, kafadanbacaklılar, vb.), uygunsuz ortam koşullarını terk edip en az etkiye maruz kalacak canlı grubudur.

Mevcut limanın anroşman kayalık alanında Padina pavonica gibi alg toplulukları ile mollusk (Brachiodontes pharaonis, Phorcus turbinatus, Chthamalus stellatus gibi) toplulukları yerleşim göstermektedir. Yapılması planlanan dip taraması faaliyetinin genişletilmesi şeklinde gerçekleştirileceği için eski tarama alanında yaşayan türler için de habitat kaybı yaşanacaktır. Kumluk ve kayalık habitatlarda bölgeye endemik makrozoobentik tür bulunmaması, taramanın çok büyük bir alanı kaplamayacak olması, yaşam döngüleri kısa olmakla beraber, çok hızlı üreyip büyüebilme ve belli bir alana kısa sürede yerleşebilme yeteneğine sahip olmaları nedeni ile zoobentik canlıların meydana gelecek olumsuzlukları tolere edebileceği ve kıyı şeridinin genelindeki canlı topluluklarının tarama faaliyetlerinden minimum düzeyde etkileneceği ön görülebilir.

İster bentik, ister pelajik olsun, bölgedeki balıkların ortamı geçici süreyle terk edeceklerine kesin gözüyle bakılabilir. Deniz balıkları, üreme sahası olarak daha çok rahatsızlık faktörü minimum olan ve uygun fiziko-kimyasal koşullara sahip alanları tercih etmektedir. Dolayısıyla balıkçı barınakları, limanlar veya diğer kıyasal konstrüksiyonlar ve çevreleri zaten tercih edilen üreme sahaları değildir.

Deniz tabanında bulunan canlı türlerinin bir kısmı yaşam ortamlarını geçici olarak terk edecek olup, sabit yaşayışlı omurgasız hayvan türleri açısından bir miktar biyokütle kaybı olacaktır. Ancak, ortamdaki bulanıklığın etkisini yitirmesini takiben, tarama yapılan alan ve çevresinde tekrar fauna ve flora yerleşiminin gözlenmesi neredeyse kaçınılmazdır.

Ekolojik Karakterin Değerlendirilmesi:

Kriter 1. Boyut

Yüksek kalitede habitatlara sahip küçük alanlar sıklıkla düşük kalitede habitatlara sahip geniş alanlardan daha işlevseldir. Habitatların bölümlere ayrıldığı ve popülasyonların izole olduğu alanlarda boyut özel öneme sahip hale gelir, zira küçük ve izole unsurların, alanların yaşamını sürdürüp sürdüremeyeceği tartışma konusudur. Çok küçük popülasyonlar genellikle son derece hassastırlar ve uygun yönetime rağmen kolaylıkla nesilleri tükenebilir. Bununla birlikte, bu alanlar bir habitatın ya da popülasyonun son kalan örneklerini barındırırlar ve tüm biyolojik çeşitliliğin muhafazası açısından çok önemlidirler. Proje alanı, yukarıdaki anlatım dikkate alındığında düşük biyoçeşitliliğe sahip ve düşük kalitede habitatlar barındıran bir ortam olarak karşımıza çıkmaktadır. Dip tarama faaliyeti genel kıyı şeridindeki biyotop ve biyoçeşitlilik yapısını bozacak boyutta değildir.

Kriter 2. Biyolojik Çeşitlilik

Biyolojik çeşitliliğin muhafazası genellikle biyolojik kaynakların sürdürülebilir kullanımında ve doğa korumada en önemli amaçlardan biri olarak görülür. Bunun temel nedeni, insanoglunun doğal çevreye olan müdahalelerin en bariz ve ciddi etkilerinin habitat tahribatı ve

türlerin neslinin tükenmesi olarak ortaya çıkmasıdır. Bölgede bulunan türlerin çok büyük kısmının geniş yayımlı yerel türlerden oluşmakta ve ilgili listelerde az sayıda koruma önceliğine sahip organizma bulunmaktadır. Omurgasızlar arasında Porifera grubundaki 4 sünger türü Bern sözleşmesi (Ek.III) kapsamındadır ve bunlardan 3'ü zaten mevcut ulusal kanunlarla avlanması yasak türler arasındadır. Bunlara ilave olarak koruma altında 3 Crustacea ve 8 Mollusca türü daha listelenmiştir. **Proje sahasını içeren bölge de dahil olmak üzere yürütülen çeşitli projelere rağmen, koruma altında olduğu belirtilen türlerden hiçbirine Mersin Uluslararası Limanı tesisi ve çevresinde rastlanmamıştır. Tamamen literatür bilgisiyle listelenen mevzu bahis organizmaların özel habitat tercihleri vardır ve mevcut çevresindeki kısıtlı habitatlar zaten bu türlerin yaşaması için uygun ortamlar değildir. Balıklar açısından daha farklı bir durum karşımıza çıkmaktadır; IUCN**

kırmızı liste kapsamındaki türlerin büyük kısmı doğrudan proje sahasında olmasa bile, Mersin Körfezi'nde uygun trol av sahalarında balıkçılar tarafından yakalanabilmektedir. **Hedef dışı tür olarak avlanılan söz konusu bu balık türleri, genellikle henüz ölmeden tekrar iskarta olarak denize atılmaktadır. Yüksek ekonomik önem arz eden Sinarit, Orfoz ve Eşkına türleri ise dip trol av kompozisyonunda yer almayan türlerdir. Özetle, tehlike altındaki balık türlerinin proje faaliyetlerinden minimum etkileneceği, bu türlerin maruz kaldıkları en büyük problemin aşırı avcılık ve yasa dışı balıkçılık faaliyetleri olduğu bilinmelidir.**

Kriter 3. Doğallık

Doğallık, ekolojik karakter unsurlarına uygulanan en önemli kriterlerden birisidir. Genel olarak, bir unsur ne kadar doğal ise, ekolojik karakterinin değerinin de o kadar fazla olacağı varsayılmaktadır. Mersin Uluslararası Limanı tesisi ve çevresi antropojenik etkilere maruz kalmış ve halen gemi trafiğinin sürdüğü bir denizel alan olması nedeni ile doğal yapının zaten değişmiş olduğu kaçınılmaz bir gerçektir. Bununla birlikte, bölgede planlanan dip taraması faaliyetinin mevcut doğal yapıya tolere edilebilir etkilerinin olacağı ön görülmektedir.

Kriter 4. Nadirlik

Nadirlik, biyolojik çeşitliliğin korunmasında çok dikkat çeken konulardan birisidir. İlgili bentik omurgasız ve balık tür listelerinden görülebileceği gibi, nadirlik açısından önem arz edebilecek yegane türler, ulusal ve uluslararası sözleşmelerle koruma altına alınan canlıları içermektedir. Habitatlar açısından herhangi bir nadirlik durumu söz konusu değildir.

Kriter 5. Kırılganlık

Az ya da çok, tüm ekolojik karakter unsurları bir kırılganlık derecesine sahiptirler. Kırılganlık daima zaman ölçeğinde ele alınmalı ve oluşan tahribatın kalıcı olduğu dereceye özel önem verilmelidir. Kırılganlık neredeyse her zaman nadirlikle doğrudan ilişkilidir. Kırılgan unsurlar er geç nadir unsurlara dönüşürler. Kırılganlık her zaman olumsuz bir faktör şeklinde algılanmamalıdır. Pek çok doğal topluluk hayatta kalabilmek için tahribata bağımlıdır. Bunlar genellikle dinamik habitatların döngü şeklindeki evrelerinin başlarında ortaya çıkan kısa ömürlü topluluklardır. Sıklıkla habitat değişikliği veya tahribatı nedeniyle türler de kırılgan hale gelebilir. Bazılarının öylesine karmaşık ve özgün gereksinimleri vardır ki, belli belirsiz ya da en ufak bir değişiklik yok edici etkiler gösterebilir. **Mersin Uluslararası Limanı tesisi ve çevresi tür topluluklarının çok yüksek bir oranda geniş yayımlı ve devamlı türler olduğu göz önüne alınırsa, kırılganlığın oldukça düşük olacağı ön görülmektedir.**

Kriter 6. Tipiklik

Proje bölgesinin tipiklik açısından öne çıkan belirgin bir özelliği bulunmamaktadır.

Kriter 7. Onarım ve/veya Restorasyon Potansiyeli

Ciddi ölçüde tahrip olmuş unsurlar değişen derecelerde onarım potansiyeline sahiptirler; bazıları neredeyse yok denecek kadar az, bazıları ise neredeyse yenileme derecesindedir. Bu noktada belirlenmesi gereken bu potansiyelin ne derece önemli olduğudur. Canlı hayat açısından değerlendirilecek olursa, çoğunluğu yüksek üreme potansiyeline ve hızlı büyüme özelliğine sahip dip omurgasızlarının, dip taraması faaliyeti esnasında kaybedilecek biyokütleyle rağmen popülasyonlarını tekrar oluşturacağı düşünülmektedir. Alanı terk edip rahatsızlık faktörlerinden

minimum düzeyde etkilenecek olan balık türleri ise, faaliyet sonrasındaki yeni ortama adapte olabilecek özelliktedir.

ÖNERİ:

Dip tarama faaliyetlerinin kaçınılmaz olarak neden olacağı 2 temel unsur söz konusudur: a) ortamda meydana gelecek bulanıklık ve buna bağlı doğrudan/dolaylı etkiler; b) habitat ve tür kaybı. Bulanıklığın etkisinin tarama bitiminden sonra kısa/orta vadede etkisini yitireceği tahmin edilmektedir. Ortamdan kaybolacak canlı biyokütlenin ise, genel kıyı şeridi biyoçeşitliliği ve biyotop özelliklerini bozmayacak boyutta olduğu düşünülmektedir. Bununla birlikte denizde yapılacak her türlü proje hazırlık aşamasında veya faaliyet esnasında denize herhangi bir kirletici veya atık madde atılmasına izin verilmemelidir. (14.03.1991 tarih ve 20814 sayılı Katı Atıkların Kontrolü Yönetmeliği; 18.03.2004 tarih ve 25406 sayılı Hafriyat Toprağı, inşaat ve Yıkıntı Atıklarının Kontrolü Yönetmeliği; 31.12.2004 tarih ve 25687 sayılı Su Kirliliği Kontrolü Yönetmeliği; ve 26.03.2010 tarih ve 27533 sayılı Atıkların Düzenli Depolanmasına Dair Yönetmelik göz önüne alınmalıdır). Ayrıca dip taraması yapılacak alanda yer alan sedimentin endüstriyel faaliyetler nedeni ile kirlenmiş olduğu düşünüldüğünde söz konusu faaliyetin orta ve uzun vadeli etkilerinin belirlenmesine yönelik olarak littoral ve neritik bölgede dağılım gösteren türler ve ayrıca su, sediment ve biotada endüstriyel kökenli metal düzeylerinin belirlenmesine yönelik bir izleme çalışması yapılmalıdır. Yapılan önerinin tam ve eksiksiz şekilde uygulanmamasının, denizel biyoçeşitliliğe kalıcı hasarlar yaratabileceği; gerçekleştirilecek her türlü proje faaliyetinde doğaya minimum olumsuz etki prensibinin sürekli göz önünde bulundurulması gerekliliği dikkate alınmalıdır.

Assoc. Prof. Dr. S. Cevher Özeren (scozeren@gmail.com)

Sayın Yetkili,

Mersin Uluslararası Liman Tesisi'nde yapılan biyoçeşitlilik çalışmasında proje alanında IUCN Kırmızı Liste (2021)'de korunan türler kapsamında Hassas (VU) türler olarak değerlendirilen *Labrus viridis* (Green Wrasse), *Umbrina cirrosa* (Shi Drum), *Dentex dentex* (Common Dentex), *Pomatomus saltatrix* (Bluefish); Kritik (CR) türler olarak değerlendirilen *Anguilla anguilla* (European Eel), *Glaucostegus cemiculus* (Blackchin Guitarfish), *Squatina aculeata* (CR), *Squatina oculata* (Smoothback Angelshark), *Squatina squatina* (Angelshark); Tehlike Altındaki (EN) türler olarak değerlendirilen *Isurus oxyrinchus* (Shortfin mako), *Mobula mobular* (Giant devil ray), *Raja radula* (Rough skate), *Rhinobatos rhinobatos* (Common guitarfish), *Thunnus thynnus* (Atlantic bluefin tuna)'un yaşadığı tespit edilmiştir. Listede yer alan ve kritik (CR) düzeydeki türler kapsamında değerlendirilen *Gobio hettitorum* (Taurus Gudgeon) ise tatlısulara yaşayan bir tür olup gerek üreme gerek beslenme gerekse barınma açısından deniz ile herhangi bir bağlantısı bulunmamaktadır.

Mersin Uluslararası Liman Tesisi'nde yapılması planlanan Faz-II çalışmaları kapsamında yapılması öngörülen dip taraması sırasında yapılacak kazıma ve inşaat faaliyetleri bu alanda bulanıklığın artmasına neden olacaktır. Dolayısıyla bu alan içerisinde bulunan balık türleri bulanıklıktan etkilenebilecek ve alandan faaliyet yapılacağı sırada geçici olarak uzaklaşacaktır. Biyoçeşitlilik çalışmaları kapsamında tespit edilen balık türlerinin bu alanı üreme alanı olarak tercih etmedikleri dikkate alındığında, alanda yapılan kazıma ve inşaat faaliyetleri sonrasında bulanıklığın ortadan kalmasıyla bu türler tekrar alanda görülmeye devam edecektir. Bu durumun inşaat faaliyetleriyle sınırlı geçici bir durum olduğu göz önüne alındığında, alanda tespit edilen balık türlerinin üremesi, beslenmesi ve barınması açısından olumsuz bir durum yaratmayacaktır. Her ne kadar söz konusu projenin balıklar üzerindeki etkisi geçici olsa da IUCN Kırmızı Liste'de koruma altında olmayan diğer balıklar ve sucul canlılar açısından yapılması öngörülen Faz-II dip taraması faaliyetlerinin üreme döneminde yapılmaması biyoçeşitliliğin devamlılığı açısından önemlidir.

Dr. Öğr. Üyesi S. Cevher ÖZEREN

Ankara Üniversitesi Fen Fakültesi

Biyoloji Bölümü

Dr. Haydar Karacan (haydarkaracan1204@gmail.com)

Mersin Uluslararası Limanı Tesisinde yapılması planlanan faz-II çalışmaları kapsamında, dip taraması sırasında yapılacak kazıma çalışmaları ve inşaat faaliyetleri bulanıklığı arttıracak olup bu etki çalışma alanı içinde sınırlı olacaktır. Bu alan içinde bulunan türler etkilenecek olup alandan geçici olarak uzaklaşacaklardır. Ancak kazıma ve inşaat işlemleri bittikten sonra ortamdan bulanıklık kalktığında türler yine bu alanlarda görülmeye devam edecektir. Deniz balıkları üreme sahası olarak Mersin Limanını tercih etmemektedir. Buda projenin deniz balıkları üzerinde hem üreme hem de beslenme ve barınma açısından olumsuz bir etki yaratmayacaktır. Alanda yapılacak olan her türlü çalışma türlerin üreme dönemine gelmemesi önemlidir. Mümkünse üreme dönemi geçtikten sonra çalışmalara başlanması daha uygun olacaktır.

Phd. Cand. Hasan Deniz Akbora (hdakbora@hotmail.com)

Mesajda belirtilen türlere MIP ve yakın çevresinde rastlanılmamaktadır. Yapılan çalışmalarda, Mersin ve Iskenderun körfezlerinde belirtilen türlerin varlığına rastlanılmıştır. Bu açıdan inşaat döneminde bulanıklık etkisinin kontrol edilmesi durumunda tehlike altındaki balık türlerinin proje faaliyetlerinden minimum etkileneceği, bu türlerin maruz kaldıkları en büyük problemin aşırı avcılık ve yasa dışı balıkçılık faaliyetleri olduğu bilinmelidir.

Mammals/Monk Seal:

Dr. Damla Beton (damlabeton@gmail.com)

Akdeniz fok (Monachus monachus) dünya çapında tehlike listesindeki türlerdendir. Eskiden tüm Akdenizde yayılım göstermesine rağmen günümüzde Moritanya kıyıları, Madeira Adaları ve Fas ile Akdeniz (Yunanistan, Türkiye ve Doğu Akdeniz) olmak üzere iki alanda yoğunluk göstermektedir. Dünya nüfusu 750 birey olarak tahmin edilirken, Akdeniz bölgesinde yer alan Türkiye kıyılarında ise 100 civarında fok yaşadığı düşünülmektedir.

Mersin Uluslararası Limanı Tesisi "Akdeniz" dağılımı bölgesinde yer almaktadır. Fokların bir yerden diğerine geçerken zaman zaman bölge yakınlarında görüldüğü bilinmesine rağmen bölgeye yakın bir fok mağarası henüz kaydedilmemiştir.

Sea Turtles:

Assoc. Prof. Dr. Onur Candan (onurcandan.phd@gmail.com)

"Mersin ili boyunca hem yeşil kaplumbağa (Chelonia mydas) hem de iribaşlı kaplumbağa (Caretta caretta) için önemli yuvalama kumsalları bulunmaktadır. Yeşil kaplumbağa için Kazanlı kumsalı ve İribaşlı Kaplumbağa için Göksu Deltası, Mersin İli'nin en önemli yuvalama alanlarıdır. Bu bölgede kıyıların yuvalama amaçlı kullanımına ek olarak yoğun bir denizel kullanım da söz konusudur. Mersin İli civarındaki denizel alanlar beslenme ve kışlama alanı olarak da kullanılmaktadır. Özellikle korunaklı koylar juvenil bireylerin barındığı ve yıl boyu kaldıkları alanlardır. Bu korunaklı alanlar arasında yapay oluşumlar da bulunmaktadır. Limanlar, balıkçı barınakları gibi alanlarda da özellikle juvenil bireylere yoğun bir şekilde rastlanmaktadır.

Bu nedenle dip tarama uygulama alanına öncelikle deniz kaplumbağası girişini engelleyecek bir sistem kurulmalıdır. Daha sonrasında ise uygun yöntemlere içerideki bireyler yakalanarak geçici olarak alan dışına alınmalıdır. Tüm saha deniz kaplumbağaları açısından güvenli olduktan sonra çalışma başlatılmalıdır.

Çalışma sırasında ortaya çıkacak beklenmeyen durumlarla ilgili uzman desteği alınarak çözüm sağlanmalıdır.

Çalışmalarda deniz kaplumbağaları konusunda doktora derecesine sahip uzman/uzmanlar ve deniz kaplumbağası konusunda en az yüksek lisans derecesine sahip saha koordinatörleri bulundurulmalıdır. Saha koordinatörleri, danışmanlar tarafından sunulan önerileri sahada uygulayacaklardır. Beklenmeyen durumlar ya da gelişmeler ile ilgili olarak danışmanları bilgilendireceklerdir.

Bu tip çalışmalar yoğun bir çaba ve ciddi bir koordinasyon ile gerçekleştirilebilir."

Dr. Ali Fuat Canbolat (canbolat@hacettepe.edu.tr):

Merhaba Serkan Bey,

Gecikme için öncelikle kusurumu dile getireyim.

Planlanan çalışmanın deniz kaplumbağaları açısından bir sıkıntı oluşturacağını düşünmüyorum. Ancak;

1. Faaliyet başlamadan bir hafta önce alanda bir bulunup liman içerisinde deniz kaplumbağası olup olmadığına bakmamız doğru olacaktır.
2. Liman içerisinde balıkçı tekneleri mevcut mudur? Balıkçı teknelerinin olması liman içerisinde deniz kaplumbağalarının olası beslenmesi anlamına gelebilmektedir. En azından sizden bu konuda bilgi talebim olacak.
3. Tesis genişletme çalışmaları sırasında alanda bir iki defa arazi çalışması yapmamız olası sıkıntıları bertaraf edecektir.
4. İşbirliği ve zamanlama konusunda sıkıntımız olmaz ise en azından deniz kaplumbağaları konusunda sıkıntı yaşayacağımız sanmıyorum.
5. Liman içerisinde deniz kaplumbağası bulunma olasılığını da düşünerek süreci birlikte yürütüp, çözümler üretiriz.
6. Gerekirse inşaat sürecinde liman içerisinde deniz kaplumbağası olur ise uygun ağlarla yakalanıp liman dışarısına çıkartmamız gerekecektir.

Saygılarımla,

Dr Ali Fuat Canbolat

Deniz Kaplumbağası Uzmanı