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MedMPAnet project

ECOLOGICAL STUDY IN THE PORTO PALERMO BAY AND SURROUNDING AREAS

Support the planning, zoning and development of a Marine Protected Area in the Porto Palermo Bay (Albania), based on sound scientific and socio-economic knowledge

INCA

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ECOLOGICAL STUDY IN THE PORTO PALERMO BAY AND SURROUNDING AREAS

MedMPAnet project

Regional Project for the Development of a Mediterranean Marine and Coastal Protected Areas (MPAs) Network through the boosting of MPA creation and management

Study required and financed by:

MedMPAnet project

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FOREWORD

Many valuable natural habitats on the coastal zone in the Mediterranean are not ecologically evaluated to be designated as Coastal or Marine Protected Areas. Enlarging percentage/size of protected areas is required in numerous documents adopted at national and international scale. Within that framework, the "Regional Project for the Development of a Mediterranean Marine and Coastal Protected Areas (MPAs) Network through the boosting of MPAs Creation and Management" (the "MedMPAnet Project") was developed in order to promote the creation of new protected areas.

The MedMPAnet Project is an integrated part of the UNEP/MAP-GEF MedPartnership Project "Strategic Partnership for the Mediterranean Sea Large Ecosystem" led by UNEP/MAP (Athens) and is implemented by the RAC/SPA (Tunis), with financial support from the European Union (EU), the Spanish Agency for International Cooperation to Development (AECID) and the French Global Environment Facility (FFEM).

More particularly in the framework of the "MedMPAnet Pilot Project in Albania", the Ministry of Environment, Forest and Water Administration and RAC/SPA have organized in Tirana, on May 3rd, 2012, an Inception Meeting for the Project. During this meeting, the Albanian Ministry of Environment representatives have been informed about the Project activities planned in Albania, and the RAC/SPA representatives get informed about the development made by Albania in terms of marine and coastal protected areas creation. This discussion led also to the choice of the pilot site to be developed as an MPA in Albania, which is the Porto Palermo Bay.

In this regard and in order to help a close coordination and smooth implementation of the MedMPAnet Pilot Project at Albanian national level, it was agreed, based on a joint selection process between RAC/SPA and the Ministry of Environment, to entrust this task to Institute for Nature Conservation in Albania (INCA), an Albanian national organization that will coordinate the Pilot Project implementation on behalf of and in close consultation with the Ministry of Environment, Forest and Water Administration and RAC/SPA.

National context

The situation analysis in the Strategic Plan for Marine and Coastal Protected Areas in Albania (SPMCPA), developed lately with the support of UNDP, concludes that despite the coastal area of Albania being one of the biodiversity hotspots in the Mediterranean Sea, there is a lack of information on the conservation status of key habitats and species, with which to develop an SPMCPA. Gap filling (providing this information) is, therefore, proposed to form a key outcome of the implementation of SPMCPA. The situation analysis indicates that Albanian marine and coastal ecosystems contribute to sustaining human health, lifestyle, and the food production needed for the economic development and well-being of the coastal population. However, Albanian marine and coastal ecosystems are under increasing pressure. The pressure primarily comes from a rapid increase in coastal urban development and the resulting increase in human use of coastal and marine ecosystems.

Despite the significance of marine and coastal ecosystems to the social and economic development of Albania and the increasing pressures that these marine and coastal ecosystems face there is a lack of administrative capacity and availability of financial and in kind resources with which to manage these pressures. Capacity building and financial resourcing are, therefore, proposed to form key outcomes of the implementation of SPMCPA.

The current MCPA system is not representative of the marine and coastal habitats and ecosystems diversity. Indeed, most MCPAs are currently coastal (only one marine PA) and a number of coastal zones are still unprotected despite their essential ecological and socio-economical role on a national or Mediterranean level. 85% of the currently protected coastal sites are along the Adriatic coast which emphasizes the low number of MCPAs on the Ionian coastlines. Existing MCPA in Albania cannot be defined as being part of an ecological network, but are initial systems from which a consistent and coherent network must be established, particularly integrating some MPAs in the open sea.

The SPMCPA reviewed the criteria for selecting habitats and species to be included within the national network of MCPA. These criteria reflect Albanian national and also international criteria for sustaining marine and coastal biodiversity. The SPMCPA based on these criteria proposed the following areas for gazetting to form the Albanian network of Marine and Coastal Protected areas.

- The Bay of Porto-Palermo
- The area from Vjosa river mouth to Sazan and Karaburun (the entire Vlora Bay)
- The area from Cape Rodoni to Patoku lagoon
- The coastal area from Buna river mouth to Viluni lagoon

The objectives of each MCPA should be to sustain the biodiversity and ecosystem health of the specified area, to contribute to the biodiversity and ecosystem health of the network and to contribute to biodiversity and ecosystem health nationally and internationally.

Project context

The pilot project is supporting the planning, zoning and development of a Marine Protected Area in the Porto Palermo Bay (Albania), based on sound scientific and socio-economic knowledge. It intends also to identify stakeholders' participation mechanisms to the Porto Palermo Bay MPA management and planning, and support its financial sustainability.

In order to support RAC/SPA in planning, zoning and developing a Marine Protected Area in the Porto Palermo Bay marine area, INCA is required to:

- Carry out an ecological study on the Porto Palermo Bay marine area (mapping of marine habitats, census and inventories of fish and invertebrates, identification of priority areas for conservation, etc.);
- Produce GIS-based maps for the Porto Palermo Bay marine area;
- Undertake a socio-economic study, with a particular attention on fisheries and fleet operating locally and in the surrounding areas, touristic activities and any other relevant aspect;
- Identify stakeholders (individuals and organized groups) to participate in the MPA-creation process, survey their needs and demands and propose participatory mechanisms tailored to the new MPA demonstration area;
- Elaborate a management plan including a zoning for the Porto Palermo Bay marine area;
- Contribute to the establishment of a sustainable financial mechanism of the Porto Palermo Bay MPA;
- Provide support to the on-job training activities that could be assured by international experts associated to the Pilot Project execution.

The good running of the above-mentioned activities will be ensured through a close partnership between INCA and RAC/SPA, in close consultation with the Ministry of Environment, Forest and Water Administration of Albania.

This publication specifically includes the results of the ecological study performed in the Porto Palermo Bay to fill gaps in environmental knowledge - establishing a quantitative description of the marine area to be protected, as well as surrounding areas. It includes results from inventory and spatial distribution of marine, coastal and terrestrial habitats and species (aquaplane surveys, semi-quantitative sampling by underwater visual transects and digital photographic quadrates) with special attention driven to particularly valuable habitats and species in particular those annexed the SPA/BD Protocol. It also provides necessary information on potentiality of zones for supporting ecological processes important for conservation purposes (habitat for important species, as well as an inventory of main sources of threats and impacts to important habitats and species supporting planning, zoning and development (management, monitoring and evaluation) of the Porto Palermo MPA. It set forward the basis for designing of indicators for ecological monitoring actions in the future.

CONTENT

1. INTRODUCTION

Porto Palermo bay, known as Panorma bay in ancient times, is situated in southeast of Himara town, at the Ionian Sea coast. The inlet of Panorma is of tectonic origin identified by the jagged coastline known since ancient times and shown in old maps.

Inside of the bay there is a small and attractive rocky peninsula, which enters about 300 meters to the sea. Here is a fortress, constructed by Ali Pasha of Tepelena at the end of 18th century in the honor of his wife, Vasiliqia.

Porto Palermo is a protected bay and had a very limited access in the former time (until 1991), as it was a military area. Due to this, marine biodiversity is presumed to have been rich in that period, although the surveys were very limited. Nevertheless, due to the traffic of military vessels, this area might have been impacted.

Currently, the base is used as a mooring site for the Coast Guard and jetty, as well as for anchoring fishing vessels in the southern part.

Aquaculture activity has started in Porto Palermo since 2004 and it is regularly continuing. A fish farm for the cultivation of sea bream (*Sparus aurata*) and sea bass ( ) has been established in the southern part of the bay.

The surrounding area is generally poor in terrestrial vegetation, but the peninsula and the southern part of the area is covered by ever-green mediterranean vegetation.

This study has been carried out based on the objectives and methodologies defined from the ToR of the project, as follows.

Posidonia oceanica & Oblada melanura © Gérard PERGENT

2. OBJECTIVE OF THE SURVEY

The main objective of this survey is to identify the important habitats and species in project area and the intermediate surroundings.

As regards to the benthic habitats, the objective is to map and assess the seagrass meadows and other habitats, in particular to:

- Provide a spatial description of the seabed environment within and around the Porto Palermo bay, including the identification of important/sensitive habitats and species ;
- Identify the benthic communities present in project area;
- Indicate the presence or absence of *Posidonia oceanica* beds; and
- Assess the extent of *Posidonia oceanica* beds and other seagrasses.

Additionally, a description of terrestrial flora and main communities has been required.

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3. METHODOLOGY

3.1. Project area

The ecological study has covered the area inside the Porto Palermo and the intermediate surroundings towards north and south of the bay.

This area has been divided into 3 zones (as illustrated in figures 1, 2, and 3):

- Core area – Porto Palermo bay (Zone I with 6 surveying transects; Zone II with 9 surveying transects);
- North Zone (Llaman bay, with 5 surveying transects);
- South Zone (with 4 surveying transects).

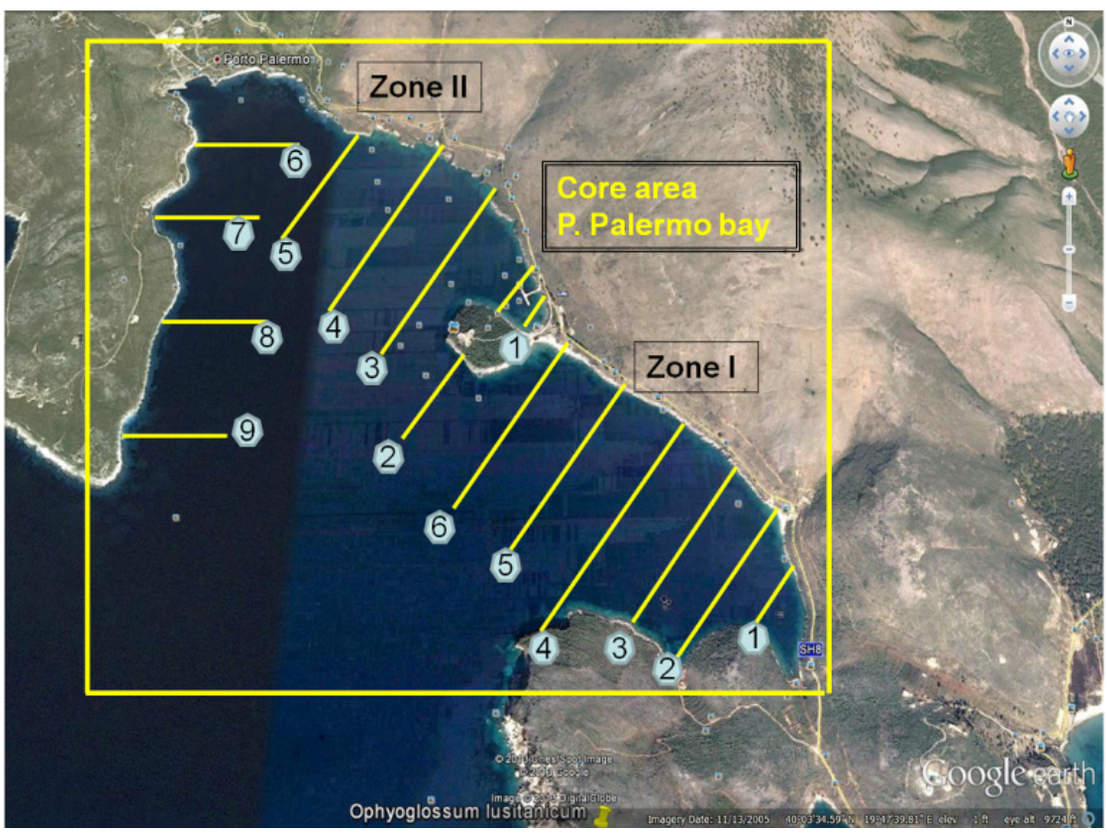


Figure 1. Core area – the bay (Zone I and Zone II)

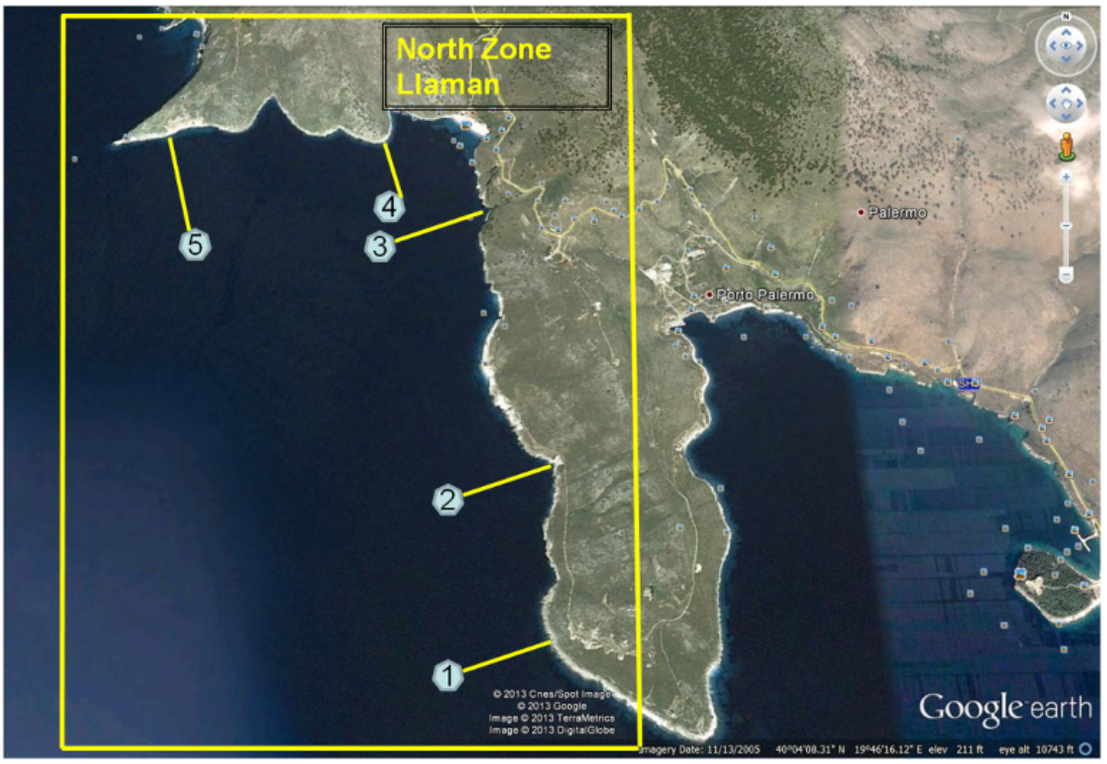


Figure 2. North Zone (Llaman bay)

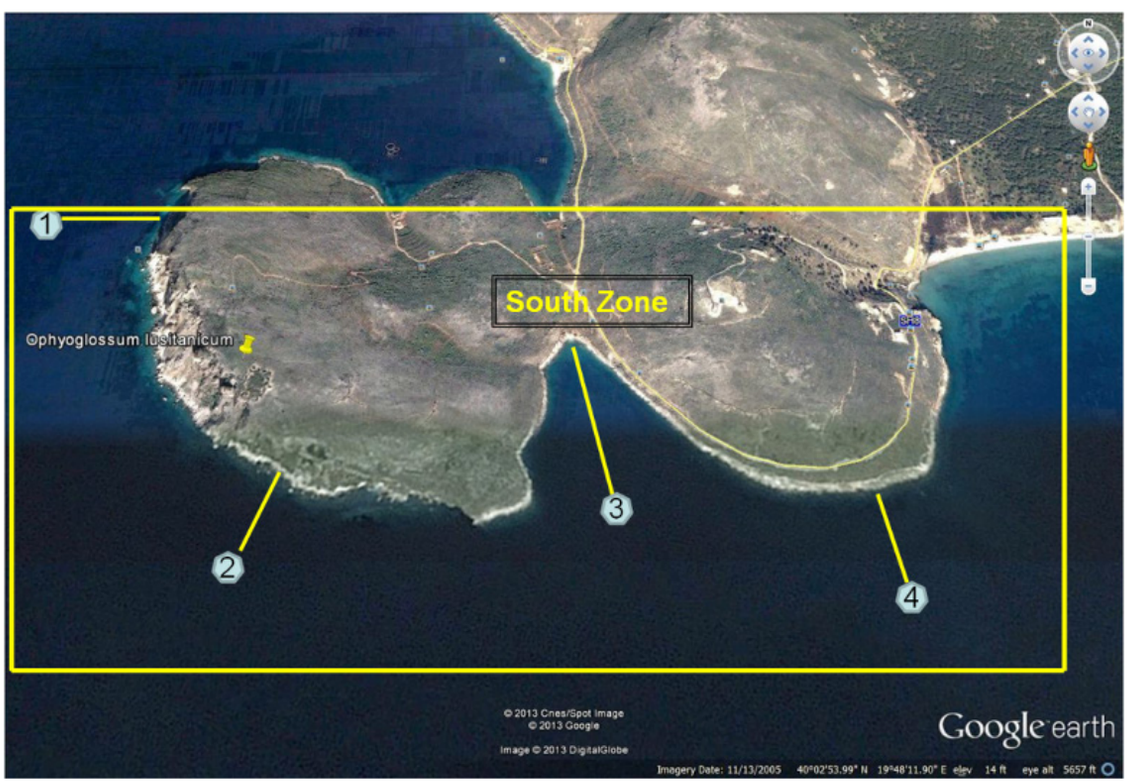


Figure 3. South Zone

3.2. Field survey

The field investigation for terrestrial flora was carried out in spring, summer and autumn by Lefter Kashta.

The field investigations for the benthic habitats took place during July - August 2013 by Lefter Kashta, Sajmir Beqiraj, Arjan Gaçe and Xhemal Mato. The benthic survey included:

- Extent of mid-littoral and infra-littoral assemblages;
- Extent of *Posidonia oceanica* meadows and other seagrasses;
- Extent of other assemblages in the upper circalittoral.

The investigation has been organized in surveying transects for each zone, as mentioned above in 2.1, fig. 1, fig. 2 and fig. 3, starting from the coastline and mid-littoral, following with infra-littoral, until the upper circalittoral (usually up to 50 – 70 m depth, depending on bottom topography) for each transect.

The investigation of mid-littoral assembles was based on visual survey from the boat and also by walking along the coast, assessing the species composition and extent of macrobenthic populations.

Shallow infra-littoral, until 3-4 m depth, was mainly surveyed by snorkeling. Predominant species of macrobenthos (macrophytes and macrofauna) and their abundance has been recorded. An underwater camera Sony digital (model Cyber-shot) was used for photo documentation of most important communities.

An underwater video-recorder (model Camera controller CBX GA, Inspecam LX&Z) was used for the survey in the infra-littoral, starting from 3 – 4 m depth, until the upper circalittoral (Fig. 4- a,b,c,d). The video-recorder was launched from a fishing boat that was used during the whole survey at sea. The echo-sounder of the boat was used to measure the depth.

The presence and extent of seagrass beds and other benthic assemblages of infra-littoral and upper circalittoral have been assessed and mapped on the bases of direct observations and analysis of underwater video recordings for each transect.

Mapping and cartography of habitats of the project area has been carried out using the ARCGIS software and combining data from the underwater surveys with the underwater video recorder and experts notes from spot diving and surveys. The topographic maps of Albania are used as reference map for showing all the results of the surveys. Different layers showing all the most important habitats and species in the Porto Palermo bay are produced together with the combined map (Fig. 26) showing the location of all these species and habitats.

Figure 4. The underwater video-recorder with accessories (a, b) and records taken from the depths (c, d)

Cymodocea nodosa © Gérard PERGENT

4. RESULTS OF THE SURVEY

Description of habitats and species of Porto Palermo area in this report is based mainly on the data collected from the present survey and few data from any previous investigation (Beqiraj, 2006; Beqiraj & Kashta, 2007; Beqiraj et *al.*, 2008; Kashta, 1996). Descriptions in the following are focused on terrestrial and marine habitats, aiming to highlight the most important habitats, species and associations.

4.1. Terrestrial habitats

Sclerophyllous scrub (Matorral)
Thermo-Mediterranean and pre-desert scrub
Tree-spurge formations

The association with tree spurge (*Euphorbia dendroides*) has been considered as the most interesting for this area and near unique in Albania. From conservational point of view, *Euphorbia dendroides*, a "thermo-mediterranean and pre-desert shrub" habitat indicator, is a natural habitat of Community importance coded as 5330, according to the EU Habitats Directive.

The floristic composition of this association consists mainly in: *Anagyrris feotida, Salvia triloba, Lotus cytisoides, Phlomis fruticosa, Glaucium flavum, Galium aparine, Pistacia terebinthus, Salvia triloba, Calicotome villosa, Spartium junceum, Ruscus aculeatus, Asparagus acutifolius, Urginea maritima, Asphodelus aestivus, Chrysopogon gryllus, Acanthus spinosus, Trifolium angustifolium, Brassica incana, Paliurus spina-christi.*

Figure 5. *Euphorbia dendroides* formation in the peninsula around the castle

Figure 6. *Euphorbia dendroides* formation on the hills of zone I

Phrygana

This type of vegetation is composed of low shrubs of less than 60 cm high and generally not close to each other. Among characteristic associations of the area we could mention those dominated by *Phlomis fruticosa* (assoc. Chrysopogono-*Phlometum fruticosae*).

The association with *Salvia fruticosa L*, is another characteristic association for this area.

Figure 7. Aassociation with *Phlomis fruticosa*

Figure 8. Association with *Salvia fruticosa*

Figure 9. Patches of forest with *Quercus ithaburensis subsp. macrolepis* in Llamani bay

Vegetation of Mediterranean pseudo-steppes.

Further degradation of phrygana as a result of overgrazing or on-going burns has affected this formation dominating it by *Brachypodium ramosum* (assoc. *Brachypodietum ramosi*) on the calcareous rocks.

Forests dominated by *Quercus ithaburensis subsp. macrolepis*

This type of vegetation is present in hills of north zone, but it doesn't form a distinct forest belt.

Quercus ithaburensis subsp. macrolepis, known as *Valona oak*, might by consider as a relict species that persisted on the Ionian coast since Tertiary period.

Vegetation of coastal rocks

The coasts of Porto Palermo area are mostly rocky. Steep rocks of some tens of meters high are frequently met in this area (western side of the castle, south zone and north zone). The xero-halophytic vegetation of Crithmo-Limonietea class dominates the lowest layer above the level of wave action. The most common species in this zone are *Crithmum maritimum, Limonium anfractum, Elymus pycnanthus, Desmazeria marina, Lotus cytisoides*, etc., which represent the endemic association *Crithmo-Limonietum anfracti*.

The upper layer of that vegetation (from 5-6 m to 50 m in certain cases), only periodically powdered by a dry smoke of crystallised salt during the strongest aerosaline storms, is represented by a very rare and spread vegetation of the alliance Capparo-Putorion. The characteristic species of that belt are: *Capparis orientalis, Putoria calabrica, Ephedra foemina*, etc. In this layer of rare vegetation certain subendemic and relict species have been sheltered like *Acis ionica, Athamanta macedonica, Brassica incana subsp. egaea*, etc.

Figure 10. *Lotus cytisoides*

Figure 11. *Limonium anfractum*

Figure 12. *Capparis orientalis*

Figure 13. *Ephedra foemina*

Figure 14. Vegetated vertical coastal rocks on the castle peninsula

Plant species recorded in Porto Palermo area

Acanthus spinosus L.
Acis ionica Bareka, Kamari & Phitos
Agave americana L.
Ailanthus altissima (Mill.) Swingle
Aira elegantissima Schur
Anagyris foetida L.
Anogramma leptophyla (L.) Link
Aristolochia sempervirens L.
Arisarum vulgare Targ-Tozz.
Asparagus acutifolius L.
Asphodelus aestivus Brot.
Asplenium ceterach L.
Athamanta macedonica (L.) Sprengel
Biscutella didyma L.
Brasica cretica Lam. subsp. aegaea (Heldr. & Hald.) S. Snogerup, M.A. Gust. & Bothmer
Capparis orientalis Veillard
Calicotome villosa (Poiret) Link
Celtis australis L.
Cerinthe major L. var. purpurescens
Colchicum cupanii Gussone
Cheilanthes fragrans (L.) Webb & Berth.
Chrysopogon gryllus (L.) Trin.
Crithmum maritimum L.
Cynosurus echinatus L.
Desmazeria marina (L.) Druce
Diplotaxis viminea (L.) DC.
Ephedra foemina Forssk.
Euphorbia dendroides L.
Galium aparine L.
Glaucium flavum Crantz
Heteropogon contartus (L.) P. Beau. Limonium anfractum (Salm.) Salm.
Lotus cytisoides L.
Malcolmia gaeca subsp. bicolor (Boiss. & Heldr.) Stork
Medicago disciformis DC.
Olea europaea L. var. sylvestris
Ophyoglossum lusitanicum L.
Origanum vulgare L.
Paliurus spina-christi Mill.
Parietaria judaica L.
Pistacia terebinthus L.
Phlomis fruticosa L.
Prasium majus L.
Prunus webbii (Spach) Vierh.
Punica granatum L.
Quercus ithaburensis subsp. macrolepis (Kotschy) Hedge & Yalt.
Rhamnus alaternus L.
Ruscus aculeatus L.
Salvia fruticosa Mill.
Silene vulgaris (Moench) Garcke
Spartium junceum L.
Trifolium angustifolium L.
Drimia maritima (L.) Stearn
Valantia muralis L

Noteworthy species

1. *Acis ionica Bareka*, Kamari & Phitos –Sub-endemic (South Albania, Ionian Islands of Greece).
2. *Aristolochia sempervirens* L. - The known area of distribution of Aristolochia sempervirens as a native species include: Algeria, Sicilia, Crete, Peloponnesus, Cyprus, Turkey, Lebanon, Syria and Israel (Mahfoud, 2010).
3. *Athamantha macedonica* (L.) Sprengel - Balkan endemic.
4. *Brasica cretica Lam. subsp. aegaea* (Heldr. & Hald.) S. Snogerup, M.A. Gust. & Bothmer.
5. *Diplotaxis viminea* (L.) DC. - Mediterranean species (IUCN -LR).
6. *Euphorbia dendroides* - Mediterranean species, Tertiary relict of Macaronesian origin.
7. *Malcolmia graeca subsp. bicolor* –Sub endemic (Albania, Greece) .
8. *Medicago disciformis* DC. - Steno-Mediterranean species.
9. *Ophioglossum lusitanicum* L. - It is categorized as Vulnerable by the IUCN (2001).
10. *Prunus webbii* (Spach) Vierh. - E-Steno-Medit.

Protected species in Albania (Red List of Flora and Fauna, 2007)

1. *Acis ionica Bareka*, Kamari & Phitos – CR (A1c).
2. *Aristolochia sempervirens* L. – EN (A1b).
3. *Athamantha macedonica* (L.) Sprengel - EN (A1b).
4. *Brasica cretica Lam. subsp. aegaea* (Heldr. & Hald.) S. Snogerup, M.A. Gust. & Bothmer VU (A1b) as *Brasica incana*.
5. *Capparis orientalis* VU (A1b).
6. *Colchicum cupanii Gussone* EN (A1b).
7. *Desmazeria marina* VU (A1b).
8. *Euphorbia dendroides* - LR (cd).
9. *Limonium anfractum* (Salm.) Salm. LR (nt).
10. *Lotus cytisoides* EN (A1b).
11. *Malcolmia graeca subsp. bicolor* - EN (A1b) as *Malcolmia bicolor*.
12. *Origanum vulgare* L. - EN (A1b).
13. *Prunus webbii* (Spach) Vierh.- VU (A1b).

Figure 15. *Aristolochia sempervirens* (a) and *Colchicum cuppanii* (b); two protected species in Porto Palermo area

Introduced plant species (Invasive species)

Two invasive plant species has been recorded in Porto Palermo area, *Agave americana* L. and *Ailanthus altissima* (Mill.) Swingle. *A. americana*, once cultivated for fibers, actually it is naturalized and expanded, covering large area on the hill slope above the national road from Himara to Saranda.

Figure 16. *Agave americana,* on the hill slope above the national road from Himara to Saranda

4.2. Marine benthic communities and habitats

Hard beds and rocks
Mediolittoral stage

The mediolittoral stage is the portion of the littoral area that is subjected to the tide movement. The organisms that inhabit the mediolittoral stage are highly adaptable to sudden changes of temperature and salinity.

Biocenosis of the lower mediolittoral rocks Littoral organogenic concretions (*Lithophyllum byssoides cushions*)

This habitat, particularly characterized by the presence of calcareous algal formations (manly of red alga *Lithophyllum byssoides*), is common in the northern and central parts of the western Mediterranean and in the Adriatic Sea. It is present only in fragments (isolated cushions) along the coast of north zone of Porto Palermo area.

Biocenosis of mediolittoral caves

Mediolittoral caves correspond to crevices or the entrances of caves that are partially out of the water. Some of these habitats are present within the bay and along the coasts of north zone of the studied area, where species like *Hildenbrandia prototypus, Phymatolithon lenormandii, Peyssonelia spp.*, etc. are grown.

Figure 17. *Lithophyllum lichenoides* on rocky exposed mediolitoral zone of Porto Palermo area

Figure 18. Mediolittoral caves within Porto Palermo bay

Infralittoral stage

The infralittoral stage is a benthic environment that is perpetually submerged. The upper limit is normally characterised by the presence of plants that cannot tolerate prolongated emersion, (e.g. Cystoseira), while the lower limit is normally fixed at the maximum depth where it is possible for the marine vascular plants or 'phanerogame' (e.g. *Posidonia oceanica*) to survive.

Biocenosis of infralitoral algae

This biocenosis includes brown, red, and green macroalgae, which are important primary producers and like seagrass, these may provide food, substrate and shelter for a wide variety of animals.

Association with *Cystoseira amentacea* var. *spicata*

This association is located in the first meter of the infralittoral and creates belts mainly in exposed coasts of the north zone of Porto Palermo area.

This association, including many strata, is characterized by high species richness; it shelters epibiont organisms and other benthic organisms mainly belonging to the algae, polychaetes, molluscs and crustaceans.

A total of twelve species of green algae, fourteen species of brown algae and twenty five species of red algae were recorded during the survey (Table 1).

Figure 19. Association with *Cystoseira amentacea* var. *spicata* (north zone of Porto Palermo area)

Table 1: Seaweeds identified during the benthic survey in Porto Palermo area (July - August 2013)

Green Algae - Chlorophyta

Acetabularia acetabulum (Linnaeus) P.C.Silva
Anadiomene stellata (Wulfen) C.Agardh
Bryopsis plumosa (Hudson) C. Agardh
Caulerpa racemosa (Forsskål) J. Agardh var. cylindracea
Cladophora prolifera (Roth) Kützing
Codium effusum (Rafinesque) Delle Chiaje
Codium bursa (Linnaeus) C. Agardh
Flabellia petiolata (Turra) Nizamuddin
Halimeda tuna (J. Ellis & Solander) J.V. Lamouroux
Ulva intestinalis v. intestinalis Linnaeus
Ulva laetevirens Areschoug
Valonia utricularis (Roth) C. Agardh

Brown Algae - Phaeophyta

Cladostephus spongiosum (Hudson) C. Agardh f. verticilatum (Light foot)Prud'home van Reine
Cysoseira amentacea (C. Agardh) Bory var. spicata (Ercegovic) Giaccone
Cystoseira barbata (Stackhouse) C. Agardh
Cystoseira compressa (Esper) Gerloff & Nizamuddin
Cystoseira corniculata (Turner) Zanardini
Cystoseira crinita Duby
Dictyopteris polipodioides (A. P. De Candolle) J.V. Lamourox
Dictyota dichotoma (Hudson) J. V. Lamouroux *var. dichotoma*
Dictyota dichotoma (Hudson) J. V. Lamouroux *var. intricata*
Dictyota linearis (C. Agardh) Greville
Halopteris filicina (Grateloup) Kützing
Padina pavonica (Linnaeus) J. V.
Scytosiphon lomentarius (Lyngbye) Link
Stypocaulon scoparium (Linnaeus) Kützing

Red Algae - Rhodophyta

Acrosymphyton purpuriferum (J. Agardh) G. Sjöstedt
Amphiroa rigida J. V. Lamouroux
Botryocladia botryoides (Wulfen) Feldmann
Callithamnion granulatum (Ducluzeau) C. Agardh
Chondrophycus papillosus (C. Agardh) Garbary & J. Harper
Corallina elongata J. Ellis & Solander
Gelidium bipectinatum G. Furnari
Grateloupia filicina (J. V. Lamouroux) C. Agardh
Hildenbrandia rubra (Sommerfeld) Meneghini
Jania rubens (Linnaeus) J. V. Lamouroux *var. rubens*
Jania rubens (Linnaeus) J. V. Lamouroux var. *corniculata*(Linnaeus) Yendo
Liagora distenta (Merthens ex Roth) J. V. Lamouroux
Lithophyllum byssoides (Lamarck) Foslie
Lithophyllum incrustans Philippi
Lithophyllum trochanter (Bory) H.Huve ex Woelkerling
Lithophyllum stictaeforme (Areschoug) Hauck
Nemalion helminthoides (Velley) Batters
Neogoniolithon mamillosum (Hauck) Setchell & L. R. Mason
Osmundaria volubilis (Linnaeus) Norris
Peyssonelia squamaria (S. G. Gmelin) Decaisne
Peyssonelia rubra (Greville) J. Agardh
Phyllophora crispa (Hudson) P. S. Dixon
Pterocladiella capillacea (S. G. Gmelin) Santelices & Hommersand
Sphaerococcus coronopifolius Stackhouse
Tenarea tortuosa (Esper) Me. Lemoine
Wrangelia penicillata (C. Agardh) C. Agardh

Seagrass meadows

Seagrasses are marine Magnoliophytes that form underwater beds, which are very important habitats for marine ecosystems. They provide food and shelter for a large number of marine species; they also prevent beach erosion by stabilizing the sediments through their rhizomes.

Three species of Magnoliophytes are present in the area: *Posidonia oceanica*, *Cymodocea nodosa* and *Halophila stipulacea*. *Posidonia oceanica* is the most abundant species, which form large meadows in shallow and medium depths at the study area (fig. 20).

***Posidonia oceanica* meadows**

The meadows of *Posidonia oceanica* are among the most important Mediterranean habitats, and their conservation is a high national and international priority (e.g. EU Habitats Directive 92/43/CEE, 21 May 1992). *Posidonia oceanica* is included in Annex I (strictly protected flora species) of the Berne Convention and Annex II (list of endangered or threatened species) of the Barcelona Convention. *Posidonia oceanica* is also included in the Red List of Albanian Flora (2007).

Posidonia oceanica meadows have a multi-functional role within coastal systems in terms of primary production, nutrient cycling, sediment stabilization, modification of wave energy gradients and provision of "nursery" habitat for fishes and invertebrates.

The upper limit of *Posidonia oceanica* meadows in the studied area was identified at 3.5 meters depth and the lower limit at 28 m. A narrow band of *Posidonia oceanica*, with short leaves, was found in an area of rocky bottom, in front of the castle, at 23 meters depth.

In those zones where water clearness is higher (Zone II, transects 3, 4, 5) *Posidonia oceanica* beds have been observed occurring in waters exceeding 25-27 m in depth. Zone I, in general, shows a regression of this lower depth limit (18-20m).

The results of this survey suggest that *Posidonia oceanica* has experienced a decrease in Porto Palermo bay. The presence of surfaces of dead matte within the area reveals that the beds occupied a much greater surface area in the past. We believe this decrease is linked manly with vessel anchoring and the last decade's constructions of fish farms within the bay.

In shallow waters (2-3m) within the bay there are identified small areas covered with *Cymodocea nodosa* patches, partly accompanied with *Halophila stipulacea* (Fig. 22, 23 and 24), in the zone II (transect 1).

Associations of the Coralligenous biocenosis

The Coralligenous belongs to the circalittoral stage, but can exceptionally be found as an enclave in the biocenosis of infralittoral algae, that favors shade. This habitat has often been observed in different sites between 20 m to 60 m depths during this survey.

Figure 20. Dense meadow of *Posidonia oceanica* at 12 m depth

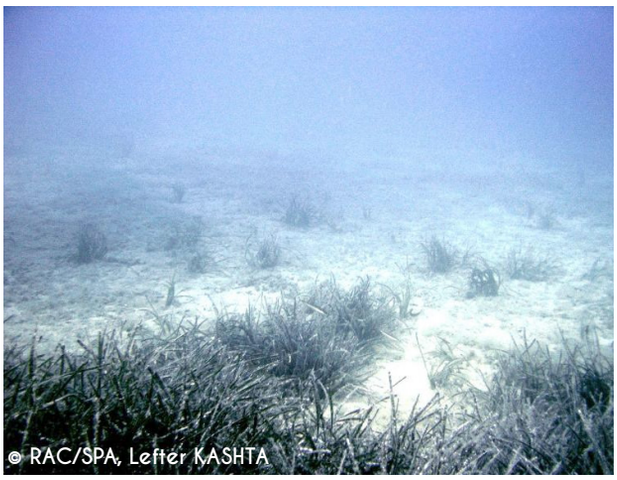


Figure 21. Lower limit of the meadow at 21m depth

Figure 22. Dead matte with photophilous algae

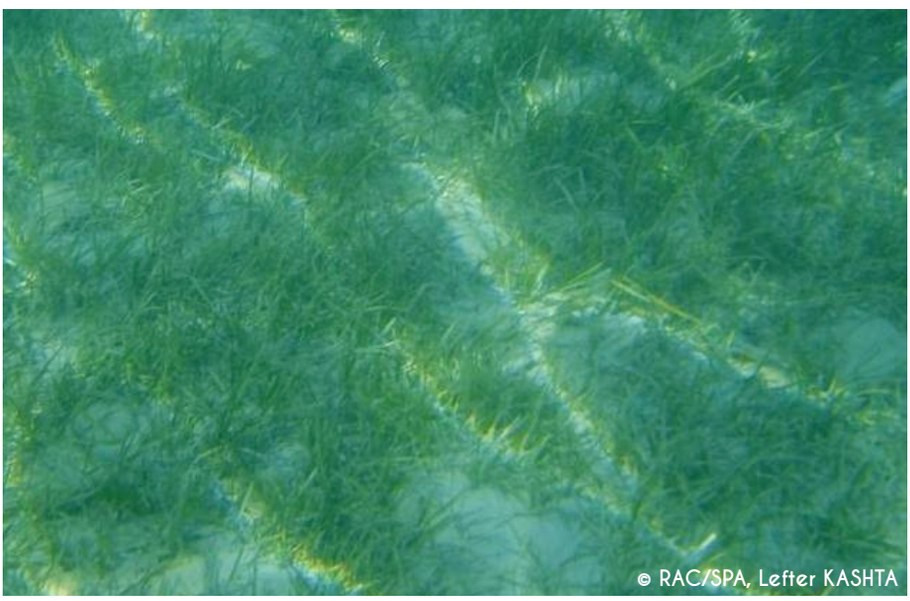


Figure 23. *Cymodocea nodosa* meadow (-3m)

Figure 24. *Halophila stipulacea* and *C. nodosa* (-2m)

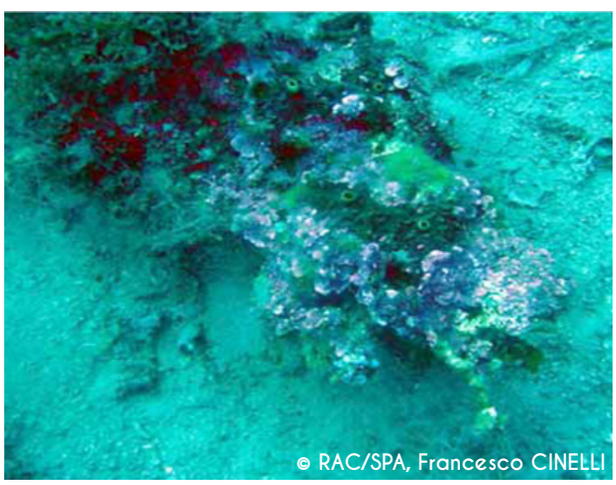


Figure 25. Coralligenous assemblages between sponges and Posidonia

4.3. Description of benthic habitats for each zone

Core area (Zone I and Zone II)

Zone I

In the zone I (fig. 1), the shallow waters of the mid-littoral and upper infra-littoral, from 0 to 3-4 m depth are characterized by stony bottom, mainly barren. In the central part of this zone barren habitat extents up to 6 m depth. The macrobenthos in these depths was predominated by populations of photophilic algae, sponges *Chondrilla nucula* and the black sea urchin *Arbacia lixula*. Cystoseira stripes were extending along the coast, up to 1 m depth in the northern part.

Meadows of *Posidonia oceanica* were mainly degraded in most of the Zone I, especially in its southern part. In this part (south) the upper limit of the meadow varies from 5 to 8.5 m depth. The degradation of the meadow was more evident from 12 m to 16 m and the lower limit was recorded in 18 m. Long bare strips in the bottom, within the Posidonia meadow, in this part may be due to human construction activities for the establishment of the fish farm. Aquaculture development (cultivation of the sea bream and the sea bass) may also be one of the factors for the general degradation of the meadow in this part.

In the northern part of the zone I, the Posidonia meadow seems to be in a better state, with a large cover and density, with the upper limit varying from 4.5 m to 7 m and with the lower limit from 20 m to 26 m depth. A relatively large presence of the sponges was recorded within the Posidonia meadow and a considerable presence of *Codium sp*. and *Pinna nobilis* in the northern part.

The upper circalittoral of the Zone I, from 26 to 70 m depth, was mainly predominated by soft bottoms, but with a high variety of microhabitats, including sandy and silt sediments, bare or covered by macroalgae, dead leafs of seagrasses under decomposition, dead shells of mollusks, mainly bivalves, coralligenous and precoralligenous formations predominated by sponges and calcareous algae, organogenic rocks, etc. It is worthy to highlight the presence of precoralligenous and especially coralligenous formation in this area, which plays an important role for increasing the biodiversity, as they are suitable habitats for sheltering a considerable species number of macroalgae, macroinvertebrates and fish. In these bottoms the most common macrofauna was represented by sponges, ascidians, gastropods Natica, Turritella, Hexaplex, echinoderms Ophidiaster, Echinaster, cnidarian Pennatula etc.

The alien invasive algae *Caulerpa reacemosa var. cylindracea* (grape Caulerpa) has been recorded near the lower limit of Posidonia meadow in the southern part of the Zone I.

The presence of antic amphorae on the bottom of the southern part of this zone can be considered as an additional asset for the development of local tourism through diving activities, which also can be attracted by coralliegenous and precoralligenous formations, as well as by the steep underwater slopes that may reach sometimes 40 m depth immediately below the coastline, like in the central part of the Zone I (transect 4, fig. 1).

Zone II

Cystoseira associations were present in several parts between the mid-littoral and upper infralittoral of the Zone II, with the predominance of *C. amentacea* in the eastern part and *C. compressa* in the western part of this zone.

Barren coastal areas extent up to 3.5 m and sometimes up to 7 m depth. They are characterized by a high presence of the black sea urchin *Arbacia lixula*, whose grazing effect is evident in the whole area. The rare macrobenthos in these habitats was mainly represented by the photophilic algae Acetabularia, Jania, Padina, the sponge *Chondrilla nucula*, the gastropod *Cerithium vulgatum* and the echinoderms *Arbacia lixula* and *Holothuria tubulosa*.

Well developed sponges populations were present in the small caves and crevices in shallow waters, 1 m – 3 m depth, in the southeastern part of the zone II. Patches of the seagrass *Cymodocea nodosa* (little Neptune grass) were recorded in those depths in the southeastern and northwestern part. A high presence of athozoans was found in the Cymodocea patches in the southeastern part.

Two alien species were recorded in the shallow waters of this zone: small presence of the seagrass *Halophila stipulacea* (fig. 25) within the Cymodocea patches in southeastern part, in 1 - 2 m depth, and the grape alga *Caulerpa reacemosa var. cylindracea* in the western part, in 4 m depth.

Inputs of freshwater are present in the coast of southeastern part of the Zone II, which have eroded the coast and created small caves and crevices. A little further in the north, on the eastern coast, the influence of the freshwater is also evident through a strip of freshwater sediments (gravel and sand) that lies from the coastline to 15 m depth on the sea bottom.

Distribution of Posidonia meadows shows a variety of the upper and lower depth limits in the Zone II. Its upper limit varies from 3.7 m in the eastern coast to 6 – 7 m in the western coast of this zone, while the lower depth limit varies from 21 m to 28 m. From the video-records, the cover and density of Posidonia meadow looks high until 12 m depth in most of this area. The degradation and fragmentation of the meadow was more evident from 13 to 16 m depth. Patches of matte morte were relatively abundant within the meadow, especially between 11 and 18 m depth. A highest degradation of the meadow has resulted in the northwestern part, where large bare fragments and matte morte intersect the meadow from 9 m to 16 m depth. In the shallower waters of this part, at 5 m depth, Cymodocea and Caulerpa were often growing on the matte, near the upper limit of Posidonia meadow.

On the western coast of the Castle (transect 2, fig. 1) Posidonia meadow was lacking, perhaps due to the immediate depth and very steep slope. In this area, the photophilic algae were found until 18 m depth, while Posidonia was found in small patches on the rocks in 23 m depth, where it was rare and with short leaves.

Communities of macroalgae, sponges and ascidians were relatively well developed in the Posidonia meadow that was also characterized by a high cover of epibiont organisms and mucilaginous algae, especially in the northern and western part of the Zone II.

Several microhabitats were recorded in deeper bottoms, under the lower limit of Posidonia meadow, until 70 m depth. The upper circalittoral, immediately under Posidonia meadow, until 30 m depth was characterized by bare soft bottoms, soft bottoms with macroalgae, matte morte covered by macrolagae, matte morte covered by sediments and soft bottoms covered by dead mollusk shells. From 30-56 m depth, besides some of above mentioned microhabitats, well developed precoralligenous and coralligenous formations were recorded with a high species richness of macroalgae, sponges (*Agelas, Axinella*), cnidarians (*Parazoanthus, Caryophyllia*) and ascidians. Soft bottoms with dead leaves of seagrasses under decomposition, ascidians, sponges, as well as bare soft bottoms were common from 40-50 m depth. On the lower depths, until 70 m, the soft bottoms were more homogenous, with bare areas and a little presence of sponges and ascidians.

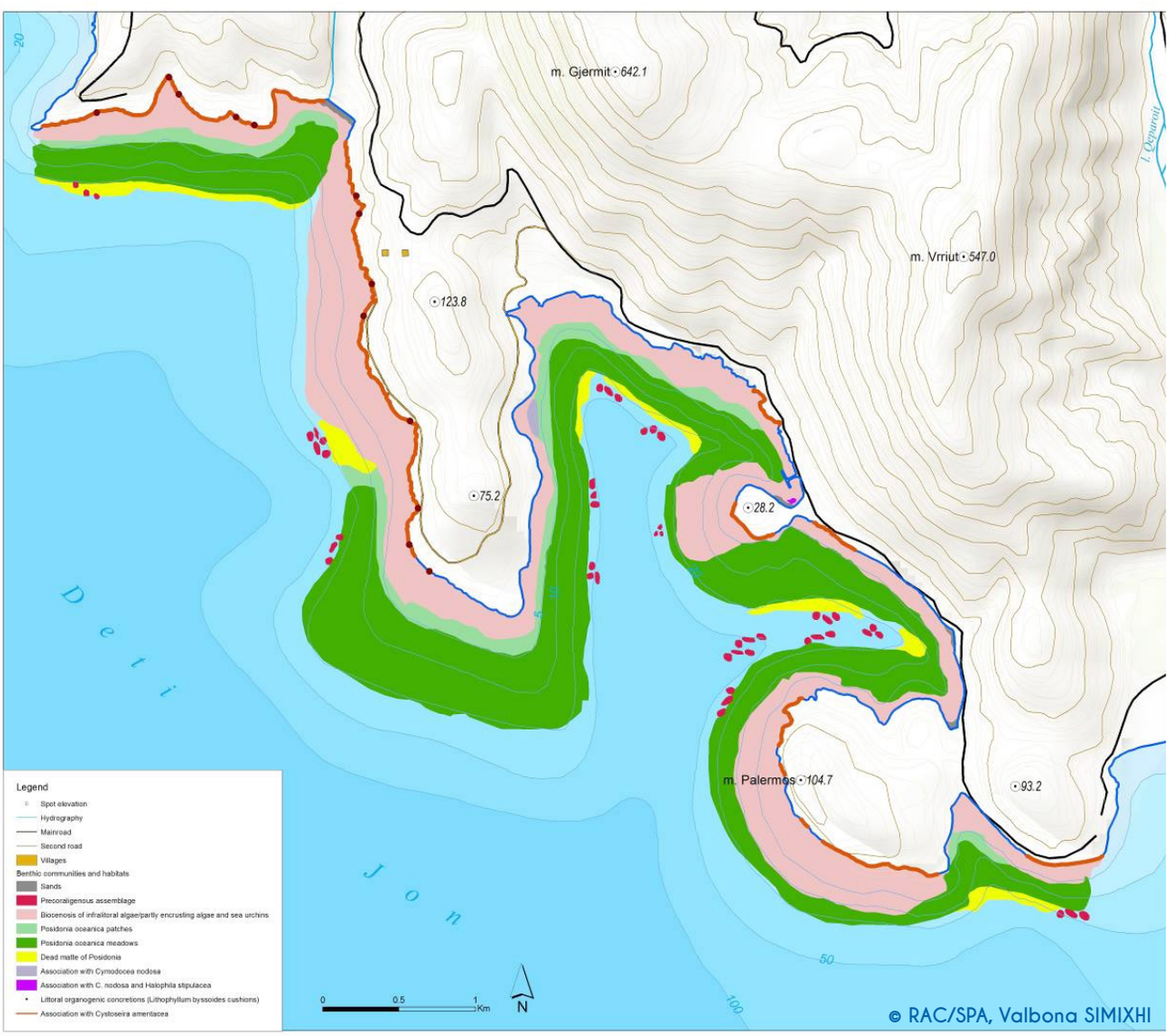


Figure 26. Map of benthic communities and habitats present in Porto Palermo area

North zone (Llamani bay)

The North Zone (Llamani bay) represents some peculiarities compared to the other zones of the surveyed area in terms of distribution of benthic biocenosis. Mid-littoral has a well developed associations of Cystoseira and Lithophyllum cushions along almost the whole coast line. At their lower part they are often accompanied by patches of photophilic algae with the predominance of Corallina. Barren areas cover a large portion of the upper infra-littoral, reaching from 5 to 11 m depth. This large representation of the barren areas in this zone, besides the grazing effect by sea urchins, may also be related to the presence of the rocks that were recently thrown in the sea by the illegal and uncontrolled tourist constructions along the coast line and the high human impact. Llamani bay is one of the areas with the highest touristic pressure along the Albanian coast during summer. The rare macrobenthic populations in these depths were represented by mucilaginous and other photophilic algae, black sea urchin *Arbacia lixula* and sponges predominated by *Chondrilla nucula*.

A strong fragmentation of the meadows of *Posidonia oceanica* was evidenced in this zone. A well developed meadow was recorded in the southern part (transect 1, fig.1), with the upper limit at 7 m depth and lower limit at 21 m. Posidonia meadow was totally lacking in the eastern coast (transects 2 and 3 in fig. 1; fig. 27). In this part, at the depths from 11 to 27 m, the rocky bottom is represented by a very rugged relief with steep slopes that may disfavor the development of Posidonia meadows. The macrobenthos in these depths was mainly predominated by macroalgae, often mucilaginous, and sponge's communities. Another possible reason for the lack of Posidonia in this part may be related to the inputs of cold freshwater from underground springs that may modify the needed values of salinity and temperature for the establishment and development of the meadow. The Posidonia meadow was represented in a relatively good state in the northern and western part of the zone, respectively situated between 8 m and 28 m depth (transect 4, fig. 1) and between 13 m and 20 m depth (transect 5, fig. 1).

Below the Posidonia meadow, from 26 m to 30 m, well developed precoralligenous and coralligenous formations were recorded, with a high presence and diversity of sponges, macroalgae including mucilaginous ones and *Caulerpa racemoca var. cylindracea*, some rare and isolated bundles of Posidonia with short leaves, free calcareous algae deposited on the bottom and matte morte covered by sediments and dead mollusk shells.

In 30-35 m depth the bottom is mainly covered by coarse sand, while in lower depth, from 40 to 50 m, the bottom consists in soft bottom with presence of precoralligenous and coralligenous formation, high abundance of sponges, echinoderms (mainly Asteroidea and Crinoidea) and dead mollusk shells.

South zone

The survey in the South zone was very rapid and not very detailed due to the weather conditions that limited the field work at sea. The mid-littoral was characterized by a continuous presence of *Cystoseira amentacea* and other photophilic algae that were very evident until 6 m depth, predominated by Padina, Acetabularia and Dyctyota.

Due to the immediate depth and very steep slope in the western part of the zone, the meadow of Posidonia started at 11 m depth in the northern part (transect 1, fig. 1) and at 13 m depth in the north-western part (transect 2, fig. 2). The lower limit of the meadow in this area was recorded at 20 m depth.

In the central and eastern part of the zone (transects 3 and 4, fig. 1) the upper limit of Posidonia meadow is at 7 m depth, while the lower limit at 19 m. A slight fragmentation of the meadow has been recorded at 12 m depth in the eastern part.

Near the lower border of Posidonia in the eastern part, at 18-19 m depth, coralligenous formations were present, predominated by macroalgae and sponges from the genus *Axinella, Agelas* and *Spongia*. Below the Posidonia meadows in the central part, at 22-22 m depth, the bottom is covered by matte morte and bare soft sediments (without macrovegetation).

Coralligenous formations with macroalgae and high diversity of sponges have also been recorded in the north-western part of the zone (transect 1, fig. 1) at 31-33 m depth.

In the central and eastern part, at 30-32 m depth, the bottom consists in soft homogenous sediments, without macrovegetation.

4.4. Marine habitats and species of conservation interest

Particular attention has been paid to the vulnerable/ sensitive Mediterranean habitats and species of conservation interest that has been published in the relevant following documents:

- Mediterranean 'Red Book' of the thread marine vegetation, associations and seascapes of the Mediterranean Sea (UNEP/IUCN/GIS, 1990).
- EU Habitat Directive (92/43) with the Annexes:
  - I (Natural Habitat Types of Community Interest)
  - II (Animal and Plant Species of Community Interest)
  - IV (Strictly protected species), and
  - V (species whose exploitation is regulated)

- The Barcelona Convention (1995) related to the Protocol concerning to the Specially Protected Areas and Biological Diversity in the Mediterranean with the Annexes:
  - II (endangered or threatened species), and
  - III (species whose exploitation is regulated)
  - The Alghero Convention (1995) on coastal and marine biodiversity in the Mediterranean
- The Bern Convention (1996) with the Annexes:
  - I (strictly protected flora species),
  - II (strictly protected fauna species), and
  - III (protected fauna species).
- National Red List of Flora and Fauna (2007)

Among the most sensitive habitats of the Mediterranean (UNEP-RAC/SPA. 1997) should be mentioned *Lithophylum byssoides* (sensitive to hydrocarbons) for the mediolittoral zone, the Cystoseira communities as an index of hydrodynamism at the upper littoral zone l, and the *Posidonia oceanica* meadows in the infralittoral zone.

Association with *Lithophyllum byssoides*

White and pallid rose plates and cushions of the calcareous rhodophytes *Lithophyllum byssoides* on rocky exposed mediolitoral zone. Typical habitat of the Western Mediterranean basin and the Adriatic Sea. Bio - indicator of high quality of water.

International status: Mediterranean 'Red Book' (vulnerable habitat), Habitat Directive 92/43 (annex I, as reefs); Alghero Convention (vulnerable habitat); Barcelona Convention (Annex II); Bern Convention (Annex I, as strict protected flora).
National status: Red List of Flora and Fauna (2007) EN B1

Association with *Cystoseira amentacea var. spicata*

This characteristic belt has been observed on some very exposed rocky areas, from 0 to 1 m depth.
Highly complex habitat; structural and functional high biodiversity. Bio-indicator of the high quality of water.
International status: Mediterranean 'Red Book'; Habitat Directive 92/43 (Annex I, as reefs); Alghero Convention; Barcelona Convention (Annex II); Bern Convention (Annex I, as strict protected flora).

National status: Red List of Flora and Fauna (2007) VU B2c

***Posidonia oceanica* meadows**

This community, endemic in the Mediterranean Sea, represents the climax of the infralittoral soft bottoms and among the most important Mediterranean habitats; their conservation is a high national and international priority.
International status: Mediterranean 'Red Book'; Habitat Directive (Annex I: * priority habitat); Barcelona Convention (Annex II); Bern Convention (Annex I, as strict protected flora).
National status: Red List of Flora and Fauna (2007) VU A2d

Association with *Cymodocea nodosa*

This important phanerogame colonizes the sand and muddy - sand bottoms, and sometimes replace regressed meadows of *Posidonia oceanica*, but in the study area it was present in a small surface only, at shallow water of the bay.

International status: Mediterranean 'Red Book'; Bern Convention (Annex I, as strict protected flora).

Table 2: Marine species of international concern in Porto Palermo, listed in the most important Conventions

Species name	Barcelona protocol (1995)		Bon (2006)		CITES (2006)	Bern (1993)
	Ann. II	Ann. III	App. 1	App. 2	App. 2	App. 2
Magnoliophyta						
Posidonia oceanica	+					+
Phaeophyta						
Cystoseira amentacea var. spicata	+					+
Rhodophyta						
Lithophyllum byssoides	+					
Lithophyllum trochanter	+					
Spongia						
Geodia cydonium	+					
Hippospongia communis		+				+
Spongia officinalis		+				+
Petrobiona massiliana						+
Mollusca						
Ranella olearia	+					+
Pinna nobilis	+					
Crustacea						
Homarus gammarus		+				+
Maja squinado		+				+
Scyllarides latus		+				+
Palinurus elephas		+				+
Echinodermata						
Paracentrotus lividus		+				+
Ophidiaster ophidianus	+					+
Pisces						
Hippocampus hippocampus	+				+	+
Lamna nasus		+			+	+
Isurus oxyrinchus		+				+
Sciaena umbra		+				+
Umbrina cirrosa		+				+
Syngnathus abaster						+
Rostroraja alba		+				
Xiphias gladius		+				
Hippocampus guttulatus					+	
Sphyrna zygaena					+	
Carcharodon carcharias	+		+	+	+	+
Reptilia						
Caretta caretta	+		+	+		+
Cetacea						
Ziphius cavirostris	+					+
Delphinus delphis	+		+	+		+
Tursiops truncatus	+			+	+	+

4.5. Fish resources

For a very long period, Porto Palermo bay remained isolated and did not develop any other activity. Being a very secret base, the movement of military vessels, were relatively limited. Obviously, the fishing activity in the bay was totally prohibited. For more than 30 years (until 1997), this Gulf was undisturbed from biodiversity point of view. There are few reports about the types of fish, mainly associated with the surface observations from ex marines who claim to have seen dolphins enter the bay or «other big fish», making it more as legend. During the July to August period of time, outside of the bay shoals of Bluefin tuna (*Thunnus thynnus*) had been observe, upward from the Ionian Sea to the Adriatic Sea during migration for reproduction. Fishing activity outside of the base was concentrated mainly for small pelagic from Saranda fleet with light attractions method. In the area of Porto Palermo are found a large diversity of fish but the most common ones are *Chelon sp*., *Mullus surmulletus*, *Diplodus sp*., *Coris juli*, *Serranus cabrilla*, *Oblada sp*., *Chromis sp*., etc. The list of fish species occurring in and around the Porto Palermo bay is given in the Annex. Following is the description of some of the species of international importance as rare or endangered species that require special protection and preservation of their habitas as foreseen in several international agreements and conventions.

***Hippocampus hippocampus* - Short snouted seahorse - Kal deti turishkurter**

Inhabits dense, complex habitats as well as patchy, relatively open and sparse habitats of coastal areas. Found on soft bottoms amongst rocks and algae, on sparsely vegetated areas, and in coastal lagoons with strong oceanic influences. Mimics the green or yellow coloration of plants allowing it to hide among the vegetation. This ability likely plays a role in seahorse feeding strategy and in predator avoidance. Makes limited daily movements within very restricted home ranges (0.7-18.1 m^2). May over-winter in deeper water. Adult dispersal over large distances is probably caused by strong wave action during storms or when it anchors itself to floating debris. Is thought to live for 3-5 years. Because of its short generation time and multiple breeding cycles during each spawning season, resilience is thought to be high. Feeds on small prey and organic debris. Has been reared in captivity. Description (based on 35 specimens): Adult height: 7.0-13.0cm. Rings: 11 + 37 (35-38). Snout length: 3.0 (2.8-3.4) in head length. Dorsal fin rays: 17 (16-19) covering 2+1 rings. Pectoral fin rays: 14 (13-15). Coronet: narrow, ridge-like and joined smoothly to nape of neck, or wedge-shaped (front narrow, back high and broad); some specimens with very large angular coronet. Spines: low, very low in adults. Other distinctive characters: very short snout (usually less than 1/3 head length) that is slightly upward-bent; prominent eye spine. Colour pattern: mottled brown to yellow, to maroon and rust; also orange, purple or black; sometimes with tiny white dots, but these do not coalesce into thick horizontal wavy lines as in *H. guttulatus*.

***Isurus oxyrinchus* - Shortfin mako - Peshkaqen tonil**

Oceanic, but sometimes found close inshore. Usually in surface waters, down to about 150 m. Coastal, epipelagic at 1->500 m. Adults feed on bony fishes, other sharks, cephalopods; larger individuals may feed on larger prey such as billfish and small cetaceans. Ovoviviparous, embryos feeding on yolk sac and other ova produced by the mother. With 4-16 young of about 60-70 cm long. Gestation period lasts 15-18 months, spawning cycle is every 3 years. Some authors have erroneously assumed that two age rings are deposited per year by this species, thus underestimating longevity, age at maturity, and resilience. These data have been removed and replaced by recent, verified estimates. Shortfin mako has been shown to have a marked sexually segregated population structure. Shortfin mako is probably the fastest of all sharks and can leap out of the water when hooked. Potentially dangerous and responsible for unprovoked attacks on swimmers and boats. Dorsal spines (total): 0; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. A large, spindle-shaped shark with large black eyes, a sharp snout, and large, narrow, hooked teeth with smooth edges. Caudal fin lunate, lower lobe strongly developed. Dark blue above, white below. Tiny second dorsal and anal fins. Max length: 400 cm TL male/unsexed; commonlength: 270 cm TL male/unsexed; max. published weight: 505.8 kg; max. reported age: 32 years. Marine; pelagic-oceanic; oceanodromous; depth range 0 - 740 m, usually 100 - 150 m

***Lamna nasus* – Porbeagle – Tonil**

Most abundant on continental offshore fishing banks but also found far from land in ocean basins and occasionally close inshore. Pelagic, epipelagic or littoral shark. Highly migratory, moves generally along the continental shelves. One of the most cold-tolerant sharks; Known to temporarily tolerate salinities as low as 10 to follow its prey. Found singly and in schools and feeding aggregations. Feeds on small and medium-sized pelagic schooling species, other sharks, squid and demersal fishes (cod, white hake, red hake, haddock and cusk). Females grow larger than males. Catch records and studies in the northeast Atlantic show segregation by sex and size. Parasites include *Phyllobothrium dagnallium* (found in stomach, intestine and spiral valve) and *Dinobothrium sp*. Regarded as potentially dangerous to people because of its size and activity but has never or very seldom been indicted in an attack on people or boats. The flesh of the porbeagle is of good quality and texture and is said to taste like swordfish. Utilized fresh, dried or salted and frozen for human consumption; for oil and fishmeal; fins for shark-fin soup. May be pan-fried and broiled. Max length : 350 cm TL male/unsexed; common length : 244 cm TL male/unsexed; max. published weight: 230.0 kg; max. reported age: 30 years.

Maturity: Lm 175.0, range 170 - 180 cm. Marine; pelagic-oceanic; oceanodromous; depth range 0 - 715 m. Temperate; 2°C - 18°C.

***Rostroraja alba* - White skate – Raxhe**

Inhabit shelf and slope waters. Found on sand and rock-sand bottom. A bottom-predator of bony fishes, other elasmobranchs, fish offal, crabs, shrimps, mysids, octopi, and cuttlefish. Minimum depth reported taken from. Maximum length for female is 202 cm. Oviparous. Distinct pairing with embrace. Young may tend to follow large objects, such as their mother. Eggs are oblong capsules with stiff pointed horns at the corners deposited in sandy or muddy flats. Egg capsules are 12.5-18.3 cm long and 10.0-13.9 cm wide. About 55-156 eggs are produced per individual annually. A giant skate with a broad-based, abruptly narrow-tipped snout covered with small, sharp thorns; pectoral disc angular, and no thorns on nape or back, but three rows of large thorns on tail. Larger immature and adult individuals grey with numerous small white spots above, underside white with no black pores; hatchlings plain reddish-brown above, often with blue spots, and white below with broad dusky grey margins on disc.

***Sciaena umbra* - Brown meager - Korbizi**

Occurs in shallow coastal waters mainly on rocky and sandy bottoms, often entering estuaries and more active at night. Also inhabits caves and reefs. Feeds on small fishes and crustaceans. SCUBA diving observations suggest this to be a very calm fish with remarkable buoyancy control and an ability to move without much apparent effort. Max length : 70.0 cm TL male/unsexed; common length : 28.0 cm TL male/unsexed; max. reported age: 21 years. Dorsal spines (total): 11; Dorsal soft rays (total): 23-25; Anal spines: 2; Anal soft rays: 7 – 8.

***Sphyrna zygaena* - Smooth hammerhead – Peshkkarabiner**

Occurs inshore and well offshore, over continental and insular shelves. Coastal, pelagic, and semi-oceanic, but often bottom associated at 1-139 m. Migrates northward in summer; young often in large aggregations of hundreds of individuals. Prefers to feed on small sharks, skates and stingrays, but also preys on bony fishes, shrimps, crabs, barnacles and cephalopods. Viviparous. Regarded as being dangerous to people, though only few can be tentatively attributed to this species due to its occurrence in temperate waters. Reported to cause poisoning. Become sexually mature when 250 to 300 cm long. The female gives birth to 30 - 40 young. Dorsal spines (total): 0; Dorsal soft rays (total): 0; Anal spines: 0; Anal soft rays: 0. A large hammerhead with a notch at the center of head; 1st dorsal fin moderately high, 2nd dorsal and pelvic fins low. Olive-grey or dark grey above, white below. Fins nearly plain, dusky or blackish tipped.

***Syngnathus abaster* - Black-striped pipefish - Gjilpërëza shiritazezë**

Euryhaline, found among detritus or vegetation over sand or mud, within a temperature range of 8° to 24°C. Probably an amphidromous species but migratory behaviour needs verification. Ovoviviparous. The male carries the eggs in a brood pouch which is found under the tail. Early free-living young measure 23 mm TL. Max length: 21.0 cm TL male/unsexed.

***Umbrina cirrosa* - Shi drum - Korb i bardhe**

Found over rocky and sandy bottoms in coastal waters. Juveniles enter estuaries. Feed on bottom invertebrates. Dorsal soft rays (total): 22-23. Max length: 73.0 cm TL male/unsexed; common length: 40.0 cm TL male/unsexed; max., published weight: 3.1 Kg.

***Xiphias gladius* – Swordfish - Peshku shtize**

Atlantic, Indian and Pacific: tropical, temperate, and sometimes cold waters, including the Mediterranean Sea. Highly migratory species. Generally above the thermocline. Larvae are frequently encountered at temperatures above 24 C . Migrate toward temperate or cold waters in the summer and back to warm waters in the fall. Adults are opportunistic feeders, known to forage for their food from the surface to the bottom over a wide depth range. Feed mainly on fishes (Atlantic mackerel, barracudinas, silver hake, redfish, herring and lantern fishes, but also on crustaceans and squids. They use their sword to kill their prey. Large individuals may accumulate large percentages of mercury in its flesh. Are batch spawners. Spawning takes place in Atlantic during spring in southern Sargasso Sea. Migrate to cooler waters to feed. Females grow fastest. Determination of age is difficult since the otoliths are very small and scales are missing in adults. Pelagic eggs measure 1.6-1.8mm and the newly hatched larvae is 4 mm long. Sword is well developed at a length of 10mm and young live pelagically in the upper water layers where they quickly develop into very voracious predators. Mt DNA restriction analysis reveal that genetic differentiation occurs between populations inhabiting the Mediterranean Sea and the tropical Atlantic ocean, indicating little genetic exchange occurring between the two. Maturity: Lm 221.0, range 156 - 250 cm. Max length: 455 cm FL male/unsexed; common length: 300 cm TL male/unsexed; max. published weight: 650.0 kg. Dorsal spines (total): 0; Dorsal soft rays (total): 38-56; Anal spines: 0; Anal soft rays: 16 - 18. Blackish-brown fading to light brown below; 1st dorsal fin with blackish-brown membrane, other fins brown or blackish-brown. A long, flat, sword-like bill and no pelvic fins.

4.6. Alien marine species occurring in Porto Palermo area

Alien species, also called biological invaders or nonindigenous species, are organisms that have been transported by human activity, accidentally or intentionally, into regions where they have not occurred historically.

Grape caulerpa (*Caulerpa racemosa var. cylindracea*): the invasive variety of *C. racemosa*, which has been spreading at a rapid rate throughout most of the Mediterranean Sea and the Atlantic, belongs to *C. racemosa var. cylindracea* (Sonder) Verlaque, Huisman et Boudouresque, an endemic taxon from the southwest coast of western Australia (Verlaque *et al.*, 2004; Ruitton *et al.*, 2005).

Following the first record in Vlora bay in 2002, it seems to be common in wide range of depths (1 - 35m) and substrata (sand, mud, rocks, and especially dead matte of Posidonia) along the Albanian coast (Kashta *et al.,* 2005,

2008; Maiorano *et al.*, 2011). Possible consequences of *Caulerpa racemosa* invasion include modifications of physical and chemical conditions (water movement, sediment deposition, substrate characteristics) and the underwater landscape, as well as profound modifications of benthic assemblages (Klein & Verlaque, 2008).

In the project area this species covers large area along north zone (at 26 - 27m depth) and small patches within the bay (from 4 m to 30 m depth).

Halophila stipulacea: this is the only seagrass introduced into the Mediterranean Sea as a Lessepsian immigrant, is nowadays common in the eastern Mediterranean. In the Albanian coast it is recorded in Ksamil, Saranda, Himara and Vlora bay (Kashta & Pizutto, 1995).

Nimble spray crab (*Percnon gibbesi*): it is a primarily an algivorous crab of the shallow infra-littoral rocky shore, with wide native range. *P. gibbesi* rapidly increased its spatial distribution in the Mediterranean Sea, after its first recording in 1999 in Italy. At present, this crab seems to have colonized most Mediterranean coasts, especially in the middle latitudes. Sightings were recorded along the Albanian coast in 2010 in different localities: Saranda, Porto Palermo, Dhermi, Himara Port, Shen Jani- Karaburun, Sazani Island. The invasion of this herbivore species in the shallow rocky infra-littoral of the Mediterranean Sea may add further stress to the already altered ecosystems (Katsanevakis *et al.*, 2011; Zenetos *et al.*, 2011).

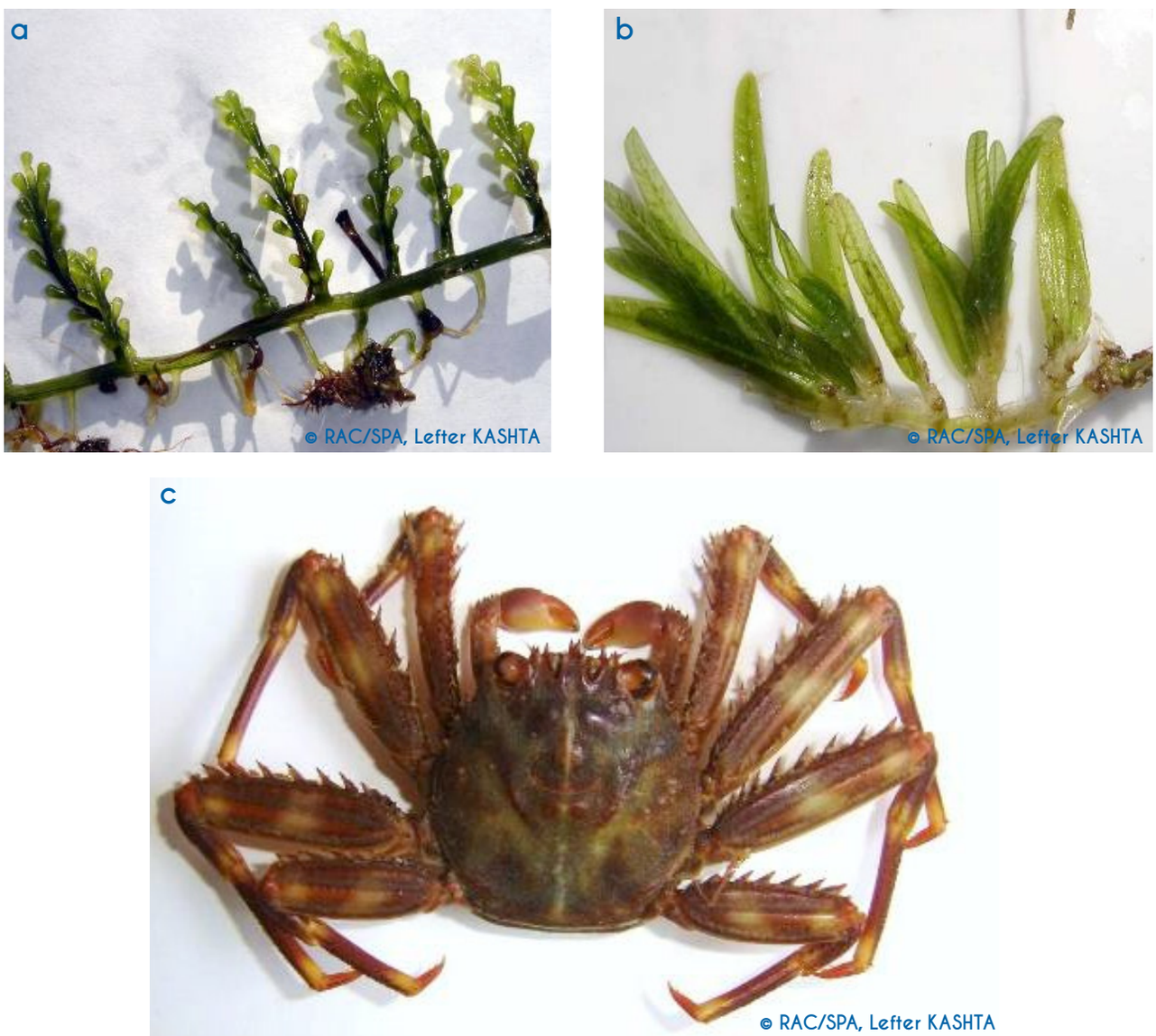


Figure 27. Alien invasive species in Porto Palermo: a. *Caulerpa racemosa var. cylindracea*; b. *Halophila stipulacea*; c. *Percnon gibbesi*

5. THE MAIN SOURCE OF THREATS TO THE PORTO PALERMO AREA

Fishing activities

After 1990, Porto Palermo base lost its military importance. Currently, this base is not included in the Distribution Plan of Army and military presence in it is symbolic. The base used only as moorings for Coast Guard and jetty in the southern part as used for anchoring fishing vessels for certain periods of time.

Fishing in the Gulf of Porto Palermo is a relatively less important activity. Due to the military limitations, fishing was a limited activity inside of the bay, as artisanal fishing after 1990.

The military presence is a deterrent for any illegal fishing activity inside of the bay. By the other hand, in front of the bay, fishing activity intensified mainly as bottom fishing where the main fishing boats are coming from Saranda and Vlora fleet, but often vessels from Durres, fishing in this area, in depth, because this is one of the best areas for fishing of rose shrimps (P*arapeneus longirostris*).

Table 3: List of economically important fish species occurring in and around the Porto Palermo bay

Species	English name	Albanian Name
Boops boops	Bogue	Vopa
Dentex dentex	Common dentex	Dentali
Diplodus annularis	Annular seabream	Sargu bishtzi
Diplodus puntazzo	Sharpsnout seabream	Sharan
Diplodus sargus	White seabream	Sargu
Diplodus vulgaris	Common two-banded seabream	Sargua
Epinephelus aeneus	White grouper	Kern i bardhe
Epinephelus caninus	Dogtooth grouper	Kern i hirte
Euthynnus alletteratus	Little tunny	Trup
Merluccius merluccius	European hake	merluci
Mullus barbatus	Red mullet	Barbuni I shkembit
Mullus surmuletus	Surmullet	barbuni i baltes
Pagellus acarne	Axillary seabream	Mormuri i eger
Pagellus bogaraveo	Blackspot seabream	Spalce e kuqe
Pagellus erythrinus	Common pandora	Pagri
Pagrus pagrus	Red porgy	Pagri
Polyprion americanus	Wreckfish	Kerr fundi
Sarda sarda	Atlantic bonito	Palamiti
Sardina pilchardus	European pilchard	Sardelë
Sardinella aurita	Round sardinella	Sardinele
Scomber japonicus	Chub mackerel	Skumber
Serranus cabrilla	Comber	Kerr i thellesise
Serranus hepatus	Brown comber	Kerr i gurit
Serranus scriba	Painted comber	Kerr bilbil
Sparus aurata	Gilthead seabream	Koce
Xiphias gladius	Swordfish	Peshku shtize

Inside the bay there is no boat or fishing boats that carry fishing activity, because the small size of the gulf itself and the prohibition of fishing activity provided by the legislation. Porto Palermo on the other side is an important site for refuge to the fishing boats from fishing ports of Vlora and Saranda, intermediate, for anchoring a good part of fishing vessels, which carry between the parts of them. Large fishing vessels Vlora, Saranda and other ports mainly use the port of Himara, but given the positioning of the Port of Himara (relatively exposed by South winds SE), Porto Palermo constitutes a safe anchorage, mainly for small vessels. However, the lack of port infrastructure (the Port Authority and border police) after anchoring, the bureaucratic procedures are longer. Officially, the jetties of Porto Palermo used only for emergency purposes in case of bad weather and after approval of the Port and border police Himara. Seabed is rocky with patches of Posidonia and with a variety of sponges, some Pinna shells but regretfully few fish.

Classification of fishing vessels as GFCM/33/2009/3 Implementation of the GFCM Task 1 Statistical Matrix includes the following types of vessels operating at Himara region and in front of Porto Palermo Bay:

Inshore boats

- Polyvalent small-scale vessels with engine less than 6 m. All vessels under 6 metres in length (LOA) with engine.
- Polyvalent small-scale vessels with engine between 6 and 12 metres. All vessels between 6 and 12 metres in length (LOA) with engine, that use different gears during the year without clear predominance of one of them or that use a gear not considered in this classification.

These boats operate a number of different gear types in the shallow near coast waters. The boats are typically fairly small (length: from 4 –8 meters, engine: 10 – 92 HP with an average of 20 HP) and are operated as a traditional vessel owner or family type concern with a crew of 1 to 2. The main cost item is fuel which counts for 74% of the operating cost; other costs include repair, new gear and various fees and charges.

Fishing effort has dropped from an average of 200 days to 170 days annually since 1992. A fishing trip is only six hours long as the fishing ground is close to the area. According to location, gear used and seasonality the catch varies in volume, as does the composition of species. Average catch per trip was said to be 12 kg, with an average price of 8 € per kg. Annual landings are thus calculated at 2.4 MT with a gross value of € 19000 per vessel. It is noted that the average price for the in-shore vessel catch is deemed to be slightly higher than for the other vessels due a better quality of product (e.g. the hook and line fishery catch).

Trawlers

- Trawlers between 12 and 24 m. All vessels, between 12 and 24 metres in length (LOA) allocating more than 50 percent of their effort operating with a demersal trawl.

Trawlers operate in shallow waters and with engine powers in the range 161-280kW. They are normally operated by the owner with a crew of 2-4. Due to the fairly short steaming time and the shallow draft, the engine power is more efficient than in the case of the other trawlers that operate in Albanian waters, where the fuel consumption per hour is higher to reach the same fishing grounds.

Average fishing effort is 40 –50 days per year in this area. Average catch per 10-hour trip is 350 - 450 kg. Fishing vessels, that fishing in this area are from Saranda (3) and Vlora (4). These fishing vessels carry out activities during June to September, while complying with the tourist season by selling products directly to the restaurants of the area. The annual catch ranges from 16,000 – 20,000 kg, and the average first-hand sale price is about 5 -6 € per kg. Other vessels from others port fishing during all the year in the waters in front of Porto Palermo, and this area is important for shrimps catches during the period from May to July.

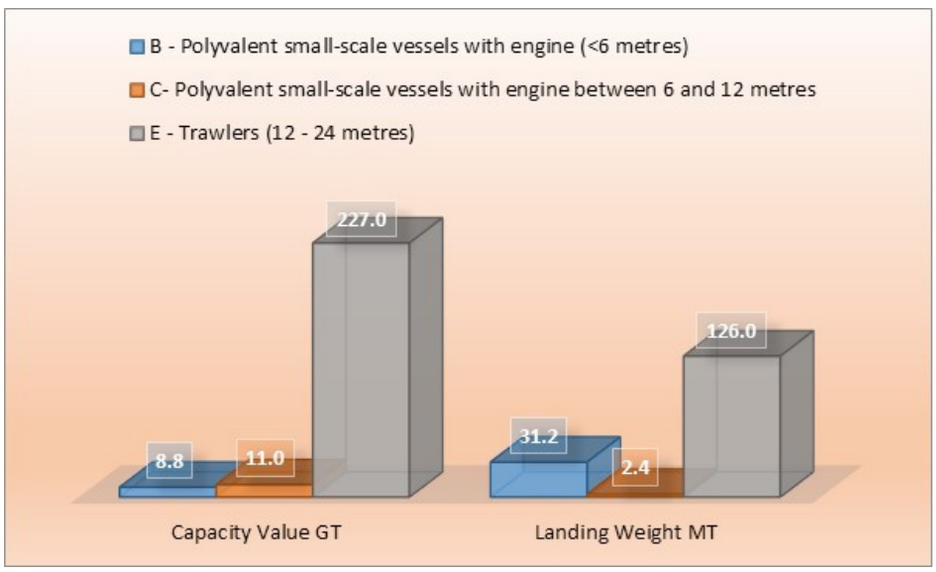
Boat type	Length	Number of boats	Landing value (Euro)
Polyvalent small-scale vessels	>6 m	13	247’000
Polyvalent small-scale vessels	6-12 m	1	12’000
Trawlers	12-24 m	7	840’000
Total		**21**	**1’099’000**

Based on FAO-AdriaMed methodology and data collected, in the table below is calculated the profit for small-scale fisheries at Porto Palermo bay. The amount of fuel cost and fixed cost are calculated by FAO-Adriamed for this kind of activity in all Adriatic countries. The data are updated based on actual fish price, yearly based.

Regarding trawlers, we are not able to prepare the same table because their activity in the area is seasonal and some fixed cost and taxes are yearly based.

(Values in €)

Item / Vessel category	In-shore	%
Turnover	19000	
Fuel cost	11936.2	74 %
Fixed costs	4193.8	26 %
Total operating costs	16130	100 %
Profit before depreciation	2,870	
Depreciation	500	
Profit before tax	2370	
Profit Tax (10)	237	
Profit after tax	2083	
Return	11.23 %	



Aquaculture

Marine aquaculture activity with cage culture started for the first time in Albania in 2003. The first permit in Porto Palermo bay was granted in 2004 for the development of marine aquaculture. Permission was granted for eight cages, in the southern part of the bay. In 2005, permission was renewed five-year term.

From the geographical point of view Porto Palermo bay is suitable for the development of marine aquaculture. The bay is protected, relatively deep which made the development of aquaculture in the bay to be economically convenient. In addition, circulation surface during the year pass on the outside of the bay from the South to the North (anticlockwise) drawing water from the Ionian to Adriatic Sea. This surface circulation causes a tenuous current inside bay in a clockwise, ensuring water circulation in the bay. Level and the strength of the superficial circulation is not measured.

Figure 28. Fish farm infrastructures within the Porto Palermo bay

The current legislation provides that the issuance of a permit for aquaculture walk through a public tender, following the request by an interested party. Before the race occurs if the area are, concerned it is used or intended to be used by any other sector in official documents or in the strategic plans of development. If the area in question is free, the area is published for public tendering.

In this concept, the process of issuing permits for aquaculture is relatively complete by legislation. Increased activity on Albanian seas leads to competition between sectorial interests, such as shipping and maritime transport, tourism, ports development, fisheries and aquaculture and environmental concerns. Sectorial approaches to the use of maritime resources lead to fragmented policy-making. This places constraints on maritime activities, reducing their potential for growth and impairing the capacity of public bodies to protect the marine environment.

The new law on Aquaculture, prepared with EU assistance foreseen the AZA (Allocation Zone for Aquaculture) Concept. AZA is a planning system aimed at integrating aquaculture activities into coastal zone areas with the other users and to avoid conflicts on the use of these areas. It is considered as a means to improve sustainable marine aquaculture in the Mediterranean. AZA is then essential to facilitate the coordination of competences among the different public agencies involved in aquaculture licensing and leasing procedures and monitoring.

AZA is intended any spatial planning system or zoning, carried out at local or national level; an AZA is also:

- a marine area where the development of aquaculture is prior to other uses.
- an area dedicated to aquaculture, recognized by physical or spatial planning authorities, that would be considered as a priority for local aquaculture development

The AZA should serve as a basis for the integration of aquaculture activities into the coastal and inland zone management and to meet sustainable development objectives within ecosystem perspectives. An AZA should be accompanied by an appropriate Environmental Monitoring Programme and the sustainability of an AZA should be considered within an EAA (Ecosystem Approach for Aquaculture).

Despite fisheries, at Porto Palermo bay, aquaculture is well developed. In this area, there are four companies; one of them is not active and one has not a valid permit since 2011:

No.	Name	Area (ha)	No. Cages	Status	Production (2012)	Permit validity
1	MIHAL KOKEDHIMA	0,4	8	active	12 mt	Not valid from 2011
2	JONIC SEA PRODUCTS INT	3.35	40	active	8 mt	31.12.2016
3	GJIKONDI	3.5	25	active	24 mt	16.09.2021
4	TORO-AS	1.5	10	Not Active	0	31.12.2018

Production usually sold in the summer period and producers adjust production cycle to be ready during the months from July to August, which coincides with the period of the tourist season.

The wholesale price from producers is about 6.3 - 6.5 USD/kg, while the retail price has varied at 7.3-7.5 USD/kg. Production does not pass through wholesale channels but is sold directly by producers to consumers, mainly restaurants of the area. Weight of fish varies from 220-330 g/piece and sometime 170 gr/piece.

- Mihal Kokedhima society is intense, where for a smaller surface and a smaller number of cages has a production of about 12 tons. In addition, the place where cages are installed is an area with poor currents and impact on the ecosystem is relatively high. The permit of this firm is over, but still working due to the lack law enforcement.
- Jonic Sea Products Int. is an international society with Israeli partner as majority. The activity of this society is low and the society has financial problems correlated with internal management of society.
- Akuakulture 21 has the contract for an area of 5 hectares. This society not start yet and legally, as TORO- AS, the contract has no validity. (Article 11/2/e of Regulation nr. 12 "On determining the procedures for the issuance of fishing permits and public competition for fishing activity in the sea, in inland water and marine and land aquaculture"
- Gjikondi society is the last one and now most productive.

Suggestions for the area

In the designation of Porto Palermo as Marine Protected Area, related to the fishery and aquaculture need to take into account these steps:

1. Enforcement MCS (Monitoring, Control and Surveillance) in order to guarantee the fishing ban in the bay;
2. Jetties to be used only for emergency for fishing boats and not during the summer. Large fishing vessels must to use the port of Himara for mooring and landing of product;
3. In the process of MPA management must to be involved the local fishermen, artisanal fishing groups (small scale fisheries), and to promote ecotourism and fishing tourism (pesca turismo) as a way to increase revenue and interest in the area ;
4. Complete legal process of cancellation of licenses to entities «TORO-AS» and «Aquaculture 21» ;
5. Mihal Kokëdhima subject take out the structure and cages, since the permit was finished in 2011 ;
6. Subjects whose aquaculture permit ends in 2018 and 2021 must to adopt their activities in accordance with the new status of the area. For this purpose, with approval of the new law on aquaculture, the subjects must to be treated in accordance with Article 51 of this law (support for Environmental Measures). For this purpose entities, under this law have the right to be compensated for the development of a «Sustainable aquaculture for Compliance with Environmental specific constraints resulting from the designation of the area as a protected area related to the Protection of Natural and Semi-Natural Habitats of Wild fauna and flora.

Illegal and uncontrolled fishing

Illegal fishing is a serious threat to fish, mussels, crustaceans and other communities in coastal and marine habitats during the two last decades in Porto Palermo area, like in the whole Albanian coast. Although some measures and legal instruments have been strengthened recently, the situation with illegal fishing is still far of being properly controlled.

Figure 29. Round holes into the meadows of Posidonia
possible marks of underwater explosions during past years

Destructive harvesting of date mussel

Illegal and destructive harvesting has caused the damage of rocky shore due to the illegal collection of the date mussel *Lithophaga lithophaga* along Ionian coast of Albania, until 6 - 10 m depth. The traces of this activity are evident from the characteristic holes of Lithophaga extraction in the rocks and stones in Porto Palermo area. Strong measures need to be undertaken to ensure banning of this activity, in order to avoid desertification of marine life along the rocky areas of the coast.

Figure 30. The jetty of Porto Palermo,
in front of the Ali Pasha Castle

Boat anchoring

As mentioned earlier in this report, Porto Palermo has been used as a marine base since after the Second World War until early '90. Additionally, during the two last decades it was used as a fishing harbor and yacht's jetty. Due to this, boat anchoring has continuously been affecting the bottom in the project area. At a depth from 15 and 25 m, along the muddy bottom in front of the docks of the harbor, a scattered meadow of Posidonia has been found, distributed along a series of rows partially covered by mud and a rich epiflora (Fig. 31).

Figure 31. Physical destruction of Posidonia
meadows, close to the harbor

Fires

The hills around the Porto Palermo bay are often burned by shepherds (Fig. 32), who believe that burning out all the pasture is the most effective and easiest way to improve them. This is a periodical high risk that may inhibit the re-appearance of natural vegetation, including the rare and endangered species of national and international concern.

Figure 32. Burned hill above the Llamani beach

Coastal constructions

Like in the whole Albanian coast, the illegal and uncontrolled tourist constructions occurred in Porto Palermo area, too, although with a lower pressure compared to nearby areas, such as Himara, Qeparo and Saranda. Recently, these constructions did not spare even the coastline, as it was also evidenced during this survey (fig. 33).

Construction activities along the coast cause permanent destruction and alteration of natural habitats, or decreases of habitat size and its fragmentation. Additionally, they destroy the coastal ecosystems by direct burial and siltation, which have a strong impact on marine populations, especially on benthos.

Figure 33. Illegal construction in Porto Palermo coast

Cattle grazing

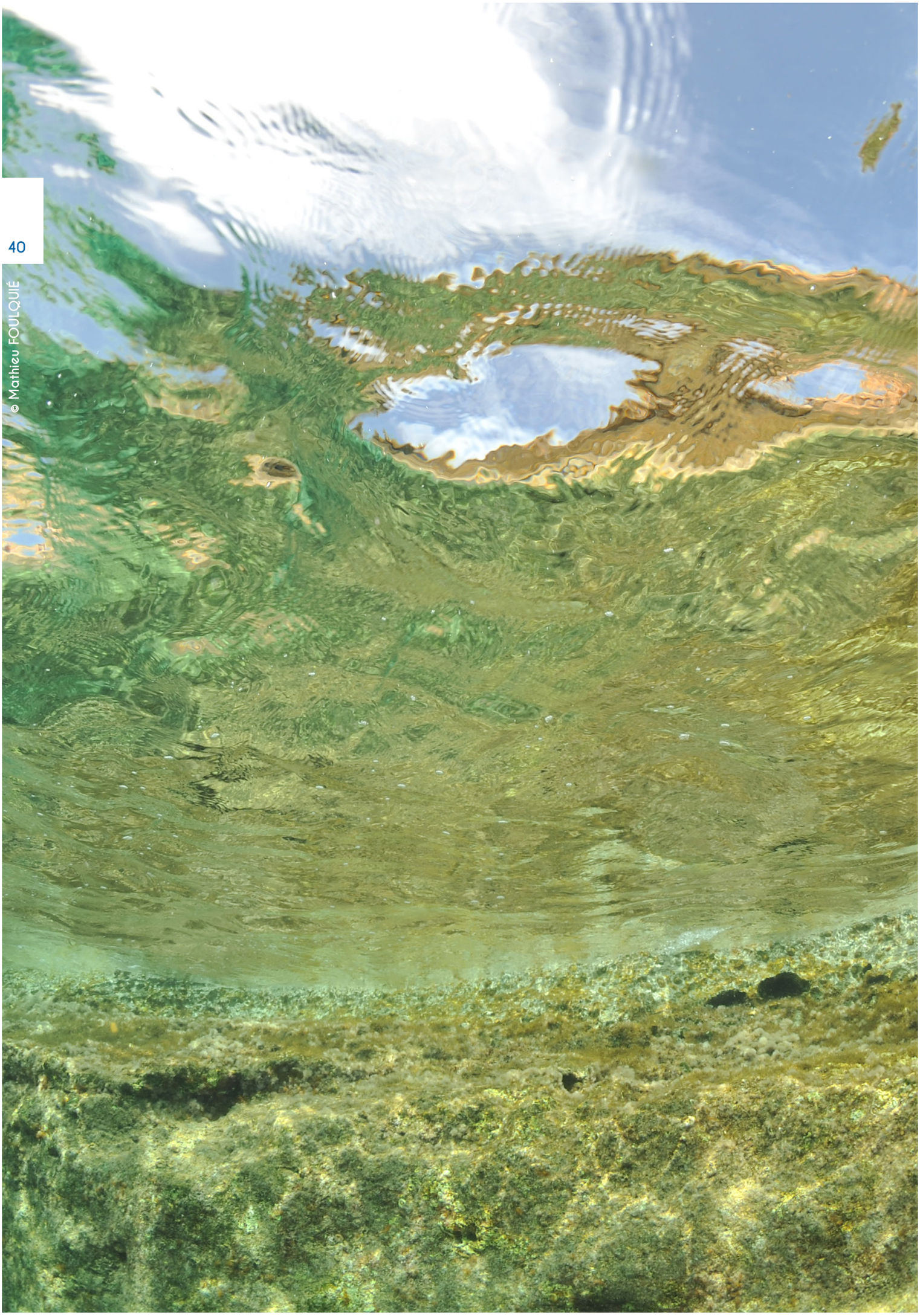
During two last decades the use of Porto Palermo area for cattle grazing was totally uncontrolled. Grazing has often affected the sensitive habitats and was spread quite close to the coast line. Although the grazing impact has not been assessed in this area, it is a potential threat for sensitive and endangered habitats and species, if it is not controlled and managed as soon as possible.

Invasive Species

A potential threat to marine biodiversity is that of invasive species *Caulerpa racemosa var. cylindracea* that is widely dispersed in Porto Palermo area, like in the whole Mediterranean basin, including the Albanian coast of Ionian Sea. As reported by a number of marine biologists, this invasive species is decreasing the biodiversity values of the invaded sea waters. Experimental work (Piazzi *et al.*, 2001a; Piazzi & Cinelli, 2003; Balata *et al.*, 2004) has shown that *C. racemosa var. cylindracea* invasions have a great impact on Mediterranean macroalgal assemblages on dead mattes of *Posidonia oceanica* and rocky bottoms, with greater impact on the former.

Despite the limited presence of the two other alien species, the seagrass Halophila stipulacea and the Nimble spray crab Percnon gibbesi in Porto Palermo area, their potential impact should be taken into account and measures against their distribution, as well as against other potential invasive species, should be addressed. This is much more relevant if this area will be proclaimed as an MPA in a near future.

Figure 34. Cattle grazing on the hill of Ali Pasha Castle in Porto Palermo



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6. INDICATORS AND KEY PARAMETERS FOR MONITORING THE ENVIRONMENTAL SITUATION

Indicators and key parameters for monitoring the environmental situation in a MPA are closely related with the principles of its conservation and management. They may vary in number and methodologies, but usually they are related with:

- Changes in abundance of relevant marine features and habitats;
- Presence and absence of species;
- Introduced and invasive species;
- Physical – chemical parameters of water quality.

In the following there are two examples of biological indicators.
Indicator: Impact on *Posidonia oceanica* meadow
Parameters: Coverage, shoot density, general density, baring, fragmentation.

Estimation of the negative effect of anthropogenic factors (such as anchoring, coastal construction work, bottom trawling, sewage, etc.) on seagrass meadow has to be done by comparing the values attained by selected indicators in sites where this factors are in force, with natural variability of this descriptors.
Reference: Conception M-D., Bernard G., GARSIA-Charton J. A. & Peres-Ruzafa A. 2000: Methods for studying impact on *Posidonia oceanica* meadow. In: introductory guide to methods for selected ecological studies in marine reserves. Goni R., Harmelin-Vivien M., Badalamenti F., Le Direach L., Bernard G. edit., GIS Posidonia publ.

Indicator: Ecological Evaluation Index (EEI) - see Panayotidis *et al.*, 2003.

The phytobenthos is mentioned in the Framework Directive for the Water Policy (WFD, 2000/60/EC) as one of the three quality elements, proposed for the classification of the Ecological Status (ES) of coastal and transitional waters.
Parameters: Composition and abundance of the hard bottom phytobenthos (green, brown and red algae) in the upper infralittoral zone (0- 50 cm depth).

Based on the calculated indexes the sampling stations may range in classes of ecological status from "Low" to "High", in terms of the Water Framework Directive 2000/60/EC.
Reference: Panayotidis P., Montesanto B. & S. Orfanidis. 2003: Phytobenthos as quality element for the evaluation of the ecological status: a case study of the implementation of the water frame directive (2000/60/ec) in the Mediterranean eco-region - Actes du deuxieme symposium Mediterranean sur la vegetation marine (Athens, 12-13 December 2003).

Caretta caretta & Cymodocea nodosa © Gérard PERGENT

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8. LIST OF FISH SPECIES

CODE	Species	English name	Albanian Name
AHN	*Anthias anthias*	Swallowtail seaperch	Shkerp kuqalosh
MGR	*Argyrosomus regius*	Meagre	Ame
GAR	*Belone belone*	Garfish	Peshku lejlek
BOG	*Boops boops*	Bogue	Vopa
OUB	*Bothus podas*	Wide-eyed flounder	Shkoter kukuvajke
GSM	*Buglossidium luteum*	Solenette	Gjuhez e verdhe
GUU	*Chelidonichthys lucerna*	Tub gurnard	Gjel i hirte
MLR	*Chelon labrosus*	Thicklip grey mullet	Qefulli i dimrit
CMK	*Chromis chromis*	Damselfish	Peshk gështënje
CBQ	*Chromogobius quadrivittatus*	Chestnut goby	Burdullak
COE	*Conger conger*	European conger	Ngjale e eger
COL	*Corallium rubrum*	Red coral	Korali i kuq
COU	*Coris julis*	Mediterranean rainbow wrasse	Peshk bari
RDC	*Dasyatis centroura*	Roughtail stingray	Nështëlie
JDP	*Dasyatis pastinaca*	Common stingray	Shkotërr
DLP	*Delphinidae*	Dolphin	Delfinet
DEC	*Dentex dentex*	Common dentex	Dentali
DEP	*Dentex gibbosus*	Pink dentex	Ballori
DEL	*Dentex macrophthalmus*	Large-eye dentex	Dentali symadh
BSS	*Dicentrarchus labrax*	European seabass	Levreku
SPU	*Dicentrarchus punctatus*	Spotted seabass	Levreku pikalosh
ANN	*Diplodus annularis*	Annular seabream	Sargu bishtzi
SHR	*Diplodus puntazzo*	Sharpsnout seabream	Sharan
SWA	*Diplodus sargus*	White seabream	Sargu
CTB	*Diplodus vulgaris*	Common two-banded seabream	Sargua
DNT	*Donax striatus*	Shellfish	vongola
DXL	*Donax trunculus*	Shellfish	Vongola, midhja buzeshare
ECH	*Echiichthys vipera*	Lesser weever	Ranxh helmues, dreq i vogel i detit
GPW	*Epinephelus aeneus*	White grouper	Kern i bardhe
EFJ	*Epinephelus caninus*	Dogtooth grouper	Kern i hirte
LTA	*Euthynnus alletteratus*	Little tunny	Trup

CODE	Species	English name	Albanian Name
GUG	*Eutrigla gurnardus*	Grey gurnard	Gjel gri
RGL	*Gymnura altavela*	Spiny butterfly ray	Aeroplanke
BRF	*Helicolenus dactylopterus*	Blackbelly rosefish	Shkerp i thellesise
HXT	*Heptranchias perlo*	Sharpnose sevengill shark	Peshkaqen me dhembe
SBL	*Hexanchus griseus*	Bluntnose sixgill shark	Peshkaqen kokeshtypur
HPI	*Hippocampus guttulatus*	Long-snouted seahorse	Kal deti turigjate
HPH	*Hippocampus hippocampus*	Short snouted seahorse	Kal deti turishkurter
HDR	*Hirundichthys rondeletii*	Black wing flyingfish	Dallendyshe krahezeze
SQM	*Illex coindetii*	squid	Totani
SMA	*Isurus oxyrinchus*	Shortfin mako	Peshkaqen tonil
LMA	*Labrus merula*	Brown wrasse	Menulla
	Labrus mixtus	Cuckoo wrasse	Peshk pavode
WRV	*Labrus viridis*		Peshk bari
POR	*Lamna nasus*	Porbeagle	Tonil
GLR	*Lepadogaster candollei*	Connemarra clingfish	Ngjitesi njollekuqe
GLP	*Lepadogaster lepadogaster*	Shore clingfish	Sqepok
LDV	*Lepidotrigla cavillone*	Large-scaled gurnard	Gjel deti me grope
GOF	*Lesueurigobius friesii*	Fries's goby	Burdullak
	Leucoraja circularis	Sandy ray	Raje e rrumbullaket
LEE	*Lichia amia*	Leerfish	Lojba
SSB	*Lithognathus mormyrus*	Sand steenbras	Murra
LFF	*Lithophaga lithophaga*	date shells	Gureshpuesi
MGA	*Liza aurata*	Golden grey mullet	Veshari
MGC	*Liza ramada*	Thinlip grey mullet	Qefulli i vjeshtës
LZS	*Liza saliens*	Leaping mullet	Veshverdhi
SQR	*Lolig vulgaris*	squid	kallamari i bute
ANK	*Lophius budegassa*	Blackbellied angler	Henez deti
MON	*Lophius piscatorius*	Angler	peskatrice
HKE	*Merluccius merluccius*	European hake	merluci
MRK	*Microchirus ocellatus*	Foureyed sole	Gjuhez brezake
MMI	*Microstoma microstoma*	Slender argentine	Symadhja
MOX	*Mola mola*	Ocean sunfish	Hana
MUF	*Mugil cephalus*	Flathead grey mullet	Qefulli i veres
MUT	*Mullus barbatus*	Red mullet	Barbuni I shkembit
MUR	*Mullus surmuletus*	Surmullet	barbuni i baltes
MSM	*Mytilus galloprovincialis*	Mussels	midhje
OCC	*Octopus vulgaris*	Common Octopus	Oktapodi
SBS	*Oblada melanura*	Saddled seabream	Melanur

CODE	Species	English name	Albanian Name
ODL	*Oedalechilus labeo*	Boxlip mullet	Buzemadhi
OYF	*Ostrea edulis*	European flat oyster	ostrika
SBA	*Pagellus acarne*	Axillary seabream	Mormuri i eger
SBR	*Pagellus bogaraveo*	Blackspot seabream	Spalce e kuqe
PAC	*Pagellus erythrinus*	Common pandora	Pagri
RPG	*Pagrus pagrus*	Red porgy	Pagri
QAR	*Parablennius gattorugine*	Tompot blenny	Peshk guri
QAV	*Parablennius incognitus*	Blenny	Barburiq deti
	Parablennius sanguinolentus	Rusty blenny	Peshk bari
DPS	*Parapenaeus longirostris*	Shrimps	karkaleci
LPZ	*Patella spp*	Limpet	patela
SJA	*Pecten jacobaeus*	Scallop	pekten
OAM	*Solea impar*	Adriatic sole	Gjuhez deti
SOS	*Solea lascaris*	Sand sole	Gjuhez e Adriatikut
TGS	*Penaeus kerathurus*	Caramote prawn	karkalec toke
GFB	*Phycis blennoides*	Greater forkbeard	Peshk-fik i bardhë
FOR	*Phycis phycis*	Forkbeard	Peshk-fik i zi
FLE	*Platichthys flesus*	European flounder	Ushojze e zeze
	Polyprion americanus	Wreckfish	Kerr fundi
OZO	*Posidonia oceanica*	Mediterranean tapeweed	Bar deti
TUR	*Psetta maxima*		rombi
RZV	*Ranzania laevis*	Slender sunfish	Peshk lepur
RBX	*Rhinobatos rhinobatos*	Common guitarfish	Peshk kitarë
	Rostroraja alba	White skate	Raxhe
BON	*Sarda sarda*	Atlantic bonito	Palamiti
PIL	*Sardina pilchardus*	European pilchard	Sardelë
SAA	*Sardinella aurita*	Round sardinella	Sardinele
SLM	*Sarpa salpa*	Salema	Salpe
CBM	*Sciaena umbra*	Brown meagre	Korb i zi
MAS	*Scomber japonicus*	Chub mackerel	Skumber
BLL	*Scophthalmus rhombus*	Brill	Bishtmellenjeza
EZS	*Scorpaena elongata*	Slender rockfish	shkerp kuq
MZS	*Scorpaena maderensis*	Madeira rockfish	Shkerp i kuq
SNQ	*Scorpaena notata*	Small red scorpionfish	Shkerp i hirte
BBS	*Scorpaena porcus*	Black scorpionfish	Shkerpi
RSE	*Scorpaena scrofa*	Red scorpionfish	Shkerp i kuq
SYC	*Scyliorhinus canicula*	Small-spotted catshark	Mice-deti
SYT	*Scyliorhinus stellaris*	Nursehound	Dac-deti
CTC	*Sepia officinalis*	Common Cuttlefish	Sepia
AMB	*Seriola dumerili*	Greater amberjack	Gofa

CODE	Species	English name	Albanian Name
CBR	*Serranus cabrilla*	Comber	Kerr i thellesise
SRJ	*Serranus hepatus*	Brown comber	Kerr i gurit
SRK	*Serranus scriba*	Painted comber	Kerr bilbil
SOL	*Solea solea*	Common sole	Gjuhez kanali
SBG	*Sparus aurata*	Gilthead seabream	Koce
YRS	*Sphyraena sphyraena*	European barracuda	Shtize
SPZ	*Sphyrna zygaena*	Smooth hammerhead	Peshkkarabiner
BPI	*Spicara maena*	Blotched picarel	Maridhe e zeze
SPC	*Spicara smaris*	Picarel	Maridhë
BRB	*Spondyliosoma cantharus*	Black seabream	Kantari
SPR	*Sprattus sprattus*	European sprat	Papaline
SUT	*Squatina oculata*	Smoothback angelshark	Skadhine
	Squilla mantis		cikale
SVW	*Symbolophorus veranyi*	Large-scale lantern fish	Buzoc i hirte
YFC	*Symphodus cinereus*	Grey wrasse	Peshk bari
YFX	*Symphodus mediterraneus*	Axillary wrasse	Peshki gjelbert
YFX	*Symphodus melanocercus*		Peshk bari
YFM	*Symphodus melops*	Corkwing wrasse	Peshk bari
YFO	*Symphodus ocellatus*		Peshk bari
YFX	*Symphodus roissali*	Five-spotted wrasse	Buzoc i zi
YFX	*Symphodus rostratus*		Peshk bari
YFX	*Symphodus tinca*	East Atlantic peacock wrasse	Peshk jeshil
KSY	*Synapturichthys kleinii*	Klein's sole	Gjuhez turke
SHQ	*Syngnathus abaster*	Black-striped pipefish	Gjilpërëza shiritazezë
SGQ	*Syngnathus acus*	Greater pipefish	Gjilperez
SGP	*Syngnathus phlegon*		Gjilperez
STX	*Syngnathus tenuirostris*	Narrow-snouted pipefish	Gjilperez turigjate
STQ	*Syngnathus typhle*	Broadnosed pipefish	Gjilperez
TWL	*Tellina spp*		telina
TGV	*Tetragonurus cuvieri*	Smalleye squaretail	Peshku lime
TMP	*Thalassoma pavo*	Ornate wrasse	Peshk pallua
TTR	*Torpedo marmorata*	Marbled electric ray	Peshk elektrik i mermerte
TTV	*Torpedo torpedo*	Common torpedo	Peshk elektrik
POP	*Trachinotus ovatus*	Pompano	Lojbe pikaloshe
WEG	*Trachinus draco*	Greater weever	Dreq deti
HMM	*Trachurus mediterraneus*	Mediterranean horse mackerel	Stavridh mesdhetar
JAA	*Trachurus picturatus*	Blue jack mackerel	Stavridh kanali
HOM	*Trachurus trachurus*	Atlantic horse mackerel	Stavridh

CODE	Species	English name	Albanian Name
LHT	*Trichiurus lepturus*	Largehead hairtail	Peshk shirit
GUN	*Trigla lyra*	Piper gurnard	Peshk gjel
POD	*Trisopterus minutus*	Poor cod	Peshk lakuriq
COB	*Umbrina cirrosa*	Shi drum	Korb i bardhe
UUC	*Uranoscopus scaber*	Stargazer	Peshk çibuk
VEV	*Venus verrucosa*		Tartufi i detit
SWO	*Xiphias gladius*	Swordfish	Peshku shtize

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