MONTENEGRO
MINISTRY OF SUSTAINABLE DEVELOPMENT AND TOURISM

UNEP MAP RAC/SPA

MEDKEYHABITATS PROJECT

Montenegro: Platamuni and Ratac areas

Summary report of the available knowledge and gap analysis

Financed by:
MAVA FONDATION POUR LA NATURE

NOTE: The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of UNEP/MAP-RAC/SPA concerning the legal status of any State, Territory, city or area, or of its authorities, or concerning the delimitation of their frontiers or boundaries. The views expressed in this publication do not necessarily reflect those of UNEP/MAP-RAC/SPA.

For bibliographic purposes, this volume may be cited as:

UNEP/MAP-RAC/SPA, 2016. Montenegro: Platamuni and Ratac areas. Summary report of the available knowledge and gap analysis. By Torchia G., Pititto F., Rais C., Trainito E., Badalamenti F., Romano C., Amosso C., Bouafif C., Dragan M., Camisassi S., Tronconi D., Mačić V., Sghaier Y.R. & Ouerghi A. Ed. RAC/SPA - MedKeyHabitats Project, Tunis: 32 p.

Graphic design : Zine el Abidine MAHJOUB - www.zinetoon.com and Yassine Ramzi SGHAIER.

Cover photos credit: Egidio Trainito

This document has been edited within the framework of the MedKeyHabitats Project "Mapping of key marine habitats in the Mediterranean and promoting their conservation through the establishment of Specially Protected Areas of Mediterranean Importance (SPAMI)"

In partnership with : Golder Associates IBM

The MedKeyHabitats Project is implemented with the financial support of MAVA Foundation.

MAVA FONDATION POUR LA NATURE

Available from:
www.rac-spa.org

Montenegro: Platamuni and Ratac areas
Summary report of the available knowledge and gap analysis

MKH
MEDKEYHABITATS

Study required and financed by:

Regional Activity Centre for Specially Protected Areas (RAC/SPA)
Boulevard du Leader Yasser Arafat
B.P. 337
1080 Tunis Cedex - Tunisia

In charge of the study:

Atef OUARGHI, MedKeyHabitats Project, RAC/SPA

Yassine Ramzi SGHAIER, MedKeyHabitats Project, RAC/SPA

Milena BATAKOVIĆ, Environmental Protection Agency of Montenegro

Scientific responsible of the study:

Giovanni Torchia (Golder) - Senior Project Manager and Project Director
Francesco Pititto (Golder) - Project Manager
Chedly Rais (Okianos) - Senior technical review of the work and preparation of the assessment report for SPAMI list
Egidio Trainito (Golder consultant) - Marine photographer and expert in marine biology and taxonomy
Fabio Badalamenti (IAMC) - Senior consultant
Chiara Romano (Scripps Institution of Oceanography) - Senior consultant
Cecilia Amosso (Golder) - Bibliographic research and review
Cyrine Bouafif (Faculty of Science - University of Tunis) - Preparation of the SDF for the two study areas
Massimo Dragan (Golder) - Senior Expert in GIS and cartographic data management
Stefano Camisassi (Golder) - Database and WebGIS expert
Davide Tronconi (Golder) - GIS Expert
Vesna Mačić (Institute of marine biology General biology) - Marine Biology Expert

Reference of the study:

MedKeyHabitats n° 9/2015

TABLE OF CONTENTS

TABLES

FIGURES

ACRONYM AND ABBREVIATIONS

°C	Celsius degrees
‰	One thousand percent
AD	Anno Domini
ASFA	Aquatic Sciences and Fisheries Abstracts
cm	Centimeters
cm/s	Centimeters per second
DD	Data deficit (sensus IUCN)
EEC	European Economic Community
EN	Endangered (sensus IUCN)
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
GDP	Gross domestic product
HMZS	Institute for Hydro-Meteorology and Seismology
IUCN	International Union for the conservation of Nature
km	Kilometer
LC	Least Concern (sensus IUCN)
LOA	Length Over All
m	Meter
MPA	Marine Protected Area
NE	Not Evaluated (sensus IUCN)
PD	Project Director
PM	Project Manager
psu	Practical salinity unit
RAC/SPA	Regional Activity Centre for Specially Protected Areas
SPA/BD Protocol	Protocol Concerning Specially Protected Areas and Biodiversity in the Mediterranean
SPAMI	Specially Protected Areas of Mediterranean Importance
UNEP	United Nation Environmental program
VU	Vulnerable (sensus IUCN)

© RAC/SPA, Arafet Ben Marzou

1.0 INTRODUCTION

Golder Associates S.r.l. (hereinafter referred to as "Golder") has been appointed by the Regional Activity Centre for Specially Protected Areas (RAC/SPA) to complete a study in two pilot sites on the coast of Montenegro. These sites are located in Platamuni and Ratac areas. The study is aimed at mapping marine habitats to establish distribution maps of key habitats in the selected pilot sites and provide concerned authorities with necessary measures for their conservation within the Project "Mapping of key marine habitats in the Mediterranean and promoting their conservation through the establishment of Specially Protected Areas of Mediterranean Importance (SPAMI) - (MedKeyHabitats project).

1.1 Scope of work

The overall scope of the project, defined in the RAC/SPA tender document, is to map the marine key habitats in the Platamuni and Ratac areas and to initiate in both areas monitoring networks of the marine key habitats, in particular *Posidonia* meadows and coralligenous biocenosis. In addition within the framework of the project, on-the-job training will be provided for local experts.

The present **Phase I** of the project consists in collecting available data in order to perform a **summary review** and a **gap analysis** highlighting the most relevant gaps in knowledge for the study areas. These actions will allow to create a baseline of current knowledge in the study areas and to detail the field activities to be carried out for the identification, distribution and characterization of marine key habitats and for the setting up of monitoring networks of the marine key habitats.

2.0 STUDY AREAS

The study focuses on two pilot sites:

- Platamuni: the study area in the Kotor municipality, goes from Žukovac Bay and Seca Albaneze in the north to Cape Platamuni in the south, approximately 10 km straight coast length, from the coast to a maximum depth of 50 m (total area of about 7 km^2) (Figure 1);
- Ratac: in the Bar municipality, approximately 1 km straight coast length, from the coast to a maximum depth of 25 - 30 m (total area of about 0.5 km^2) (Figure 1).

The preliminary study areas presented in the figures below were elaborated based on available bathymetric data (http://www.emodnet.eu/bathymetry).

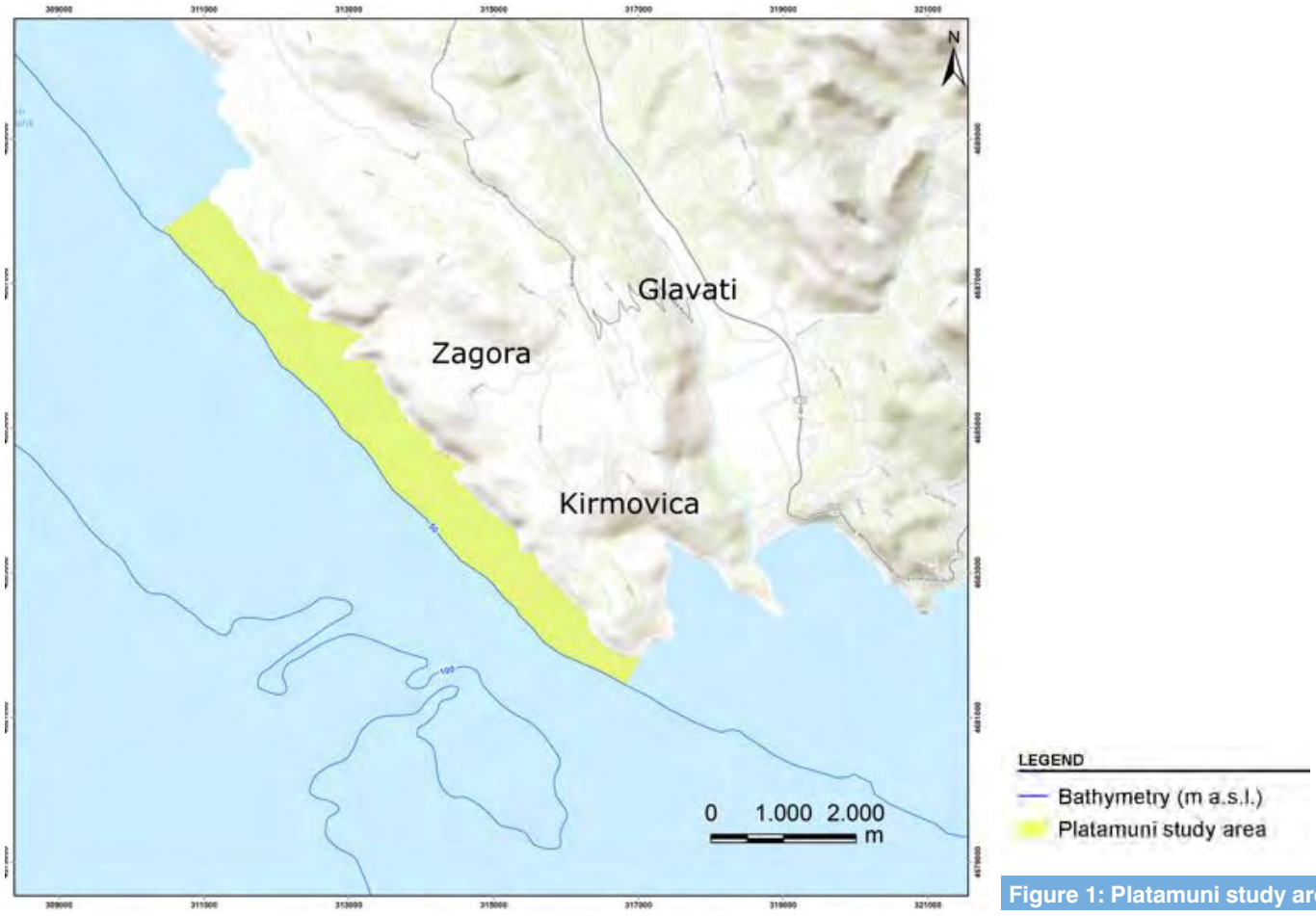


Figure 1: Platamuni study area

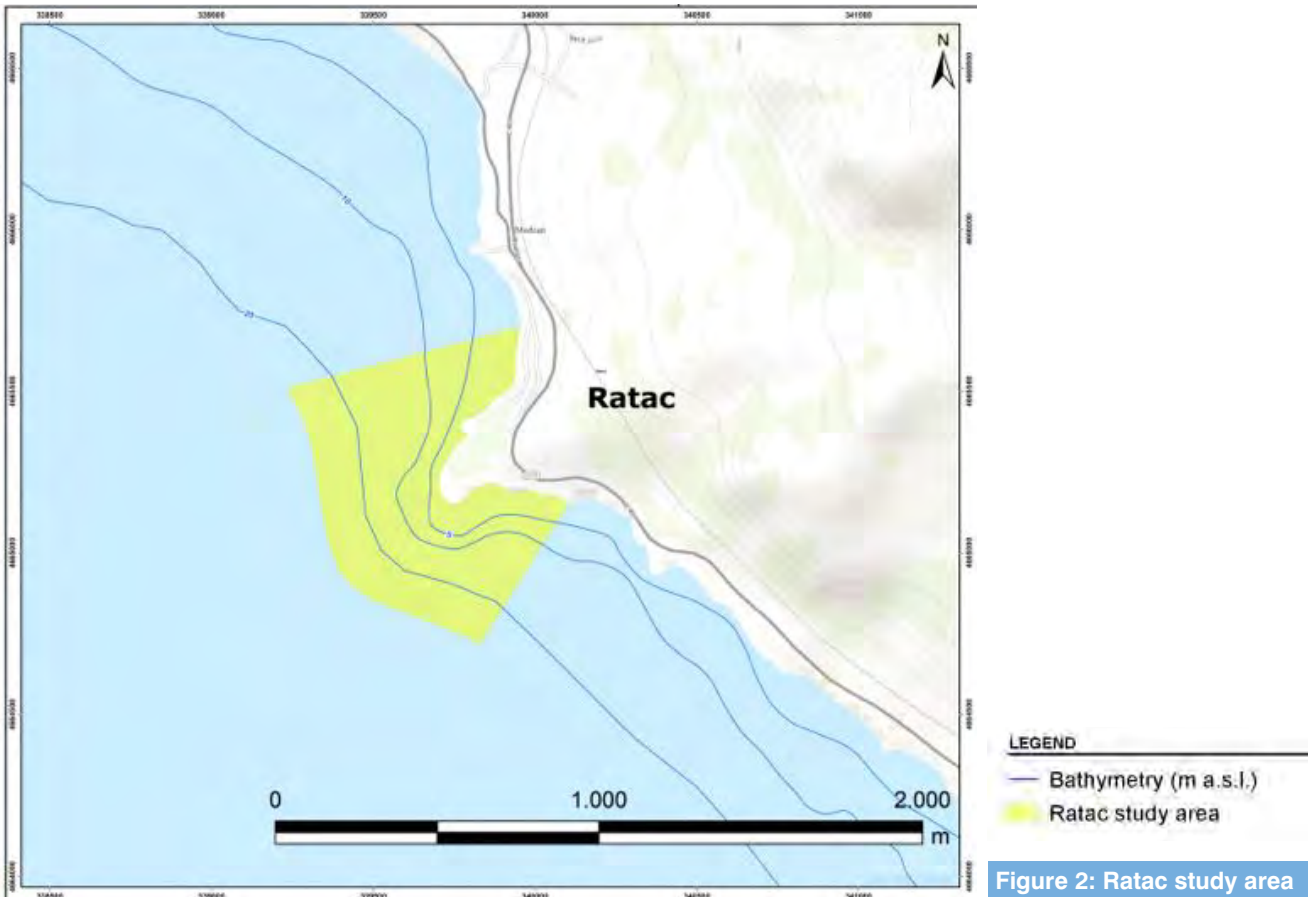


Figure 2: Ratac study area

3.0 METHODOLOGY FOR THE BIBLIOGRAPHIC REVIEW

In order to establish a preliminary description of Physical and biological features of the study areas, as well as the potential impacts and threats, a literature research was performed. The research was carried out with the support of databases of peer-reviewed literature (e.g. Scopus, ASFA, Google Scholar). The following main data sources were considered:

- scientific literature and "grey" literature;
- previous ecological and fishery studies conducted in the study area;
- national and international environmental database (including data from FAO international projects);
- other relevant data and information already available to National experts (Marine Biology Institute of Kotor).

The results of the literature research for the southern Adriatic and the Montenegrin coast in general and for the two study areas are described in the present summary report and organized in three main subjects:

- geophysical, geomorphological and oceanographic features;
- biological features (plankton, benthos, fish assemblages, habitats and biodiversity);
- land and sea uses, human impacts and potential threats.

The following step was a gap analysis between available information and the information needed for the identification of marine key habitats and their management within the two pilot sites.

This analysis was conducted prior to the field survey, in order to identify the main gaps in knowledge and potential areas of interest to be investigated in more detail during the surveys. During the gap analysis the data available for each main subject were analyzed and assessed for both Platamuni and Ratac pilot sites on two aspects:

- available information typology and sources, and
- deficiency / GAP analysis and required studies.

4.0 THE SOUTHERN ADRIATIC SEA AND THE MONTENEGRIN COASTS

4.1 Geophysical and geomorphological and oceanographic features

Montenegro coast belongs to the south-eastern part of the Adriatic Sea. The total coastal line of Montenegro is 293 km. It consists of a wider variety of rocks, including carbonates, flisch and volcaniclastites. In general, the coast line is characterized by calcareous rocky shores with sub-vertical and vertical cliffs sloping abruptly down to 20-30 m depth on a mosaic of gravel, sand and mud, intermingled with small pebble/gravel beaches or creeks with gentler slopes (RAC/SPA-UNEP/MAP, 2011).

The thermohaline properties of the Adriatic Sea are determined mainly by the air-sea interaction, water exchange through the Otranto Strait, river discharge, mixing, currents, and topography of the basin.

The current dynamics of the Southern Adriatic is dominated by the presence of a quasi-permanent cyclonic gyre that in the winter season creates the conditions for the open-ocean convection and the production of dense and oxygenated waters (Ovchinnikov *et al.*, 1985; Bignami *et al.*, 1990; Malanotte-Rizzoli, 1991).

The average amplitude of the tidal waves in the southern Adriatic is 25 cm.

Due to the large volume of water, the temperature in winter does not fall below 12 °C. In the summer, inshore waters warm up to 27 °C or more, and during the winter an isotherm that extends to the open sea is present. The south Adriatic is 8-10 °C warmer than its central and northern parts during winter. In other seasons the horizontal temperature distribution is more uniform. Generally, the open sea is warmer than the coastal waters.

Salinity of the Adriatic is relatively high and its ranges are significant. In the southern part, salinity varies between 38.4 to 38.9 psu, and is especially high in the intermediate layer. The average transparency of the Adriatic Sea is 17.6 m in winter to 20.8 m in summer (Agencija za zaštitu životne sredine, Crna Gora, 2014).

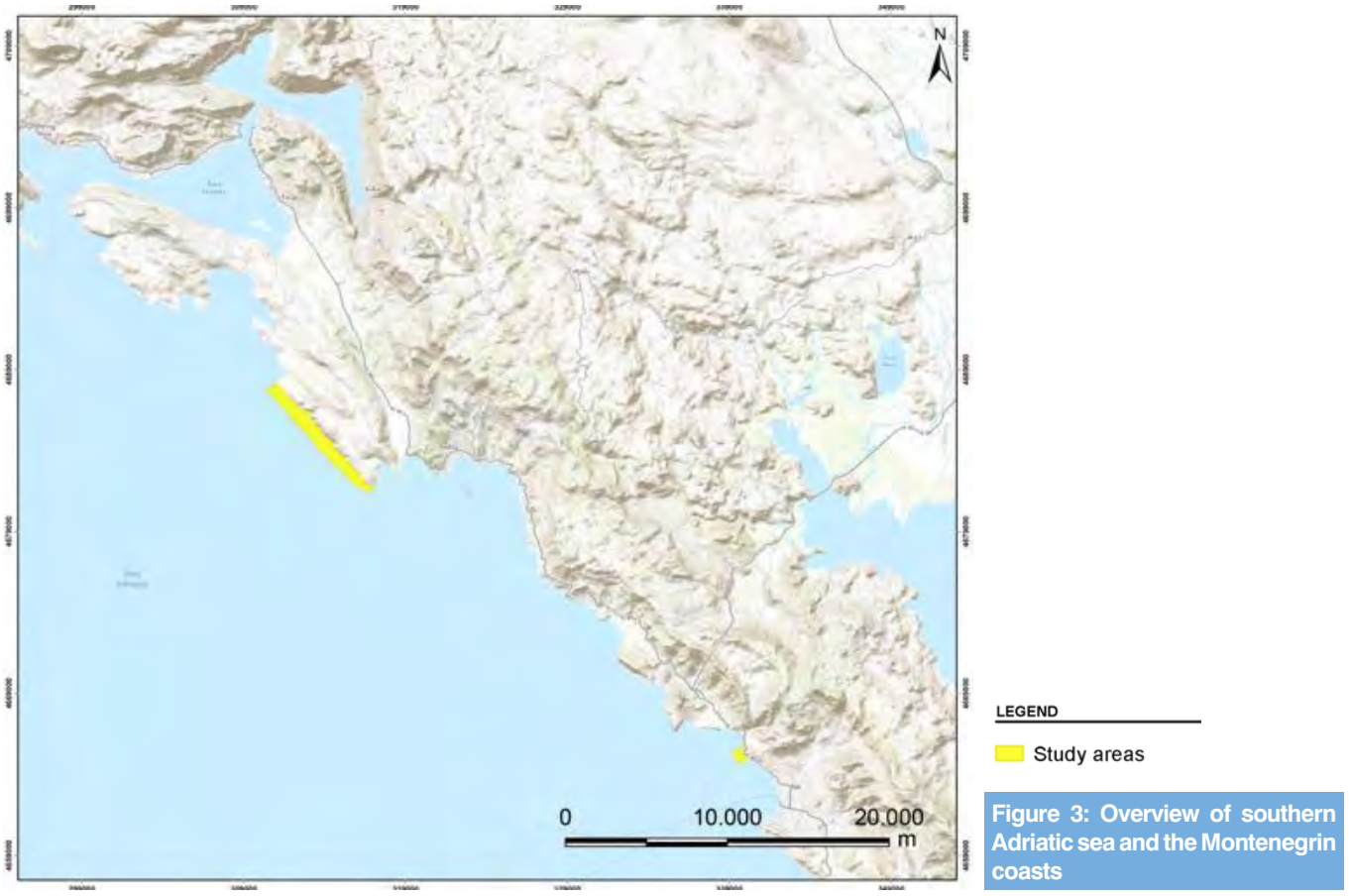


Figure 3: Overview of southern Adriatic sea and the Montenegrin coasts

4.2 Biological features

Available data on **plakton** in Adriatic Sea show that coastal and open waters of the south Adriatic are the richest areas in the Adriatic Sea. They are characterized by holoplankton. Zooplankton of open sea shows a high diversity of fauna but a small biomass in part of open water above the greatest depths, and significantly high values of biomass in epipelagic waters above the continental shelf (Vukanic and Vukanic, 2003)

According to different scientific studies, the plankton composition and dynamic of the along Montenegrin coast is influenced by extensive use of the littoral zone and increasing development of tourism (Drakulovic and Vuksanovic, 2010), effects of climatic change (Lucic *et al*., 2009; Pestorić *et al*., 2010) and freshwater inputs particularly from the Buna/Bojana River system (Marini *et al*., 2010).

The **benthic assemblages** surveyed along the coast of Montenegro are diverse and typical of the infralittoral of Mediterranean hard and soft substrate (RAC/SPA-UN*EP/MAP*, 2011; Kruzic and Benkovic, 2008; Despalatović *et al.*, 2010; Nikolić *et al.*, 2010, Legac and Brenko, 1999; Falace *et al.* 2010).

The upper part of the infralittoral is rocky and Algal coverage is generally scanty because most of this zone is often characterized by a coralline barren dominated by sea urchins and encrusting algae (RAC/SPA-UNEP/MAP, 2011). Sea urchin grazing has led to the disappearance of photophilic algal assemblages from a large part of the Montenegrin coast. Close to the surface, clear signs of date-fishing (*Lithophaga lithophaga*) are present in many areas.

The lower part of the infralittoral is often covered by well-preserved *Posidonia oceanica* meadows, together with pristine sciaphilous assemblages, where the slope or the complexity of the substratum is high (RAC/SPA-UNEP/MAP, 2011).

The midlittoral is often characterized by the presence of *Mytilus* spp., with a rich assemblage of predators, including the starfish *Coscinasterias tenuispina* and the mollusc *Stramonita emastoma.*

At the base of the reefs at depths of between 16 m and 20 m colonies of large sized *Axinella cannabina* are present. In the south part of the country, at such depths, water transparency is reduced and a cloud of mud is often observed close to the cliff foot, a possible effect of the Bojana river.

According to Falace *et al.* (2010), in recent years in the Adriatic Sea there has been a change in macroalgal assemblages. Important changes involve the structure of the algal communities, e.g. migration of sciaphilous macroalgae in shallower waters, a reduction in habitat-forming species (mainly *Cystoseira* spp., and *Sargassum* spp.), together with an increase in Rhodophyta and opportunistic species. The current species composition might be related to both a reduction in light penetration and an increase in the sedimentation rate.
The number of **fish species** reported for the Adriatic Sea is 418 species, representing 120 families, which amounts to 72 % of the known species and subspecies of the Mediterranean (in total about 581 species and subspecies) (Dulčić *et al*., 2013).

During the last 25 years, changes in the quantitative and qualitative composition of the Adriatic ichthyofauna have been noted. These observations can be related to oceanographic changes in the Adriatic Sea, but it is also likely that biological invasion (particularly as a consequence of the construction of the Suez Canal), overfishing by humans, and the consequent changes in the balance of the food chain, have had a significant impact on fish populations in the Adriatic over the last decades (Dulčić, 2003).

RAC/SPA-UNEP/MAP (2011) detected 38 fish species along the Montenegro coast. The three species more abundant were shoaling species like *Chromis chromis*, *Boops boops* and *Spicara smaris*, followed by *Symphodus ocellatus, Oblada melanura, Serranus cabrilla, Diplodus vulgaris* and *Salpa salpa*.

The average richness (number of species) found was of 13.8 species/250 m^2, similar to the one reached in comparable studies along the Mediterranean. However, overall low fish abundance (number of specimens) was found along the Montenegrin coast. This was particularly true for sedentary species, probably more affected by harmful fishing practices. It is also remarkable the low abundance and size of species with high commercial value (*Epinephelus* spp., *Diplodus* spp., *Sparus aurata, Dentex dentex*).

The following **marine habitats** or biocenosis are present along the Montenegrin coast according to Badalamenti *et al.* (2012):

1. Barren = encrusting coralline algae and sea urchins *Arbacia lixula* and *Paracentrotus lividus*
2. Boulders barren = same as above plus large boulders
3. Cladocora caespitosa reefs = *Cladocora caespitose* assemblage
4. Coralligenous assemblages = Large boulders with dominance of *Halimeda tuna, Parazoanthus axinellae* and sponges
5. Infralittoral algal turf assemblages
6. Infralittoral gravel assemblages
7. Infralittoral mud assemblages
8. Infralittoral mud and gravel assemblages
9. Infralittoral pebble assemblages
10. Infralittoral sand assemblages
11. Large sponge assemblage with *Geodia, Aplysina* and *Petrosia*
12. Mussel bed assemblage
13. Photophilic algae assemblage with *Cystoseira* spp. and *Halopteris* spp.
14. Photophilic algae assemblage with *Cystoseira* spp.
15. Photophilic algae assemblage with *Padina pavonica*

16. *Posidonia oceanica*
17. Rubble and turf assemblage with *Codium* sp.
18. Sciaphilic algae assemblages on hard substrata = Rocky substrates dominated by *Codium bursa* and *Flabellia petiolata*
19. Sciaphilic algae assemblages on hard vertical/subvertical substrata with *Flabellia petiolata* and *Halimeda tuna*
20. Sciaphilic algae assemblages on hard substrata with *Flabellia petiolata* and *Peyssonnelia* spp.

In addition, recent studies performed in Kotor Bay (RAC/SPA-UNEP/MAP, 2013) highlighted the importance of this Montenegrin bay for its biological and ecological unique characteristics. Inventory of benthos species counted 77 soft bottom taxa and 150 hard bottom taxa. A total of 23 fish species belonging to 7 families were observed. In addition, 21 different benthic habitats were identified in the bay, including *Savalia savaglia* facies, coralligenous assemblages *Cladocora caespitosa* and large-sized sponges (*Axinella* spp.) (Annex II of SPA/BIO Protocol).

Figure 4 a.: Dead *Cladocora* colonized by benthonic species

Figure 4 b.: *Savalia savaglia* colonies (RAC/SPA-UNEP/MAP, 2013)

4.3 Land and sea uses, human impacts and potential threats

Fishing, and to a much greater extent, tourism, are the two main human activities along the coast. In general the coast seems to be in good conservation status, especially on rocky areas, however in many locations high proportion of barren see bottom were observed. The possible causes are overfishing, with the use of explosives and date harvesting and sea urchin overgrazing due to decrease in number, after intensive fishing, of large sea urchin predators such as a number of sea bream species (RAC/SPA-UNEP/MAP, 2011).

The Montenegrin fisheries sector accounts for about 0,5 % of GDP (Gross Domestic Product) and employs around 400 people (full and part time), excluding mariculture and the fish processing sector (European Commission, 2013). The fisheries sector is mainly small scale without industrial fishing. Montenegro's fleet consists of: 2 fishing vessels over 24 m Length Over All (LOA), 17 fishing vessels up to 24 m LOA, 4 fishing vessels longer than 12 m LOA, and 90 fishing vessels up to 10 m LOA, bringing the total number of vessels to 113 (European Commission, 2013).

Four main fishery ports are present in Montenegro: Bar, Budva, Herceg Novi and Kotor (inside the Boka Kotorska Bay). The fish is sold usually in market stalls and in restaurants, since these ports are not characterized by organized landing sites or fish auction markets.

Fishing gear used in small-scale coastal fishing includes: trawl nets, gillnets, trammel nets, traps for fish and crustaceans, floating (surface) and bottom long-lines, harpoons and angles for squids. Very few data are available about the catches of artisanal fisheries. In 2011 according to official data, 174 tons of pelagic fish and 344 tons of demersal fish were caught in Montenegro (European Commission, 2013).

The main commercial fish species are: European hake (*Merluccius merluccius*), red mullet (*Mullus barbatus*), breams (*Pagellus* spp.), whiting (*Merlangius merlangus*), anglerfish (*Lophius budegassa* and *Lophius piscatorius*), commons sole (*Solea vulgaris*), horned octopus (*Eledone cirrhosa*) and musky octopus (*Eledone moschata*), common cuttlefish (*Sepia officinalis*), European squid (*Loligo vulgaris*), Norway lobster (*Nephrops norvegicus*) and deep-water rose shrimp (*Parapenaeus longirostris*) (Vergoc *et al.*, 2004).

The Adriatic Sea and the Montenegrin coast could also be seriously impacted by the rapid expansion of tourism and the future plans for tourism infrastructure (RAC/SPA-UNEP/MAP, 2011). Pollution from untreated sewage may be a problem in the near future following the development of tourist infrastructure and the general increase in human pressure along the coast. The dumping of soil from road construction or improvement is also becoming a serious problem and the negative effects on marine life need to be considered.

UNEP/MAP-RAC/SPA report from 2009 also highlighted the main impacts on coastal areas most impacted by climate change which include:

- change of precipitation pattern, saltwater intrusion, changes of ecosystem functioning: Coastal lagoonsand lowlands: Tivat Salina, Buljarica marsh/bay, Velika plaza-Stoj-Knete-Ada Bojana, Bojana river estuary;
- change of mass movements, impacts on ecosystem functioning: Bay of Kotor, Platamuni, Katici island, Stari Ulcinj island;
- introduction of termophilous species: Bay of Kotor, port of Bar, Ulcinj - Milena Port, Bojana river estuary;
- conversion in permanent marine, salted waters: Bojana river estuary, Knete and Port Milena, Buljarica marsh, Jaz river, Tivat salina, Morinj bay.

5.0 THE PLATAMUNI AREA

5.1 Geophysical, geomorphological and oceanographic features

The study area of Platalumi is characterized by vertical and less vertical carbonates limestone cliffs (Radović, 1964; RAC/SPA-UNEP/MAP, 2011) that descend steeply down to 20-30 (40) m depth in the sea, and therefore the isobath of 50 m is located at a relatively short distance from the coastline. In the area of Platamuni rocks are sedimentary, represented by limestone, dolomitic limestone and dolomite.

The carbonates generate quite specific coastal forms due to geological structure, erosion and karstification. This creates a series of forms such as caves and holes of different dimensions, fissures, boulders, small coves or bays (Agencija za zaštitu životne sredine, Crna Gora, 2014). In deeper areas rocky bottom is sparse and more often the seabed is covered by sand. In particular five marine caves of different shape and dimensions and three pebble beaches were observed in the area (Mačić, 2014).

In the study area sea currents are influenced by the currents of the southern Adriatic, that have a top speed of 42 cm/s (inflow velocity) and 88 cm/s (outflow velocity) (Agencija za zaštitu životne sredine, Crna Gora, 2014). The main surface current has a SE to NW direction with a speed of 42 cm/s, following the coast.

Waves are more common in winter from the north (January - March) or south (November), and generally have a height of 0.5 to 1.5 m. Waves higher than 1.5 m are rare and occur from the south. Waves higher than 4.5 m were registered but are even more uncommon.

The salinity of the sea water at the investigated stations (Institute for Marine Biology - Kotor) was 38.30 to 38.48 ‰, and on the high seas to 39 ‰.

5.2 Biological features

The information presented in this section derive mostly from a study performed in 2014 and titled "Feasibility Study and Plan for Establishing a marine protected area Platamuni" (Agencija za zaštitu životne sredine, Crna Gora, 2014).

5.2.1 Plankton

No specific data on plankton are available from literature for of Platamuni area.

Planktonic composition and dynamics along Platamuni coast are probably similar to those of Montenegrin coast in general. However, inside marine cave particular species of plankton different from the species present in the open sea could be found (Bussotti *et al.*, 2006).

5.2.2 Benthos

The **supralittoral zone** in the study area is only a few meters wide and it is mostly constituted by the continuation of well-developed maquis.

The **mediolittoral zone** of the study area is mainly characterized by solid rock surface, with only three small pebble beaches. The southern part of the area the cliffs are tens of meters high above the sea level and continue under water almost vertically, which is a specific habitat for many organisms.

Due to the inclination of the rocks the mediolittoral is a relatively narrow band. The algae *Cystoseira amentacea*, mixed with *Cystoseira compressa*, were found in abundance in the area demonstrates the good quality of sea water and good conservation status of the habitat (Agencija za zaštitu životne sredine, Crna Gora, 2014).

The large number of young *Mytilus galloprovincialis* was observed in the *Cystoseira* that could indicate a worsening in the condition of the biocenosis (Mačić *et al.*, 2010). This mussel is a species with higher ecological potential that can displace the algae of the genus *Cystoseira*, especially the sensitive *C. amantacea*. Also predator species such as the starfish *Coscinasterias tenuispina* and the snail *Stramonita haemastoma* were observed in this area.

After a narrow zone of mediolittoral in good conservation status with communities of brown algae, the rocky surface largely continues in barren rocky biocenosis in many locations. In this area the rocky surface is partially covered with calcified algae, while other algae are very rare or completely absent. The dominant benthonic species are sea urchins *Paracentrotus lividus* and *Arbacia lixula*, and in some places and sponge *Chondrilla nucula* (Agencija za zaštitu životne sredine, Crna Gora, 2014). These large barren areas are the result of the destructive and illegal collection of date mussels and overfishing performed also with explosive devices (Agencija

za zaštitu životne sredine, Crna Gora, 2014; RAC/SPA-UNEP/MAP, 2011). The significant reduction in size and number of predatory fish species leads to an increase in the number of sea urchins that graze on algae.

The **infralittoral zones** that are covered with seagrasses (*Posidonia oceanica*) and photophilic algae considerably stretched in the area of Seke Albaneze and Cape Kostovica; while the community of small shrubs algae is dominant in the area of the Cape Platamuni, St. Nicholas and large and small Krekavice. *P. oceanica* upper limit was 11 m, while the lower limit is 24 m (Agencija za zaštitu životne sredine, Crna Gora, 2014). The shallowest upper limit is recorded for the location Seka Albaneze and bays Nerin, precisely in places where the sea floor slopes gently. At other locations, it was something deeper and that, in most cases after a rocky substrate, which is more or less covered with algae.

Particular **marine caves** benthonic communities were identified in 5 main caves along coastline of the study area from Cape Platamuni to Cape Žukovac (ca. 10 km) during a recent survey (Mačić, 2014).

This area is characterized by the presence of many smaller holes. Marine caves are considered important and endangered habitat since they are a particular ecosystem and their rock walls are characterized by specific benthonic communities of marine invertebrates and algae (Bussotti *et al.*, 2006): the yellow cup (*Leptopsammia pruvoti*); a number of multi-colored sponges that lives in completely dark caves (e.g. *Chondrosia reniformis*); cave shrimp (*Stenopus spinosus*); Neptune's lace (*Reteporella grimaldii*); leopard goby (*Thorogobius ephippiatus*); tunicates and many others. The complex of two small caves and neighboring beaches situated in the bottom of the inlet Velika Krekavica is also considered very important as potential habitat for monk seals (Mačić, 2014).

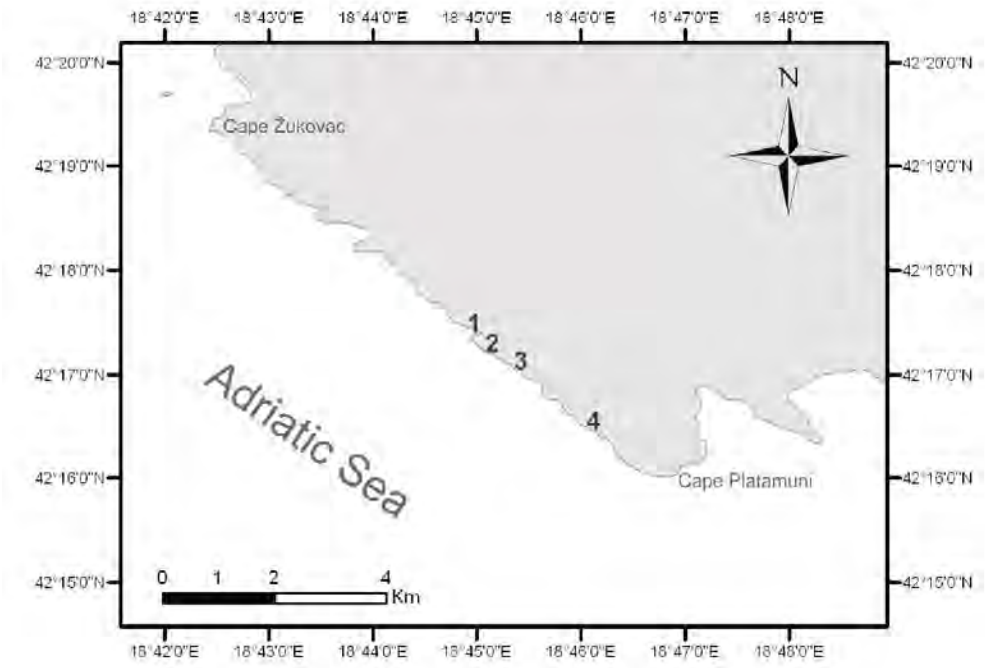


Figure 5: Distribution of marine caves in the area of future MPA Platamuni (1. inlet Velika Krekavica, 2. Saletova cave, 3. Krekavica, 4. close to St. Nikola)
(Source: Mačić, 2014)

5.2.3 Fish assemblage

The fish species observed within the study area are indicated in Table 1 (Agencija za zaštitu životne sredine, Crna Gora, 2014). The fish community present in the area is characteristic of the Mediterranean. Species with commercial value or important for diving tourism were observed only in low number and small size (e.g. *Epinephelus* sp., *Diplodus* sp., *Sparus aurata*). This situation may be the result of overfishing and in particular of illegal fishing activities that are known to take place in the area.

In general, the most numerous species of fish were members of the family Labridae, Sparidae and Serranidae (Agencija za zaštitu životne sredine, Crna Gora, 2014). The most abundant species observed was Boops boops, a small pelagic fish that moves in large groups.

The carbonates coastline from Cape Platamuni to Cape Žukovac is considered important nursery area for fish, especially groupers due to the abundance of caves and holes (Mačić, 2014).

Table 1: fish pecies observed within the study area

Family	Species
Apogoninae	*Apogon imberbis*
Centracanthidae	*Coris julis*
Centracanthidae	*Spicara maena*
Centracanthidae	*Spicara smaris*
Congrinae	*Conger conger**
Gobiinae	*Gobius auratus*
	Gobius bucchichi
	Gobius cruentatus
	Gobius geniporus
	Gobius vittatus
	Thorogobius epiphiatus
	Thorogobius macrolepis
Labridae	*Labrus bimaculatus**
	*Labrus merula**
	Symphodus doderleini
	Symphodus mediterraneus
	Symphodus melanocercus
	Symphodus ocellatus
	Symphodus roissali
	Symphodus rostratus
	Symphodus tinca
	Thalassoma pavo
Mullidae	*Mullus surmuletus*
Muraenidae	*Muraena helena*
Phycidae	*Phycis phycis*
Pomacentridae	*Chromis chromis*
Salariinae	*Lipophrys nigiceps*
	Parablennius gattorugine
	Parablennius zvonimiri

Family	Species
Scorpaeninae	*Scorpaena maderensis**
	*Scorpaena notate**
	*Scorpaena porcus**
	*Scorpaena scrofa**
Serranidae	*Anthias anthias*
	*Epinephelus costae**
	*Epinephelus marginatus**
	Serranus cabrilla
	Serranus scriba
Sparidae	*Boops boops*
	Diplodus annularis
	*Diplodus puntazzo**
	*Diplodus sargus**
	*Diplodus vulgaris**
	Oblada melanura
	Pagrus pagrus
	Sarpa salpa
	*Sparus aurata**
	Spondyliosoma cantharus
Trpiterigiidae	*Trpiterigyon delaisi*

* Species of commercial value or important for diving tourism

5.2.4 Habitat and biodiversity

The sea bed map released by Realised by Planetek Italia s.r.l. and from satellite imagery acquired in late spring 2012 (and a small portion in spring 2010) reports the presence in the study area of a narrow strip of rocky bottom along the coastline followed by extended areas of sand/soft bottom. Scattered densely vegetated patches are also present in the first meters from the coast.

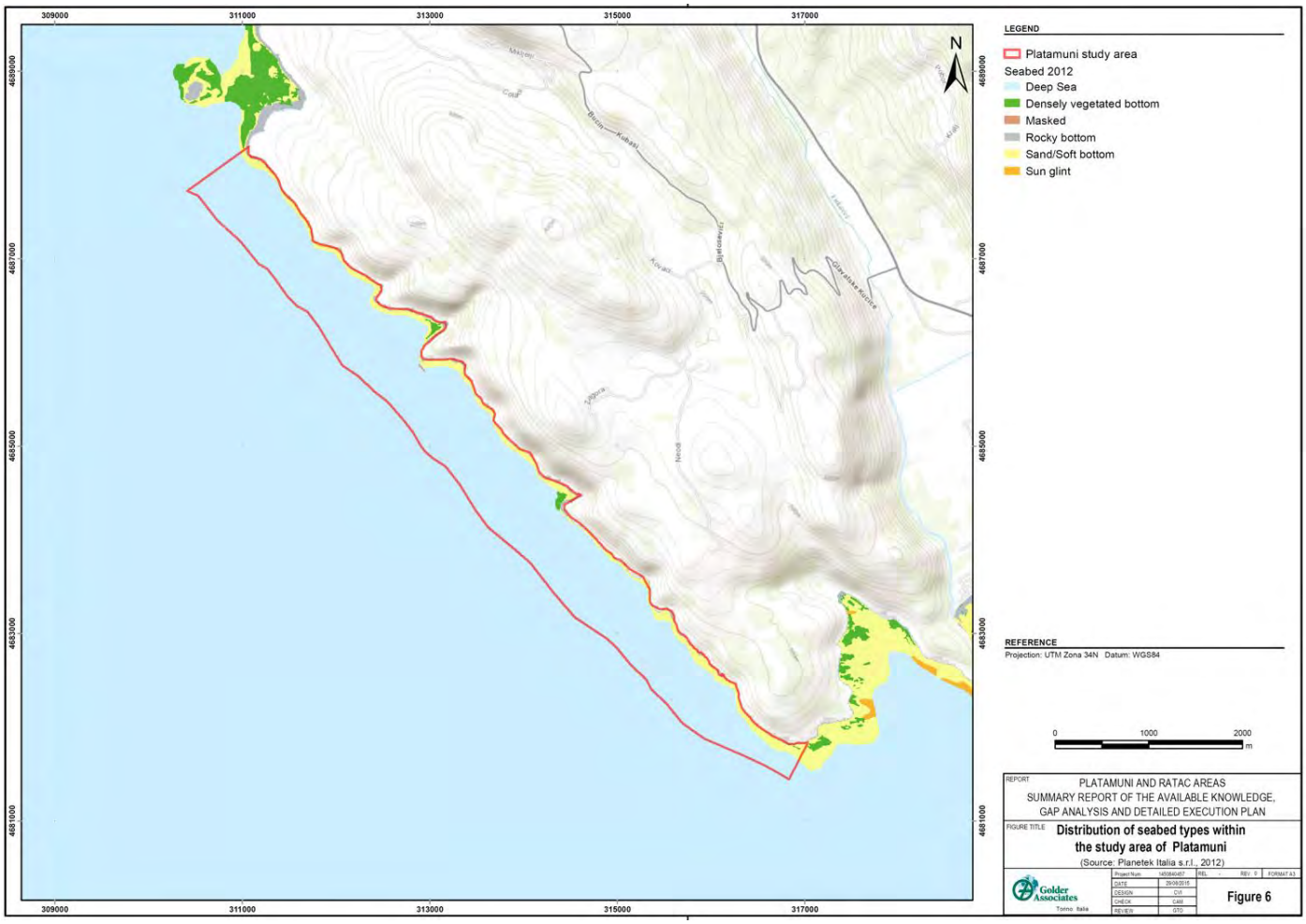


Figure 6: distribution of seabed types within the study area of Platamuni (Source: Planetek Italia s.r.l., 2012)

The presence of different biocenoses and associations (categorization by UNEP/MAP-RAC/SPA, 2015 found in the Platamuni area is shown in Table 2. These data demonstrate a large diversity and complexity of the study area. A detailed in depth analysis would certainly result in more extensive list of habitats present (Agencija za zaštitu životne sredine, Crna Gora, 2014). The presence in the area of *P. oceanica* meadows and sea caves needs to be highlighted, because these are priority habitats under the EU Habitats Directive (Habitat Directive 92 /43/EEC) and under the Barcelona Convention (UNEP-MAP-RAC/SPA, 2015).

Table 2: marine habitats found in the study area

Code	Description
I.3.	Stones and pebbles
I 4.1.	Biocenosis of supralittoral rock
II 3.1.	Biocenosis of mediolittoral coarse detritic bottoms
II 4.2.	Hard beds and rocks
II 4.2.1.	Biocenosis of the upper mediolittoral rock
II 4.3.	Mediolittoral caves
III 2.2.1.	Association with *Cymodocea nodosa* on well sorted fine sands
III 3.1.	Biocenosis of coarse sands and fine gravels mixed by the waves
III 5.1.	*Posidonia oceanica* meadows
III 6.1.	Biocenosis of infralittoral algae
III 6.1.1.	Overgrazed facies with encrusting algae and sea urchins
III 6.1.19	Association with *Cystoseira spinosa*
III 6 1.2.	Association with *Cystoseira amentacea* (var. *amentacea*, var. *stricta*, var. *spicata*)
III 6.1.20.	Association with *Sargassum vulgare*

The species identified in the study area that are protected at national or international level are listed in the Table 3 (Agencija za zaštitu životne sredine, Crna Gora, 2014).

Dolphins and sea turtles were also observed several times in the study area (personal comm. from locals), but these incidental observations have never been formally reported.

Table 3: listed species observed in the study area

Taxa	Specie	Barcelona convention (Annex)	IUCN	Bern convention (Annex)	Protected by national law
Magnoliophyta	*Posidonia oceanica*	II	LC	I	x
Heterokontophyta	*Cystoseira amentacea* var. *stricta*	II	NE	I	x
	Cystoseira spinosa	II	NE	I	x
Rhodophyta	*Lithophyllum lichenoides*	II	NE	I	x
Porifera	*Axinella demicornis*		NE		x
Cnidaria	*Cladocora caespitosa*	II	DD		x
Echinodermata	*Centrostephanus longispinus*	II	NE	II	x
	Paracentrotus lividus	III	NE	II	
	Ophidiaster ophidianus	II	NE	II	x
	Holothuria forskali		LC		x
	Holothuria polii		LC		x
	Holothuria tubulosa		LC		x
Mollusca	*Lithiphaga lithophaga*	II	NE	II	x
	Pinna nobilis	II	NE		x
	Luria lurida	II	NE	II	x
	Tonna galea	II	NE	II	x
Crustacea	*Scyllarides latus*	III	DD	III	
	Scyllarus arctus	III	NE	III	
	Palinurus elephas	III	VU		
	Homarus gammarus	III	LC		
Pisces	*Epinephelus marginatus*	III	EN	III	

The exotic algae species *Womersleyella setacea* was found in different locations within the study area (Fant *et al.*, 2013). This alga is considered invasive since it can cover large areas of the seabed and sometimes sessile organisms. It poses a potential high threat to biodiversity (Mačić, 2008). The presence of invasive algae *Caulerpa cylindracea* and of the alien blue crab (*Callinectes sapidus*) (Mačić & Kljajic, 2012) was also observed in the area.

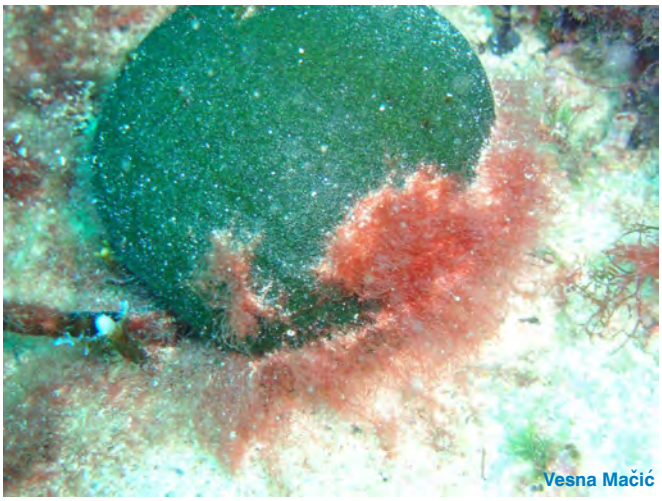


Figure 7: exotic algae species *Womersleyella setacea*

Figure 8: invasive algae *Caulerpa cylindracea*

Figure 9: alien blue crab (*Callinectes sapidus*)

5.3 Land and sea uses, human impacts and potential threats

Though belonging to the municipality of Kotor, the study area is geographically much closer to the bay of Budva. In the vicinity of the study area there are three villages: Glavatičići, Zagora and Krimovica. On the basis of data on natural, landscape and cultural values, the area from the Cape Platamuni has been identified as EMERALD site within the EMERALD network in Montenegro.

After the Second World War 504 inhabitants lived in this area, this number declined slightly to 446 inhabitants in 1971, while in the period from 1971 to 1991, there was a drastic depopulation of the area and the population was reduced to 139. The last two decades the population has stabilized and recorded a slight growth.

The study area is characterized by a rich cultural heritage in the sea and on land. Underwater cultural heritage is represented by the remains of a shipwreck from Hellenistic period in the Kalafat rim, today known as Seca Albaneze and Cape Platamuni. Petrified remains of amphorae (I century AD), which indicates the possible existence of an ancient shipwreck, are also visible. In addition, near Cape Platamuni at depth of 71m there are the remains of the steamer Carlotta, made by George Brown & Company in 1914 in Scotland.

On land there are numerous archaeological sites (burial mounds - tumuli), sacral buildings (fourteen churches and a monastery) and cultural landscape constituted by the agglomeration of traditional houses in small rural settlements.

The study area is preserved from anthropogenic influence and no main infrastructures are present. This is primarily due to the inaccessibility of the terrain and the unsuitability for construction and touristic exploitation. A quarry, organized beaches (Trsteno and Ploce), and other illegal tourist facilities (Žukovac bay, inland bays Nerin, Marovic pile) are present in the vicinity of the study area.

Legal fishing and illegal fishing activities (fishing with explosives, collecting date mussels and other marine organisms, unauthorized fishing with underwater gun, use of various illicit means for fishing) are also practiced in the area (Agencija za zaštitu životne sredine, Crna Gora, 2014; RAC/SPA-UNEP/MAP, 2011). The effects of overfishing are visible on fish and benthos communities. Detailed information on fished quantities and fishing gear used in the area are not available. Commercial species captured in this area are listed below[1].

[1] During this phase, considering the data already available from literature, no further investigation on local fishery was performed. These data will be collected during the field surveys planned allowing to better coordinate the information deriving from the interview with local fishermen with the data collected geomorphology, on marine habitats and species

© RAC/SPA, Arafet Ben Marzou

Table 4: Main species of commercial value used in the area

Taxa	Species
Pisces	*Auxis rochei*
	Conger conger
	Dentex dentex
	Dentex gibbosus
	Diplodus sargus
	Diplodus vulgaris
	Labrus merula
	Lophius budegassa
	Merluccius merluccius
	Mullus barbatus
	Mustelus mustelus
	Pagellus erythrinus
	Pagrus pagrus
	Psetta maxima
	Raja miraletus
	Sarda sarda
	Scomber japonicus
	Scorpaena scrofa
	Seriola dumerili
	Solea impar
	Sparus aurata
	Sphyraena sphyraena
	Spondylosoma cantharus
	Squalus acanthias
	Trachinotus ovatus
	Trigla lucerna
	Zeus faber
Crustacea	*Homarus gammarus*
	Scyllarus arctus
	Palinurus elephas
	Scyllarides latus

Taxa	Species
Echinodermata	*Holothuria tubulosa*
	Holothuria forskali
	Ophidiaster ophidianus
	Paracentrotus lividus
Molluscs	*Octopus vulgaris*
	Loligo officinalis
	Sepia officinalis
	Luria lurida
	Pinna nobilis
	Lithophaga lithophaga

Other potential impacts identified for the marine study area are listed below (Agencija za zaštitu životne sredine, Crna Gora, 2014):

- installation and operation of underwater electrodes and cable electrodes;
- wastewater discharge;
- leaching of pesticides, herbicides and other chemicals;
- anchoring;
- invasive species;
- illegal construction;
- tourism.

Morover, according to UNEP-MAP RAC/SPA (2009), Platamuni area is one of the areas vulnerable to impacts of climate change on marine and coastal biological diversity in the Adriatic.

6.0 THE RATAC AREA

6.1 Geophysical geomorphological and oceanographic features

No specific data on geophysical, geomorphological and oceanographic features are available from literature for the Ratac area.

Based on the available bathymetric information (http://www.emodnet.eu/bathymetry) and satellite imagery, Ratac peninsula seems to be characterized by a few meter high calcareous rocky coastline with many pebble beaches distributed mainly on the east side of the peninsula. The sea bottom seems to be by slowly lowering from a rocky bottom to a quite flat soft bottom.

6.2 Biological features

6.2.1 Plankton

No specific data on plankton are available from literature for Ratac area.

Planktonic composition and dynamics along Ratac coast are probably similar to those of the Montenegrin coast in general.

6.2.2 Benthos

Specific data on the Ratac area concern exclusively phytobentonic species (Kljajic et al. 2012). The table below lists phytobenthos species identified in the Ratac area. In summer the species with the highest coverage was *Digenea* simplex, followed by *Padina pavonica, Dyctiota dichotoma* and *Payssonellia squamaria*. In autumn the species with the highest coverage were *Flabellia petiolata* and *Digenea simplex*. The vertical walls of large rock were completely covered *Flabellia petiolata*, with many epiphyte species. The highest number of macroalgae was observed in summer of 2011 (23 species) and the lowest in winter (14 species).

Table 5: Species of phytobenthos found in Ratac (source: Kljajic *et al*. 2012)

Phytobenthos Species	Summer 2011	Fall 2011	Winter 2012	Spring 2012
Posidonia oceanica	+	+	+	+
Acetabularia acetabulum	+			+
Amphiroa rigida	+		+	+
Anadiomene stellata	+	+	+	
Caldophora sp.	+	+	+	+
Cladostephus verticillatus	+	+	+	+
Codium bursa	+	+	+	+
Corallina officinalis	+	+	+	+
Cystoseira compressa		+		
Dictiota dichotoma	+		+	+
Dictiota linearis	+	+		
Digenea simplex	+	+	+	+
Halimeda tuna	+	+	+	+
Halopteris scoparia	+	+		
Halymenia floresia	+			
Jania rubens	+	+	+	+
Laurencia obtusa	+			
Liagora viscida	+			
Lithophyllum sp.			+	+
Padina pavonica	+	+		+
Peyssonellia rubra	+	+	+	+
Peyssonellia squamaria	+			
Peyssonnelia rosa-marina	+		+	
Sphaerococcus coronophifolius	+	+		+
Udotea petiolata	+	+	+	+
Wrangelia penicillata	+	+		
Total	**24**	**17**	**15**	**16**

6.2.3 Fish assemblage

No specific data on fish assemblage are available from literature for the Ratac area.

6.3 Land and sea uses, human impacts and potential threats

This area is situated in the Bar municipal and it is of touristic interest especially during the summer months. Onshore, an important cultural heritage site is represented by the ruins of an old monastery.

General data on commercial fish species and fishing equipment used in Montenegro are probably true also for this part of the coast[2].

The main potential threats in the area are over fishing, also because of illegal fishing and the vicinity of the Bar port area, which is the biggest port in the Montenegro (pers comm. Mačić, 2015).

6.3.1 Habitat and biodiversity

The sea bed map released by Planetek Italia s.r.l. from satellite imagery acquired in late spring 2012 (and a small portion in spring 2010) reports in the area a narrow strip of rocky bottom along the coastline followed by alternate patches of densely vegetated bottom and sand/soft bottom.

The study performed on transects starting from the beach highlighted the presence of a supralittoral zone characterized by the remains of organic matter, mainly seaweed *Posidonia oceanica* (Kljajic *et al*. 2012). Since the beaches are used for tourism purposes the detritus of *Posidonia* is probably removed from time to time in the summer, so the stable structure of this area is disabled, although overall it seems better preserved than other similar locations along the Montenegrin coast.

The Mediolittoral and partly the infralittoral zones are characterized by the presence of unstable pebbles unfavourable to the development of phytocenosis. The further infralittoral is a mosaic of larger stones between which there is a sandy surface. On the rocks at a distance of about 60 m from the coast patches of Posidonia were found, while meadows of sea grass starts only at about 90 m from the coast along the investigated transects. This meadow seems to be well developed and in good conservation conditions (Kljajic *et al*. 2012).

[2] During this phase, considering the data already available from literature, no further investigation on local fishery was performed. These data will be collected during the field surveys planned allowing to better coordinate the information deriving from the interview with local fishermen with the data collected geomorphology, on marine habitats and species observed.

© RAC/SPA, Egidio Trainito

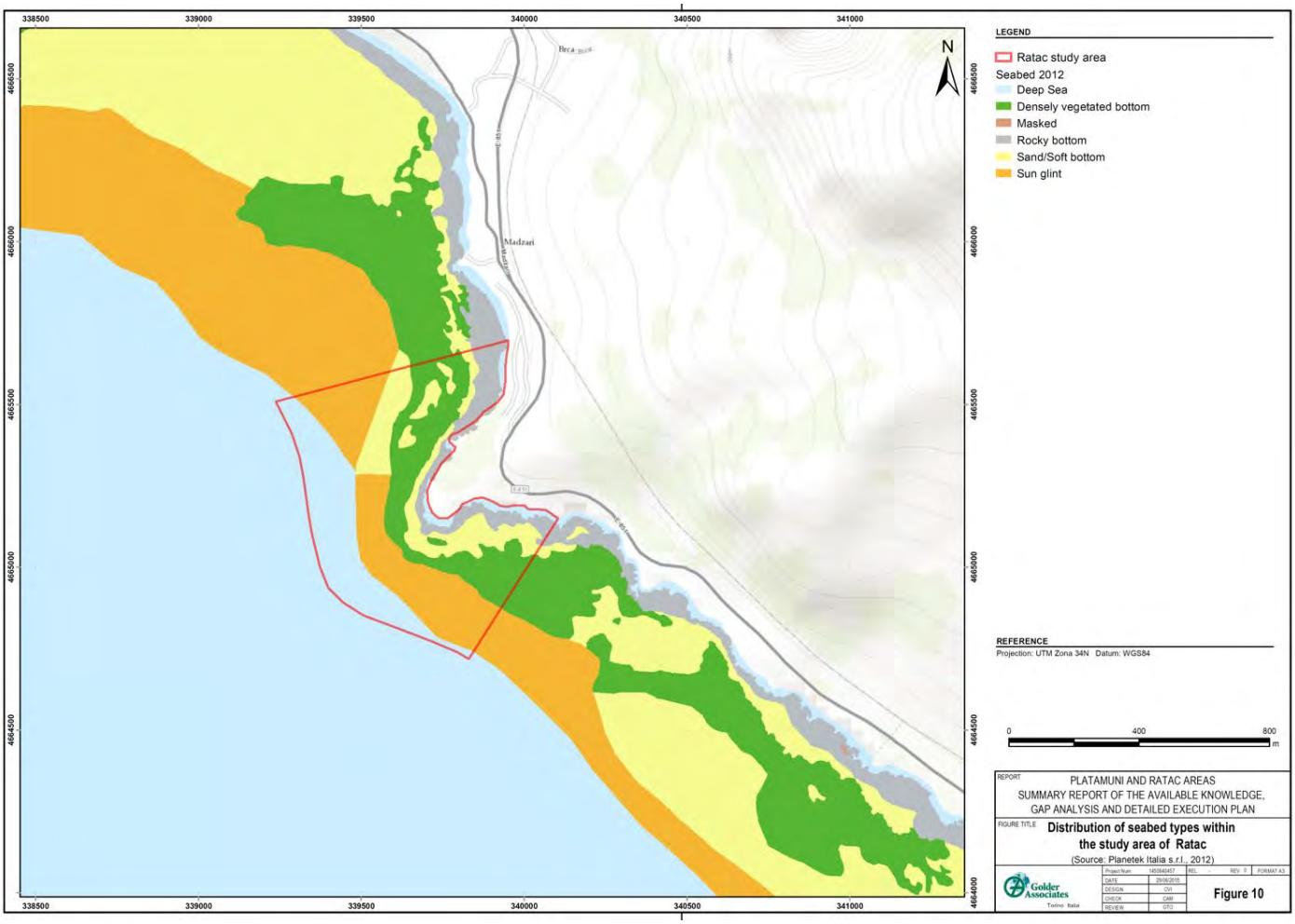
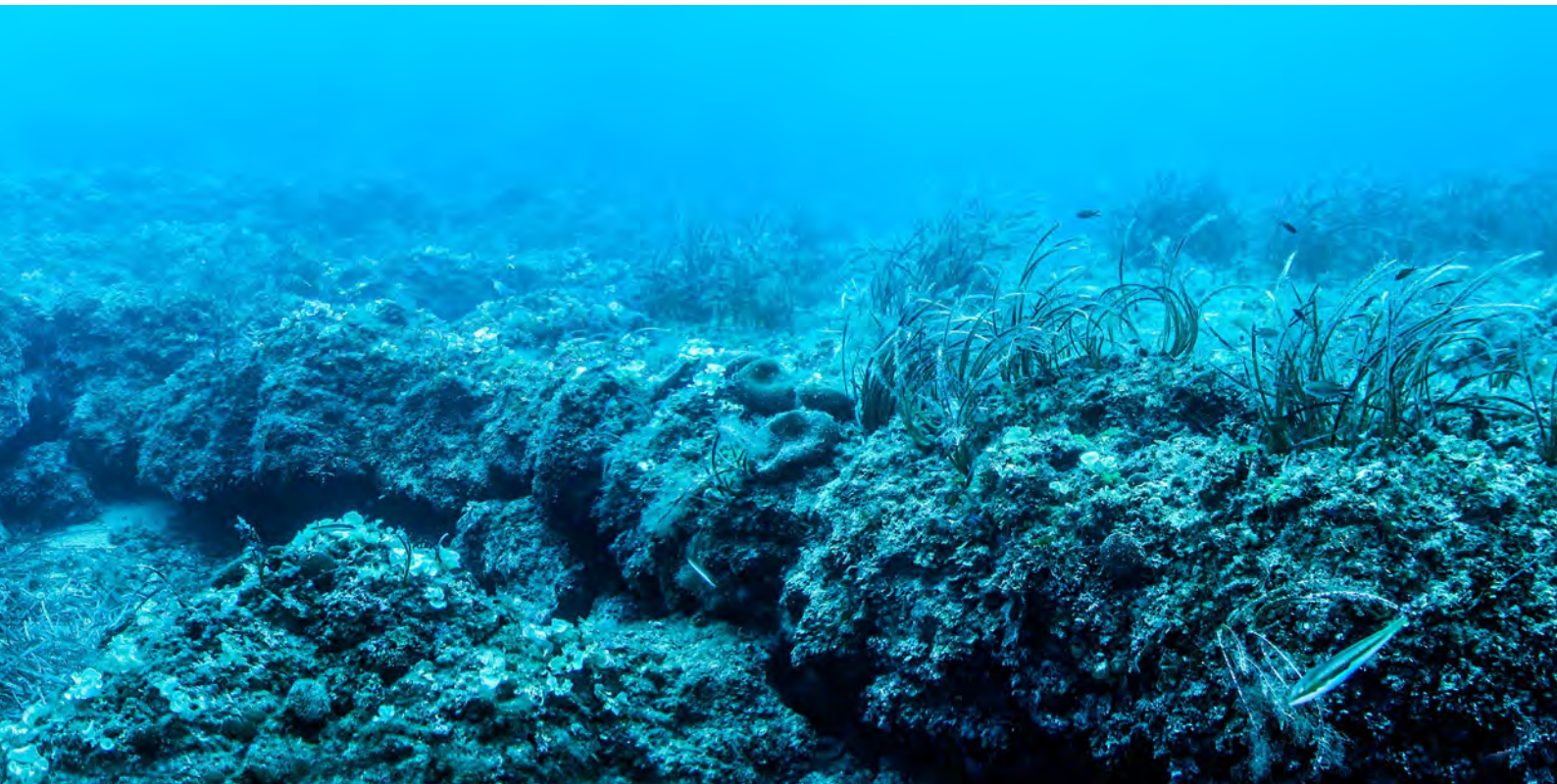


Figure 10: distribution of seabed types within the study area of Ratac (Source: Planetek Italia s.r.l., 2012)



7.0 GAP ANALYSIS

A gap analysis between available data and the information needed for the identification of marine key habitats and their management within the two pilot sites was conducted prior to the field survey, in order to identify the main knowledge gaps and potential areas of special interest to be investigated more in-depth during the surveys.

Each main feature described above is analyzed and assessed under two aspects ("Available information typology and sources" and "Deficiency / Gap Analysis and Required Studies") as detailed in the following paragraphs:

1) **Available information typology and sources**

   This section describes all the available information typology on environmental and social data derived by the desk studies, scientific researches and publications carried out in the Project region.

2) **Deficiency / Gap analysis and required studies**

   Available information is evaluated by typology and analyzed in order to identify what additional information (further data, details and studies) is required. Then, the identified gaps are classified with the following rating system associated to a potential risk gap, to assess the most significant gaps that need to be filled (Table 6).

Table 6: Classification of gaps

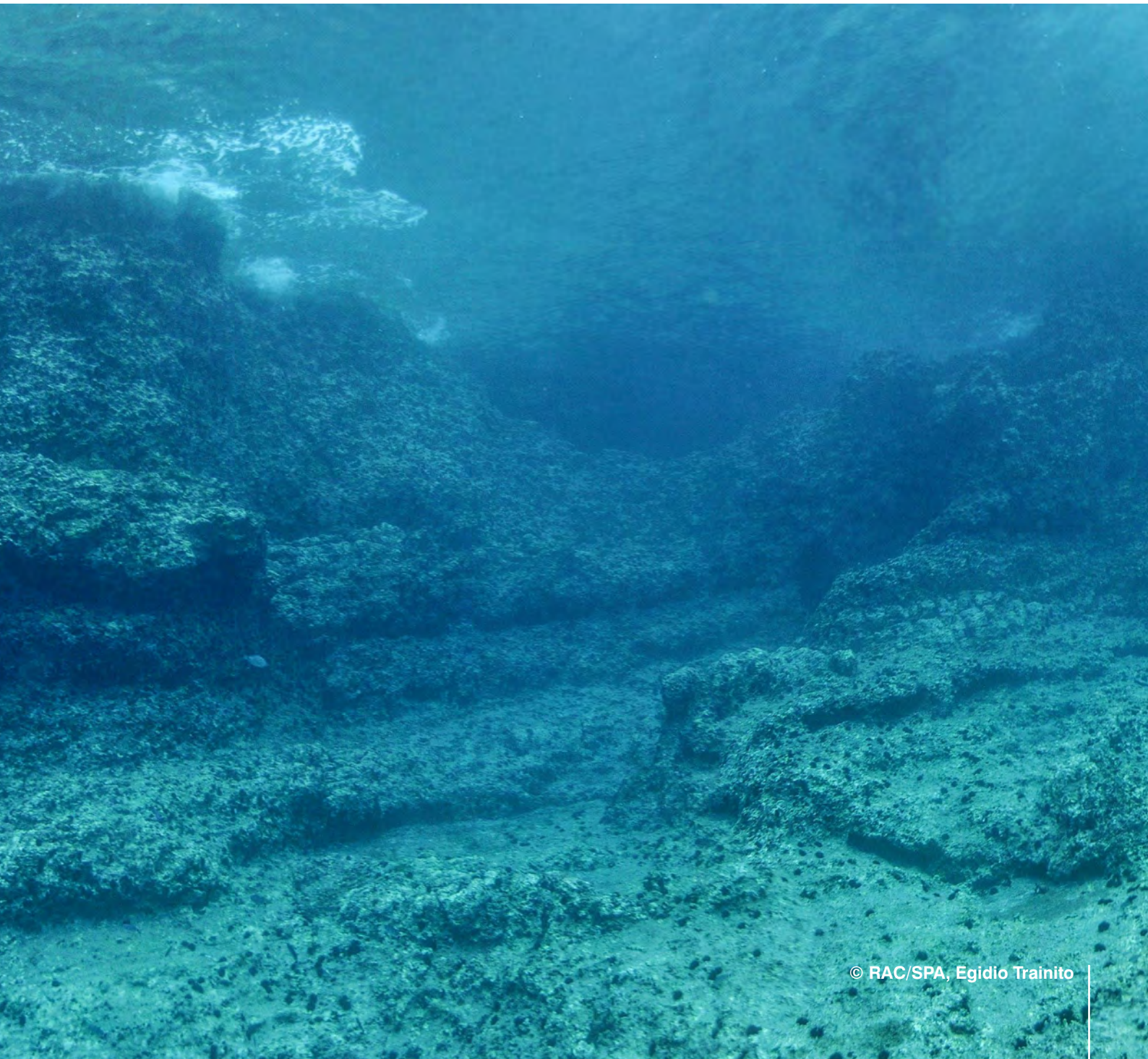
Type of gap	Classification
Very significant – must be filled with specific survey/data collection	High Gap
Moderately significant – recommend to be filled with specific survey/data collection	Medium Gap
Low significant – a gap that may not be important in this context, and likely is not critical or does not require specific survey/data collection	Low Gap

Features	Area	Available Information Typology and Sources	Deficiency / Gap Analysis and Required Studies
Geophysical, geomorphological and oceanographic features	Platamuni	Different scientific papers and reports that include information on geophysical, geomorphological and oceanographic features are available: • Agencija za zaštitu životne sredine (Crna Gora), 2014. Studija izvodljivosti i dogovoreni plan za uspostavljanje marinskog zaštićenog područja Platamuni. Podgorica, godine. • RAC/SPA - UNEP/MAP, 2011. Rapid assessment survey of coastal habitats to help prioritize the suitable new areas needing a status of protection for the development of a network of Marine and Coastal Protected Areas in Montenegro. By Badalamenti F., Garcia Charton J.A., Trevino-Oton J., Mačić V., and Cebrian D. Ed. RAC/SPA - MedMPAnet Project, Tunis: 52 p + Annexes. • Mačić V., 2014. Marine caves in the area of future MPA PLATAMUNI (Montenegrin coast). Stud. Mar. 27(1): 19-30 • Radović, M., 1964. Geografske karakteristike crnogorskog primorja. Godišnjak geografskog Društva SR Crne Gore, Cetinje, pp: 57-73.	In general, broad scale data geophysical, geomorphological and oceanographic features of the area are available from different studies, however a higher level of detail is needed at local level. In particular, a side scan sonar total coverage map needs to be prepared in the area in order to help the delineation of marine habitats Medium Gap
	Ratac	No specific data on geophysical and geomorphological and Oceanographic features are available from literature for Ratac area.	Data on geophysical, geomorphological and oceanographic features of the area needs to be collected. Regarding marine geomorphology in particular, a side scan sonar total coverage map needs to be prepared in the area in order to help the delineation of marine habitats High Gap

Features	Area	Available Information Typology and Sources	Deficiency / Gap Analysis and Required Studies
Biological features: plankton	Platamuni	No specific data on plankton are available from literature for the Platamuni area. Planktonic composition and dynamics along the Platamuni coast are probably similar to those of the Montenegrin coast in general, which is described in the publications listed below: • Lucic D., Benovic A , Onofri I., Batistic M.,Gangai B.,, Miloslavic M., Onofri V., Njire J., Brautovic I., Bojanic Varezic D. 2009. Planktonic cnidarian in the open Southern Adriatic sea: a comparison of historical and recent data. Ser. Hist. nat. 19 • Drakulovic D., Vuksanovic N., 2010. Phytoplankton assemblages and density in the montenegrin coastal sea. Rapp. Comm. int. Mer Médit., 39: 351 • Marini M., Grilli F., Guarnieri A. , Jones B., Klajic Z., Pinardi N., Sanxhaku M., 2010. Is the southeastern Adriatic Sea coastal strip an eutrophic area? Estuarine, Coastal and Shelf Science 88 (2010) 395-406 • Pestorić B., Lučić D., Joksimović D., 2010. Cladocerans spatial and temporal distribution in the coastal south adriatic waters (Montenegro). Stud. Mar., 25(1): 101-120 • Vukanic, D., Vukanic, V. 2003. Review of characteristics of zooplankton community in southeastern part of Southern Adriatic (http://agris.fao.org/agris-search/search.do?recordID=CS2004000105) • Vilicic D., Marasovic I. Miokivic D., 2002. Checklist of phytoplankton in the eastern Adriatic Sea. Acta Bot. Croat. 61 (1), 57–91	Specific data on plankton in Platamuni area are not available. Even if not fundamental for the definition of key habitats, marine plankton of the study area should be investigated, in particular inside marine caves where species of plankton different from the species present in the open sea could be found. **Low Gap**
	Ratac	No specific data on plankton are available from literature for the Ratac area. Planktonic composition and dynamics along the Ratac coast are probably similar to those of the Montenegrin coast in general, which is described in the publication listed below: • Lucic D., Benovic A , Onofri I., Batistic M.,Gangai B.,, Miloslavic M., Onofri V., Njire J., Brautovic I., Bojanic Varezic D. 2009. Planktonic cnidarian in the open Southern Adriatic sea: a comparison of historical and recent data. Ser. Hist. nat. 19 • Drakulovic D., Vuksanovic N., 2010. Phytoplankton assemblages and density in the montenegrin coastal sea. Rapp. Comm. int. Mer Médit., 39: 351 • Marini M., Grilli F., Guarnieri A. , Jones B., Klajic Z., Pinardi N., Sanxhaku M., 2010. Is the southeastern Adriatic Sea coastal strip an eutrophic area? Estuarine, Coastal and Shelf Science 88 (2010) 395-406 • Pestorić B., Lučić D., Joksimović D., 2010. Cladocerans spatial and temporal distribution in the coastal south adriatic waters (Montenegro). Stud. Mar., 25(1): 101-120 • Vukanic, D., Vukanic, V.2003. Review of characteristics of zooplankton community in southeastern part of Southern Adriatic (http://agris.fao.org/agris-search/search.do?recordID=CS2004000105) • Vilicic D., Marasovic I. Miokivic D., 2002. Checklist of phytoplankton in the eastern Adriatic Sea. Acta Bot. Croat. 61 (1), 57–91	Specific data on plankton in the Ratac area are not available. Even if not fundamental for the definition of key habitats, marine plankton dynamics of the study area should be investigated in order to assess and monitor the effect of organic pollution from existing settlements including touristic facilities and Bar port area. **Low Gap**

Features	Area	Available Information Typology and Sources	Deficiency / Gap Analysis and Required Studies
Biological features: fish assemblage	Platamuni	Specific information on fish assemblage of the area is available. These data are presented in the following studies: • Agencija za zaštitu životne sredine (Crna Gora), 2014. Studija izvodljivosti i dogovoreni plan za uspostavljanje marinskog zaštićenog područja Platamuni. Podgorica, godine • Mačić V., 2014. Marine caves in the area of future MPA PLATAMUNI (Montenegrin coast). Stud. Mar. 27(1): 19–30 • RAC/SPA-UNEP/MAP, 2011. Rapid assessment survey of coastal habitats to help prioritize the suitable new areas needing a status of protection for the development of a network of Marine and Coastal Protected Areas in Montenegro. By Badalamenti F., Garcia Charton J.A., Trevino-Oton J., Mačić V., and Cebrian D. Ed. RAC/SPA-MedMPAnet Project, Tunis: 52 p + Annexes.	Sufficent data on fish assemblage are available. **No Gap**
	Ratac	No specific data on fish assemblage are available from literature for Ratac area.	Data on fish assemblage present in the area should be collected in order to assess the effects of fishery and other anthropic impacts on the area. This data could also help to verify the effectiveness of future management measures. **High Gap**
Biological features: habitat and biodiversity	Platamuni	Studies performed in the area identified the presence of different habitats, including two protected habitat, national and international listed species and some invasive species. The data are presented in the following document: • Agencija za zaštitu životne sredine (Crna Gora), 2014. Studija izvodljivosti i dogovoreni plan za uspostavljanje marinskog zaštićenog područja Platamuni. Podgorica, godine. • Fant, M., Polato, F., Rzaničanin, A., Molinari, A., Bernat, P. & Mačić, V. (2012): Start up of «Katič» MPA in Montenegro and assessment of marine and coastal ecosystems along the coast. DFS, Technical report, Jun-July 2012. • Mačić V., 2014. Marine caves in the area of future MPA PLATAMUNI (Montenegrin coast). Stud. Mar. 27(1): 19–30 • Mačić, V., Thibaut, T., Antolić, B. & Svirčev, Z. (2010): Distibution of the most common Cystoseira species on the coast of Montenegro (South-East Adriatic Sea). Fresenius Environmental Bulletin (ISSN 1018-4619), Vol.19, No.6, pp. 1191-1198 • Mačić V., Panou A., Bundone L., Varda D., 2013. Survey of the future Marine Protected Area of Platamuni and the adjacent peninsula of Lustica with emphasis on marine caves as potential habitats of the endangered Mediterranean monk seal. Istitute of Marine Biology Kotor • Mačić, V. (2008): Novo nalazište invazivne alge Womersleyella setacea (Hollenberg) R. E. Norris u crnogorskom podmorju. Voda 2008, 37. konferencija o aktuelnim problemima korišćenja i zaštite voda. Mataruška Banja, 3-6. jun, pp 293-296. • Mačić, V. & Kljajić Z. (2012): Pregled unešeneih vrsta u crnogorskom podmorju. Vode 2012, pp: 255-260. • RAC/SPA-UNEP/MAP, 2011. Rapid assessment survey of coastal habitats to help prioritize the suitable new areas needing a status of protection for the development of a network of Marine and Coastal Protected Areas in Montenegro. By Badalamenti F., Garcia Charton J.A., Trevino-Oton J., Mačić V., and Cebrian D. Ed. RAC/SPA-MedMPAnet Project, Tunis: 52 p + Annexes.	Some data on Platamuni area are available. A detailed in depth analysis could result in more extensive list of species and habitats present. In particular the presence of coralligenous should be investigated. Future studies should be focused in particular on detail mapping of key habitats and assessment of the presence and abundance of protected species already identified in the study area. The presence and diffusion of invasive species should also be assessed and carefully monitored, since they can pose a potential threat to biodiversity. **Medium gap**
	Ratac	Some information on seabed features is available in a raster polygon layer of sea bed map released by Planetek Italia s.r.l. and form satellite imagery acquired in late spring 2012. The study Kljajic *et al.* 2012 on phytobenthos performed along transects highlighted the presence of *P. oceanica* meadows.	Few data are available on the presence and distribution of *P. oceanica* meadow. A detailed in depth analysis will result in more extensive list of species and habitats present. Future studies will be focused in particular on mapping in detail the presence and abundance of key habitats (e.g. coralligenous) and protected species. **High Gap**

Features	Area	Available Information Typology and Sources	Deficiency / Gap Analysis and Required Studies
Land and sea use, human impacts and potential threats	Platamuni	Some general information regarding land and sea use, human impacts and potential threats in Platamuni area are published in the following report: • Agencija za zaštitu životne sredine (Crna Gora), 2014. Studija izvodljivosti i dogovoreni plan za uspostavljanje marinskog zaštićenog područja Platamuni. Podgorica, godine.	Some data on Platamuni area are available on this subject. However additional information regarding fishing activities should be collected in order to assess the current pressure on marine resources. **Low gap**
	Ratac	The main use potential impacts were identified based on personal communication (Mačić, 2014) but no further detail on the possible effects on marine communities is available.	Only personal communications are available. Additional information need to be collected in order to assess the current anthropic pressure on marine resources. **Medium gap**



© RAC/SPA, Egidio Trainito

© RAC/SPA, Egidio Trainito

8.0 REFERENCES

Agencija za zaštitu životne sredine (Crna Gora)., 2014. Studija izvodljivosti i dogovoreni plan za uspostavljanje marinskog zaštićenog područja Platamuni. Podgorica, godine.

Bignami F., Salusti E., Schiarini S., 1990. Observations on a bottom wein of dense water in the southern Adriatic and Ionian Seas. *Journal of Geophysical Research*. 95 : 7249-7259.

Bussotti S., Terlizzi A., Fraschetti S., Belmonte G., Boero F., 2006. Spatial and temporal variability of sessile benthos in shallow Mediterranean marine caves. *Marine Ecology Progress Series*. 325 : 109-119.

Despalatović M., Grubelić I., Piccinetti C., Cvitković I., Antolić B., Nikolić V., Žuljević A., 2010. Distribution and abundance of the sand star *Astropecten irregularis* (Pennant, 1777) (Echinodermata, Asteroidea) on the continental shelf in the northern and middle Adriatic Sea. *Acta Adriatica*, 51(1) : 35-44.

Drakulovic D., Vuksanovic N., 2010. Phytoplankton assemblages and density in the Montenegrin coastal sea. Rapp. Comm. int. Mer Médit., 39 : 351.

Dulčić J., Soldo A., Jardas I., 2003. Adriatic fish biodiversity and review of bibliography related to Croatian small-scale coastal fisheries. Split, Croatia, 14th – 15th October 2003.

European Commission., 2013. Screening report Montenegro Chapter 13 – Fisheries. 21 November 2013

Falace A., Alongib G., Cormacib M., Furnarib G., Curielc D., Cecered E., Petrocellid A., 2010. Changes in the benthic algae along the Adriatic Sea in the last three decades. *Chemistry and Ecology*, 26 : 77-90.

Fant M., Polato F., Rzaničanin A., Molinari A., Bernat P. Mačić V., 2012. Start up of «Katič» MPA in Montenegro and assessment of marine and coastal ecosystems along the coast. DFS, Technical report, Jun-July 2012.

Kljajic, Z., Drakulović D., maklrović S., Mačić V., 2012. Praćenje biodiverziteta po transketima. Morsko dobro, Tehnički izvještaj, 45 p.

Kruzic P., Benkovic L., 2008. Bioconstructional features of the coral *Cladocora caespitosa* (Anthozoa, Scleractinia) in the Adriatic Sea (Croatia). *Marine Ecology*. 29 : 125-139.

Lucic D., Benovic A , Onofri I., Batistic M.,Gangai B., Miloslavic M., Onofri V., Njire J., Brautovic I., Bojanic Varezic D., 2009. Planktonic cnidarian in the open Southern Adriatic sea: a comparison of historical and recent data. *Annales, Series Historia Naturalis* :19 pp.

Mačić V., 2008. Novo nalazište invazivne alge *Womersleyella setacea* (Hollenberg) R. E. Norris u crnogorskom podmorju. Voda 2008, 37. konferencija o aktuelnim problemima korišćenja i zaštite voda. Mataruška Banja, 3-6. Jun : 293-296.

Mačić V., 2014. Marine caves in the area of future MPA PLATAMUNI (Montenegrin coast). *Studia marina*. 27(1) : 19–30.

Mačić V., Kljajić Z., 2012. Pregled unešeneih vrsta u crnogorskom podmorju. Vode 2012, 255-260.

Mačić V., Panou A., Bundone L., Varda D., 2013. Survey of the future Marine Protected Area of Platamuni and the adjacent peninsula of Lustica with emphasis on marine caves as potential habitats of the endangered Mediterranean monk seal. Institute of Marine Biology Kotor.

Mačić V., Thibaut T., Antolić B., Svirčev Z., 2010. Distribution of the most common *Cystoseira* species on the coast of Montenegro (South-East Adriatic Sea). *Fresenius Environmental Bulletin*. 19 (6) : 1191-1198.

Malanotte-Rizzoli P., 1991. The Northern Adriatic Sea as a prototype of convection and water mass formation on the continental shelf, Deep Convections and DeepWater Formation in the Oceans, P.C. Chu and J.C. Gascard, eds., Elsevier Oceanography Series. 57 : 229-239.

Marini M., Grilli F., Guarnieri A., Jones B., Klajic Z., Pinardi N., Sanxhaku M., 2010. Is the southeastern Adriatic Sea coastal strip an eutrophic area? *Estuarine, Coastal and Shelf Science*. 88: 395-406.

Nikolić V., Žuljević A., Antolić B., Despalatović M., Cvitković I., 2010. Distribution of invasive red alga Womersleyella setacea (Hollenberg) R.E. Norris (Rhodophyta, Ceramiales) in the Adriatic Sea. *Acta Adriatica*, 51(2): 195-202.

Ovchinnikov et al., 1985. Ovchinnikov, I. M., V. I. Zats, V. G. Krivosheya and A. I. Idodov, The formation of deep Eastern Mediterranean Waters in the Adriatic Sea, 1985, Okeanologija, 25 : 911 -917. English translation: Oceanology, 25 : 704-707.

Pestorić B., Lučić D., Joksimović D., 2010. Cladocerans spatial and temporal distribution in the coastal south adriatic waters (Montenegro). S*tudia marina*. 25(1): 101-120.

RAC/SPA-UNEP/MAP, 2011. Rapid assessment survey of coastal habitats to help prioritize the suitable new areas needing a status of protection for the development of a network of Marine and Coastal Protected Areas in Montenegro. By Badalamenti F., Garcia Charton J.A., Trevino-Oton J., Mačić V., and Cebrian D. Ed. RAC/SPA - MedMPAnet Project, Tunis: 52 p + Annexes.

RAC/SPA-UNEP/MAP, 2013. Ecological quantitative description of Boka Kotorska Bay marine area (Montenegro). By Golder Associates. Ed. RAC/SPA - MedMPAnet Project, Tunis: 82 pp + Appendices.

RAC/SPA-UNEP/MAP, 2013. Fishery activities assessment in Montenegro : case study of five selected parts of Montenegrin coast. By Mirko Djurović and Olivera Marković. Ed. RAC/SPA - MedMPAnet Project, Tunis: 39p.

Radović M., 1964. Geografske karakteristike crnogorskog primorja. Godišnjak geografskog Društva SR Crne Gore, Cetinje : 57-73.

UNEP/MAP-RAC/SPA, 2015. Handbook for interpreting types of marine habitat for the selection of sites to be included in the national inventories of natural sites of conservation interest. Denise BELLAN-SANTINI, Gérard BELLAN, Ghazi BITAR, Jean-Georges HARMELIN, Gérard PERGENT. Ed. RAC/SPA, Tunis. 168 p. + Annex (Orig. pub. 2002).

UNEP-MAP RAC/SPA., 2009. Sub-regional report on vulnerability and impacts of climate change on marine and coastal biological diversity in the Mediterranean Adriatic countries. By Pavasovic A., Cebrian D., Limam A., Dedej Z., Vucijak B., Radovic J., Guidetti P., Buskovic V., Dobrajc Z., Ed. RAC/SPA, Tunis: 52 pp.

Vilicic D., Marasovic I., Miokivic D., 2002. Checklist of phytoplankton in the eastern Adriatic Sea. *Acta Botanica Croatica*. 61 (1) : 57-91.

Vrgoc N., Arneri E., Jukic-Peladic S., Krstulovic Šifner S., Mannini P., Marceta B., Osmani K., Piccinetti C., Ungaro N., 2004. Review of current knowledge on shared demersal stocks of the Adriatic Sea. AdriaMed Technical Documents. No.12.

Vukanic D., Vukanic V., 2003. Review of characteristics of zooplankton community in southeastern part of Southern Adriatic (http://agris.fao.org/agris-se

United Nations Environment Programme
Mediterranean Action Plan
Regional Activity Centre for Specially Protected Areas (RAC/SPA)
Boulevard du leader Yasser Arafat - B.P. 337 - 1080 Tunis Cedex - TUNISIA
Tel.: (+216) 71 206 649 / 71 206 485 / 71 206 851 • Fax: (+216) 71 206 490
E-mail: car-asp@rac-spa.org • www.rac-spa.org