UNIVERSITY OF MONTENEGRO
INSTITUTE OF MARINE BIOLOGY – KOTOR

Further survey of marine caves including monk seal habitats in Montenegro (cape Platamuni - cape Voluica)

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This project was finansed by Jugopetrol AD Kotor

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INTRODUCTION

In September 2013, and thanks to the generous donation of Jugopetrol AD Kotor, we systematically surveyed the coastline between cape Arza and cape Platamuni in order (a) to register all marine caves as an important and endangered habitat and (b) to detect the presence/absence of the critically endangered Mediterranean monk seal, Monachus monachus. The area of study included the future Marine Protected Area of Platamuni (MPA Platamuni) planned to be established between cape Platamuni and cape Žukovica. This type of survey was done in Montenegro for the first time and carried out by the Institute of Marine Biology in Kotor in collaboration with the local NGO MedCEM (Mediterranean Center For Environmental Monitoring) and monk seal experts of the Greek NGO "Archipelagos - environment and development".

We registered a total of 45 marine caves in the area of study. A total of 11 caves had a beach inside and they may serve as a potential terrestrial habitat for the monk seal. We did not find any evidence of monk seal presence but single surveys may not detect seal evidence even in areas well known for their stable seal population.

Furthermore, we created a brochure with information about marine caves and the monk seal and distributed 2.600 copies to the schools of the neighbouring municipalities.

In 2014, thanks to the new donation of Jugopetrol AD Kotor we continued our survey in order (1) to register marine caves along the coastline of Montenegro not yet surveyed in the area from cape Platamuni (Budva) to cape Voluica (Bar), (2) to systematically register the species composition of algae communities along the coastline as an index for the quality of seawater and (3) to repeat the survey of some caves already known in the area of Arza - Platamuni for possible monk seal presence since regular surveys are needed in order to establish the present status of this elusive species in the area (Figure 1).

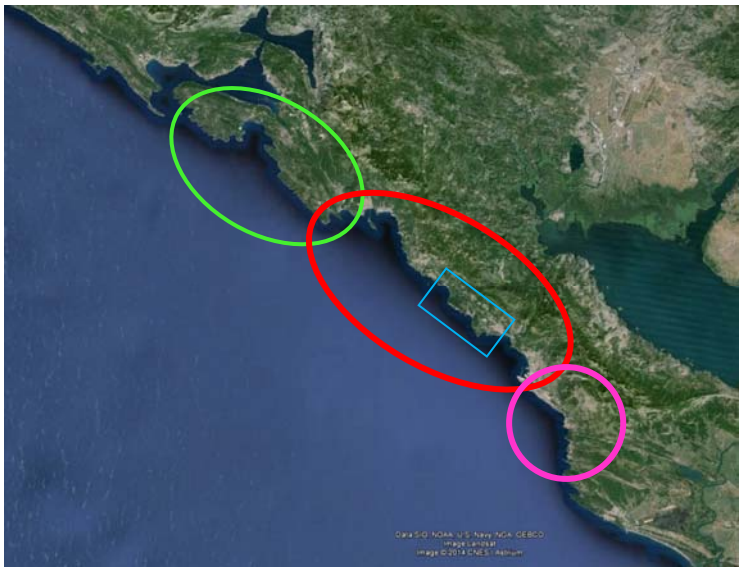


Figure 1. . Survey area in 2013.g. and 2014.g.

Survey area for cave mapping in 2014.

Area added for algae mapping

Area planed for MAP Katič

MATERIALS AND METHODS

The surveys has been carried out by the same -already trained- team members as in September 2013: we invited again an expert with long experience on monk seal conservation from abroad (Aliki Panou, NGO Archipelagos - environment and development, Greece) and one member of the local NGO MedCEM (Dušan Varda, Mediterranean Center For Environmental Monitoring) active in marine conservation. Planed activities were realised together with Vesna Mačić and Branislav Lazarević from Institute of marine biology, Kotor in May 2014.

Field work was realised before the start of the high season, since tourism along the coastlines may drive away potentially present monk seals and algae communities are at an excellent state of development after the winter. The equipment for the field work, i.e. rubber boat, GPS, diving equipment, underwater cameras, plastic bags and bottles for taking samples has been provided by the Institute of Marine Biology in Kotor. We performed 8 days of field work and 20 days of the work in the laboratory.

As it was indicated in project proposal our work was divided in tree sectors.

1. Survey of the coast from cape Voluica to cape Platamuni for mapping of marine caves and potential habitats for monk seals

This part of the survey was done by snorkeling and caves were checked if there is any beach in the interior and presence of any protected species. For all registered caves/holes the following basic data were noted: location name, geographic coordinates, dimensions (in meters), exposition, morphological characteristics, date of survey, and typical living organisms in the cave and in front of it. During the post processing of the collected data all locations were mapped by Quantum GIS software.

We would like to emphasize that, by national law on nature protection (Sl. list no. 51/08), speleological objects are naturally formed holes in the rock longer than 5m, where a person can enter and their entrance is smaller than their length or depth. In the recently issued law on nature protection (Sl. list br. 62/13), no dimensions for the definition of speleological objects are given. However, and for the purpose of this study, we will use here the first definition as described above as we did also in our report on the cave survey Lustica - Platamuni in 2013. Furthermore, it would be useful for the future to select the final list of speleological objects of the present as also of the previous study according to the definition given by the new regulation on the cave register (No. 09-166/6) and adapt them to the format required by this regulation..

2. Mapping of algae and evaluation of ecological status by CARLIT method

For the analysis of ecological status it was planned to map algal communities at the sea level along the coast from cape Voluica to cape Arza. Calculation of the water body environmental status could be correctly calculated only after survey of the missing part of the coast of Montenegro (cape Voluica to the Port Milena). But for the purpose of this study we mapped completely Bar municipality (down to the island Stari Ulcinj). This is a first step in the evaluation of the seawater quality according to EU Water Frame Directive and CARLIT method, so, we calculated EQ index for the surveyed coast. Further analysis are needed for checking and possible calibration of this method for Montenegrin coast.

Figure 2. Area from cape Arza to island Stari Ulcinj where mapping of alage was performed

Cartography of littoral rocky-shore communities (CARLIT) is a European Union Water Framework Directive-compliant monitoring method widely used in the Western Mediterranean Sea. This non-destructive method is based on a visual observation of the type and length of coast occupied by rocky-shore communities in the upper-sublittoral zone (Ballesteros et al. 2007; Nikolić et al. 2013).

The CARLIT methodology in this study was applied according to general procedures elaborated by Ballesteros et al. (2007) and some slight modifications elaborated by Nikolić et al. 2013. for the Adriatic Sea.

$$EQ = \frac{\sum(l_i \times SL_i)}{\sum l_i}$$

EQ = ecological quality value of a coastline sector
l_i = length of the coastline with the community category *i*
SL_i = sensitivity level of the community category *i*

In the Table 1. are shown different community types followed by assigning a "sensitivity level" (SL), ranging from 1 to 20. As proposed in the North-Western Mediterranean Sea CARLIT table, the highest SL values were assigned to well developed *Cystoseira* forests, intermediate values to degraded communities with photophilic turf algae and mussel beds, whilst the lowest values were assigned to heavily degraded communities found in extremely polluted areas, consisting mostly of green algae and/or cyanobacteria. The proposed list of communities included the most common *Cystoseira* species which can be found in the upper-sublittoral in the Adriatic Sea. The most characteristic species is *Cystoseira amentacea var. spicata,* which forms a visible belt in the upper-sublittoral zone of exposed zones. In order to simplify data collection and analysis, the abundance of its stands was classified into three levels: continuous belt, abundant patches and rare scattered plants. A lower SL value was assigned to *Cystoseira barbata*, because it is commonly observed in slightly polluted zones across the studied area, as well as to *Cystoseira compressa* already known for higher toleration of pollution (Nikolić et al., 2013).

Table 1. Type of communities and sensitivity level

Type of community	Sensitivity level
Trottoir *Lithophyllum byssoides*	20
Cpontinuous belt *C. amentacea var. spicata*	20
Abundant patches C. amentacea var. spicata	15
Rare scattered plants of *C. amentacea var. spicata*	10
Cystoseira compressa	12
Photophilic algae	10
Corallina officinalis	8
Mytilus	6
Green algae	3
Cyanobacteria	1

The establishment and abundance of natural shallow water macroalgal communities is known to be mainly determined by coastline geomorphology (Ercegović, 1964; Ballesteros, 1992) and such variability has to be taken into account to properly highlight the effects of potential human impacts. Following the original CARLIT method (Ballesteros et al., 2007), set of geomorphologic features potentially affecting the distribution of macroalgal communities along the Adriatic coastline has been also taking into account (Nikolić et al. 2013). For the purpose of this study we analyzed two characters: coast morphology and coastline slope (Table 2) and from the same scientific paper we used referent values for the central Adriatic Sea (Table 3).

Table 2. Geomorphologic factor Category

Geomorphologic factor Category	
Coast morphology	High coast Low coast Blocks
Coastline slope	Horizontal (0–30◦) Sub-vertical (30–60◦) Vertical (60–90◦) Overhanging

Table 3. Reference area values

Geomorphological factors		Ecological quality value (EQ_{ref})
High coast	Horizontal (0–30◦)	20
High coast	Sub-vertical (30–60◦)	17,55
High coast	Vertical (60–90◦)	12,96
High coast	Overhanging	10
Low coast	Horizontal (0–30◦)	19,02
Low coast	Sub-vertical (30–60◦)	17,72
Low coast	Vertical (60–90◦)	14,62
Low coast	Overhanging	9,66
Blocks		12,76

3. Survey of potential monk seal habitat in area surveyed last year (cape Arza to cape Platamuni)

We survey again the 11 caves already known as potential monk seal habitat in the area between cape Arza and cape Platamuni since only regular surveys may detect seal presence.

RESULTS

1. Survey of the coast from cape Voluica to cape Platamuni for mapping of marine caves and potential habitats for monk seals

After the field work all data were organized in tables and locations were mapped in Quantum GIS. In the surveyed area from cape Platamuni to cape Voluica we registered 16 caves and 14 caves/slits. Altogether, 30 features were registered and data are presented

Figure 2. Caves and holes in the surveyed area

During this research we also encountered several protected species, thus contributing to the general knowledge of their distribution and underlining the ecological importance of this area. Of all species found inside the caves or close to them we may underline the presence of the following protected species:

(a) Algae and seagrass: *Lithophyllum byssoides, Cystoseira amentacea, Posidonia oceanica, Cymodocea nodosa*
(b) Molluscs: *Lithophaga lithophaga*
(c) Sponges: *Geodia cydonium*
*(d) P*lants: *Euphorbia dendroides*
*(e) B*irds: *Alcedo atthis* (kingfisher).
(f) Bats *(Miniopterus schreibersii)* (in the area cape Arza- cape Platamuni)

Data for all surveyed features in the area from cape Voluica to cape Platamuni are presented in separate tables for each one.

No. 1	**location: rt Ratac**  Foto: Aliki Panou
coordinates	N 42º 08' 10.43" E 19º 02' 33.82"
dimensions	1,5m wide x 1m high x 6m long (depth of sea water 1m; high inside 1m)
exposition	South-west
morpho-characteristics	After the entrance the cave is curved in the direction of south-east. On the bottom of the cave are pebbles.
living organisms	Close to the entrance are massive assemblages of *Corallina officinalis* and *Mytilus galloprovincialis* with some *Patella sp.* Most dominant, but scarce, organisms inside the cave are spong**es**y. On the cave walls above the sea level, there are many red incrusting algae.
notes	Next to these rocks there is a nudist beach on the right hand side and a big touristic complex on the left hand side, so the anthropogenic pressure may be significant.
date of survey	26. 05. 2014.
In front of the cave	There are many assemblages of the protected algae *Cystoseira amentacea*. Also very dense assemblages are created by *Corallina officinalis* and *Mytilus galloprovincialis* with some *Patella sp.*

No. 2	**location: Golo brdo**  Foto: Vesna Mačić
coordinates	N 42º 08' 13.25" E 19º 02' 00.06"
dimensions	2m wide x 2m high x 10m long (inside depth of sea water 1,5m; high above the sea 7m)
exposition	south
morpho-characteristics	Inside the rock the cave room is curved almost 90□ in the direction of south-east. Pebbles are on the bottom of the cave.
living organisms	Scarce, some, *Patella sp.* and incrusting algae
notes	/
date of survey	26. 05. 2014.
In front of the cave	There are many assemblages of protected algae *Cystoseira amentacea*. Also very dense assemblages are created by Corallina *officinalis* and *Mytilus galloprovincialis*.

No. 3.	**location: Golo brdo (kod ispusta)**  Foto: Aliki Panou
coordinates	N 42º 08' 12.65" E 19º 02' 17.66"
dimensions	1m wide x 1m high x 1(2)m long
exposition	south
morpho-characteristics	4 very small holes with the pebble beaches
living organisms	Not observed
notes	/
date of survey	26. 05. 2014.
In front of the cave	Not observed

No. 4.	**location: Štrbine**   Foto: Vesna Mačić
coordinates	N 42º 08' 13.25" E 19º 02' 00.06"
dimensions	1,5m wide x 4m high x 12m long (inside depth of the sea water is 1m; high above the sea 6m; pebble beach 2m x 2m)
exposition	south
morpho-characteristics	Simple cave room ends with a pebble beach and on the botom is also pebble.
living organisms	Very scarce. Some incrusting alagae, sponges and barnacles
notes	Potential habitat for monk seals
date of survey	26. 05. 2014.
In front of the cave	Some *Dictiotales* and *Cystoseira amentacea* in paches

No. 5.	**location: Crni rt (u. Perazića potok)**  Foto: Vesna Mačić
coordinates	N 42º 08' 20.8" E 19º 00' 30.4"
dimensions	2m wide x 4m high x 2m long (inside high 1,5m)
exposition	west
morpho-characteristics	Overhang, pebble beach
living organisms	Not observed
notes	4 very similar small holes. Potenial resting place for monk seals
date of survey	26. 05. 2014.
In front of the cave	Pebble and bigger rocks with photophilous algae, while in deeper areas there is seagrass *Posidonia oceanica.*

No. 6.	**location: Crni rt (u. Perazića potok2)**  Foto: Vesna Mačić
coordinates	N 42º 09' 06.16" E 19º 00' 10.46"
dimensions	6m wide x 2m high x 7m long (inside pebble beach 4x3m)
exposition	west
morpho-characteristics	Overhang, from the middle is pebble beach, 30º slope
living organisms	Nothing evident
notes	This cave is a potential resting place for monk seals
date of survey	26. 05. 2014.
In front of the cave	Not observed

No. 7.	**location: rt Sapavica**   Foto: Vesna Mačić
coordinates	N 42º 09' 07.59" E 19º 00' 09.88"
dimensions	4m wide x 3m high x 11m long (inside pebble beach 2 x 1m)
exposition	west
morpho-characteristics	Overhang. On the back of the beach there are big rounded rocks, while in the zone closer to the sea there are smaller pebbles.
living organisms	Some *Patella sp*. and very scarce, washed up mostly everything
notes	Potential resting place for monk seals
date of survey	26. 05. 2014.
In front of the cave	Some photophilous algae

No. 8.	**location: rt Sapavica2**   Foto: Vesna Mačić
coordinates	N 42º 09' 09.96" E 19º 00' 09.50"
dimensions	4m wide x 3m high x 11m long (beach pebble 2x1,5m)
exposition	west
morpho-characteristics	On the cave floor there are pebbles and the walls are smooth.
living organisms	All walls close to the entrance are covered by dense associations of *Acetabularia acetabulum*. There are some *Patella sp*. and barnacles
notes	Potential resting place for monk seals
date of survey	26. 05. 2014.
In front of the cave	*Cystoseira amentacea* in patches and some other turf algae

No. 9.	**location: rt Sapavica 3**  Foto: Vesna Mačić
coordinates	N 42º 09' 09.96" E 19º 00' 09.50"
dimensions	0,4 wide x 3m high x 11m long
exposition	west
morpho-characteristics	Part of the cave floor is sandy with some bigger pebbles.
living organisms	Barnacles, some incrusting algae, small number of sponges, mostly *Spirastrella cunctatrix; Chondrosia reniformis.*
notes	/
date of survey	26. 05. 2014.
In front of the cave	Some photophilous algae on bigger rocks and pebble

No. 10.	**location: u. Pećin**  Foto: Vesna Mačić
coordinates	N 42º E 18º
dimensions	0,4m wide x 3m high x 11m long
exposition	North-west
morpho-characteristics	Narrow channel with some small rock formations on the cave walls. On the caves floor there is sand.
living organisms	Some incrusting algae and very very scarce macro-organisms
notes	/
date of survey	26. 05. 2014.
In front of the cave	Not observed

No. 11.	**location: u. Pećin 2**  Foto: Vesna Mačić
coordinates	N 42º 09' 38.48" E 18º 59' 28.64"
dimensions	1m wide x1m high x10m long
exposition	North-west
morpho-characteristics	Narrow channel with some pebbles on the cave floor
living organisms	Very scarce, just few small sponges, incrusting algae and barnacles
notes	/
date of survey	26. 05. 2014.
In front of the cave	Not observed

No. 12.	**location: rt Stolac**  Foto: Vesna Mačić
coordinates	N 42º 09' 46.66" E 18º 59' 06.65"
dimensions	5m wide x 7m high x 10m
exposition	South-east
morpho-characteristics	Wide entrance, without particular characteristics
living organisms	*Apogon imperbis*, *Actinia equina*, *Cnidarian* incrusting species to check in the future, close to entrance a lot of barnacles and diverse sponge species
notes	/
date of survey	26. 05. 2014.
In front of the cave	Rocky barren area

No. 13.	**location: u. Stolac**  Foto: Vesna Mačić
coordinates	N 42º 09' 54.53" E 18º 59' 04.32"
dimensions	5m wide x 5m high x 4m long (overhang)
exposition	east
morpho-characteristics	Overhang with a beach. The beach is sandy in the area closer to the sea water and on the back there are bigger rocks (together with lot of marine litter)
living organisms	Not checked
notes	Inside the cave there are pigeons. Outside the cave there was a big raptor.
date of survey	26. 05. 2014.
In front of the cave	pebbles

No. 14.	**location: u. Stolac 2**  Foto: Vesna Mačić
coordinates	N 42º 09' 54.24" E 18º 59' 03.67"
dimensions	3m wide x 5m high x 17m long
exposition	east
morpho-characteristics	Bare rocks of different size are on the cave's floor, and also there is a little area with sand. The vertical walls are quite smooth.
living organisms	Most abundant were hydroids but there were no many organisms. Interesting is the presence of fish *Muraena helena* and of the protected sponge *Geodia cydonium*.
notes	/
date of survey	26. 05. 2014.
In front of the cave	Not observed

No. 15.	**location: u. Stolac 3**  Foto: Vesna Mačić
coordinates	N 42º 09' 55.96" E 18º 59' 01.94"
dimensions	3m wide x 3m high x 5m long
exposition	west
morpho-characteristics	Channel into the rocks seems to have 2 entrances and should be checked
living organisms	Not many organisms on the cave walls. Most abundant are sponges
notes	/
date of survey	26. 05. 2014.
In front of the cave	Mostly sand and pebbles

No. 16.	**location: Lučica**  Foto: Vesna Mačić
coordinates	N 42º 12' 01.67" E 18º 56' 51.18"
dimensions	1,5m wide x 1(4) m high x 6m long (sea water inside is 2m deep and chamber is 5m high)
exposition	south
morpho-characteristics	The entrance is consisting of the 2 windows, one above each other
living organisms	Many sponges on the cave walls, close to the entrance also many barnacles and some algae
notes	/
date of survey	26. 05. 2014.
In front of the cave	Photophilous algae, mostly *Dyctiotales.*

No. 17.	**location: rt Skočiđevojka**  Foto: Vesna Mačić
coordinates	N 42º 13' 17.18" E 18º 54' 19.85"
dimensions	7m wide x 4m high x 4m long (inside the cave, sea water depth is 2-3m and chamber is above sea level 4m high)
exposition	west
morpho-characteristics	Rocks are smooth creating one cave chamber
living organisms	Many spongesy on the cave walls
notes	In vicinity dead fish (probably dynamite)
date of survey	27. 05. 2014.
In front of the cave	Abundant *Corallina officinalis*, with some *Lithophyllum byssoides.*

No. 18.	**location: rt Skočiđevojka 2**  Foto: Vesna Mačić
coordinates	N 42º 13' 23.38" E 18º 54' 18.64"
dimensions	0,5m wide x 0,5m high x 4m long
exposition	west
morpho-characteristics	Small whole, water dept is 1-2m
living organisms	At the entrance of the cave there is small trottoir with abundant red incrusting algae and more inside the cave there are some sponges but not many
notes	/
date of survey	27. 05. 2014.
In front of the cave	Nice trottoir, many *Corallina officinalys* and some *Lithophyllum byssoides.*

No. 19.	**location: u. Slana luka**  Foto: Vesna Mačić
coordinates	N 42º 14' 13.17" E 18º 53' 54.08"
dimensions	4m wide x 6m high x 10m long
exposition	south
morpho-characteristics	Massive rocks are creating a big slit positioned with a slope of cc 60□ (not only above the sea but also below the sea surface)
living organisms	Many organisms because there is abundant light. Most common are algae *Corallina officinalis, Laurencia sp., Dictiotales, Colpomenia sinuosa,* some *Lithophyllum byssoides.* From animals most abundant are barnacles and *Mytillus galoprovincialis*.
notes	Floating marine litter
date of survey	27. 05. 2014.
In front of the cave	Many turf algae and part of the rock is barren

No. 20.	**location: u. Tričin zalaz (Debeli rt)**  Foto: Vesna Mačić
coordinates	N 42º 14' 24.77" E 18º 53' 54.11"
dimensions	7m wide x 3m high x 10m long (pebble beach 1,5m x 2m)
exposition	north
morpho-characteristics	The entance Entrance is partially divided into twoto parts above the sea but below the sea level there it is one entrance
living organisms	Very scarce, barnacles, *Patella sp*., some sponges, incrusting algae
notes	On the beach inside the cave there are marine litter
date of survey	27. 05. 2014.
In front of the cave	Pebbles and some metal marine litter

No. 21.	**location: u. Tričin zalaz 2 (Debeli rt 2)**  Foto: Vesna Mačić
coordinates	N 42º E 18º
dimensions	2m wide x 1m high x 8m long
exposition	North-west
morpho-characteristics	Narrow channel with smooth walls
living organisms	Some incrusting algae and not many other organisms
notes	/
date of survey	27. 05. 2014.
In front of the cave	Pebbles and barren

No. 22.	**location: Sveti Stefan**  Foto: Vesna Mačić
coordinates	N 42º 15' 09.20" E 18º 53' 45.62"
dimensions	2m wide x 0,5m high x 3m long
exposition	west
morpho-characteristics	Hole with the sandy beach and in the vicinity there are similar 2 beaches and one passage
living organisms	Not observed
notes	It is important as a potentially good location for monk seals but with very much anthropogenic impact
date of survey	27. 05. 2014.
In front of the cave	Sand and pebbles

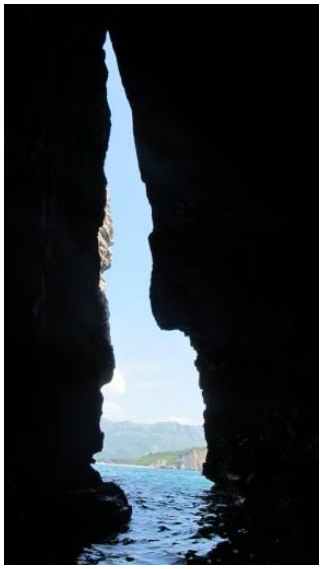
No. 23.	**location: Miločer**  Foto: Vesna Mačić
coordinates	N 42º 16' 14.21" E 18º 53' 20.79"
dimensions	1,5m wide x 1m high x 4m long
exposition	South-west
morpho-characteristics	Small hole
living organisms	Incrusting algae and almost nothing else
notes	/
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 24.	**location: Miločer2**  Foto: Vesna Mačić
coordinates	N 42º 16' 10.78" E 18º 53' 29.30"
dimensions	2m wide x 2m high x 3m long
exposition	South-west
morpho-characteristics	Small hole
living organisms	Not observed
notes	/
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 25.	**location: Rafailovići**  Foto: Dušan Varda
coordinates	N 42º 16' 35.23" E 18º 52' 53.46"
dimensions	2m wide x 4m high x 3m long (inside pebble beach m x 2m)
exposition	east
morpho-characteristics	Widely open to the sea
living organisms	Not observed
notes	High anthropogenic impact
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 26.	**location: Zavala**  Foto: Vesna Mačić
coordinates	N 42º 16' 50.16" E 18º 51' 26.51"
dimensions	1m wide x 2m high x 2m long (parallel to the coast is 10m long)
exposition	west
morpho-characteristics	Slit in the rock
living organisms	Sponges are quite abundant and there are some incrusting algae
notes	High anthropogenic impact
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 27.	**location: Sv. Nikola**  Foto: Vesna Mačić
coordinates	N 42º 15' 49.42" E 18º 51' 25.39"
dimensions	4m wide x 6m high x 12m long
exposition	south
morpho-characteristics	On the bottom there are sand and pebbles and on the right hand side there is a relatively small channel
living organisms	Organisms are more abundant in the small channel on the left side. Could be *Cladocora caespitosa*, barnacles, sponges, hydrozoans.
notes	/
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 28.	**location: rt Mogren (ispod tunela)**  Foto: Vesna Mačić
coordinates	N 42º 16' 24.98" E 18º 49' 44.33"
dimensions	1,5m wide x 7m high x 6m long
exposition	South-east
morpho-characteristics	Big slit with important part above the sea level
living organisms	Trottoir is entering the cave, abundant *Corallina officinalis* and turf. There are small *Lithophyllum byssoides*
notes	/
date of survey	27. 05. 2014.
In front of the cave	Barren, rocks

No. 29.	**location: Vrančeva sika**  Foto: Vesna Mačić
coordinates	N 42º 16' 33.80" E 18º 49' 31.69"
dimensions	6m wide x 7m high x 30m long
exposition	South (west)
morpho-characteristics	The big chamber entrance is from the south side. From that part of the cave on the left hand side there is another entrance while on the right hand side there are 2 channels. These channels are curved and more or less parallel going together into a third small entrance. There is a small beach sandy but with sharp rocks, seems like crashed recently
living organisms	Not very much observed but it seems not abundant, apart of barnacles and spongesy
notes	Potentially good location for resting of monk seal.
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 30.	**location: Vrančeva sika 2**  Foto: Vesna Mačić
coordinates	N 42º 16' 34.58" E 18º 49' 31.64"
dimensions	1m wide x 4m high x 4m long
exposition	north
morpho-characteristics	Holes with overhang rocks
living organisms	Not observed
notes	/
date of survey	27. 05. 2014.
In front of the cave	Not observed

No. 31.	**location: u. Podrupice (kod Platamuna)**  Foto: Vesna Mačić
coordinates	N 42º 16' 35.92" E 18º 47' 06.95"
dimensions	1m wide x 2m high x 4m long
exposition	North-east
morpho-characteristics	Small hole
living organisms	scarce
notes	/
date of survey	27. 05. 2014.
In front of the cave	Barren on the rocks and some sand

2. Mapping of algae and evaluation of ecological status by CARLIT method

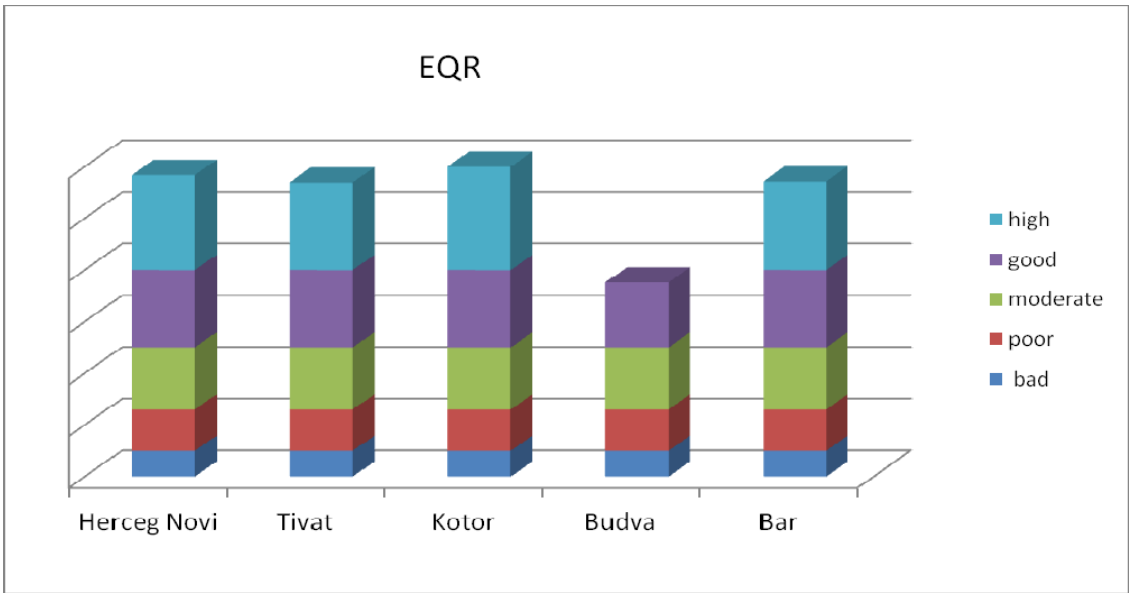
We mapped algal communities in the mediolitoral along the coast from cape Arza in the northern part of Montenegro to the island of Stari Ulcinj in the southern part of the country. The results are shown in Figures 3, 4 and 5. The *Cystoseira* assemblages in the surveyed area are abundant. These species are known as builders of a climax biocenosis on a hard bottom. Furthermore, these species are mostly indicators of clean sea water and a good ecological status. In the southern part of the surveyed coast there are several locations with degraded rocky habitats and a lower ecological status in general, what is reflected also by a higher abundance of green algae, mussels and cyanobacteria. In most of cases, this degraded ecological status is caused by new constructions on the coast while only in few cases it is because of bad sea water quality.

Figure 3. Distribution of the alga *Cystoseira amentacea* (●continuous belt; ●abundant patches; ●rare scattered plants)

Figure 4. Distribution of ● *Cystoseira compressa* and ● photophilic algae

Figure 5. Distribution of ● mussels , ● green algae, ● cyanobacteria

The ecological quality index calculated for the municipality of Budva shows good water quality, while in the municipalities of Herceg Novi, Tivat, Kotor and Bar the ecological quality index is very good (Graph 1).



Graph 1. CARLIT ecological quality index (EQR) for the surveyed coast from cape Arza to the island Stari Ulcinj

3. Survey of potential monk seal habitat in the area surveyed in 2013 (cape Arza to cape Platamuni)

In Figure 6, 11 caves already known as potential monk seal habitat in the area between cape Arza and cape Platamuni are presented. We surveyed again these locations in May 2014 but, once again, no evidence of monk seal presence was found. We discovered by SCUBA diving new details for the cave in the location "Tijesna luka": an underwater channel 29m long and 3m wide is ending with an air gap 1 x 3m and 3m high above sea level.

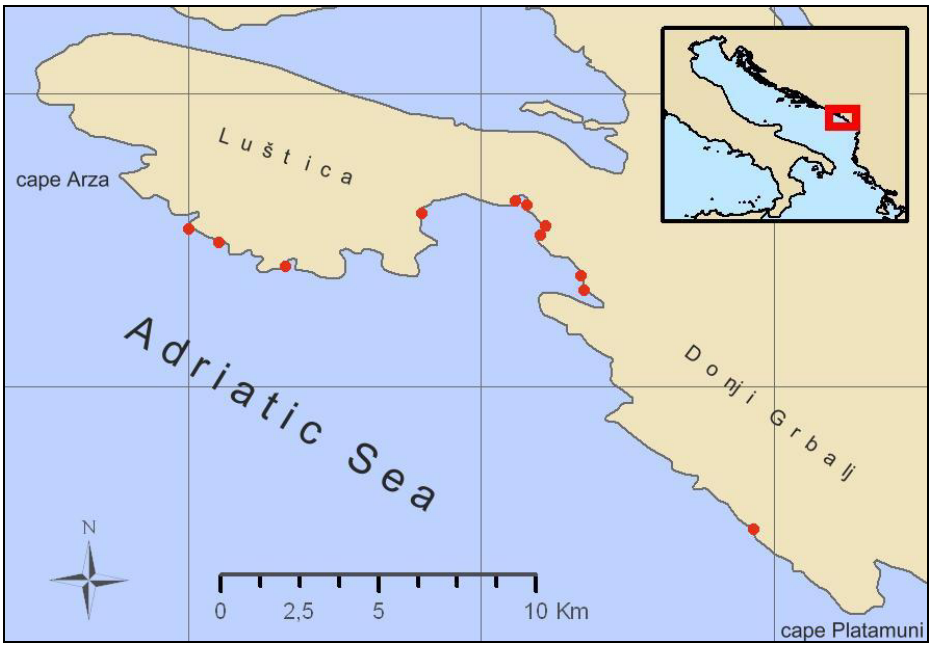


Figure 6. Locations registered during the 2013 survey as potential habitats for monk seal and surveyed again in May 2014.

CONCLUSIONS

In the area from cape Platamuni to Cape Voluica we registered 30 locations, 16 of which may be classified as caves, according to the definition given above. The biggest one, Vrančeva sika close to Budva, is characterized by 3 entrances. In total, we registered 8 locations as potential habitats for monk seals. As in 2013, evidence of monk seal presence was not found.

In the surveyed area we also registered several protected species: 4 marine plants (*Lithophyllum byssoides, Cystoseira amentacea, Posidonia oceanica, Cymodocea nodosa*), one terrestrial plant (*Euphorbia dendroides*), two invertebrate species (*Lithophaga lithophaga, Geodia cydonium*) and one bird species (*Alcedo atthis*). The protected bat species *Miniopterus schreibersii* was registered in high numbers in three caves in the area from cape Arza to Cape Platamuni while only very few individuals were there in 2013.

The evaluation of the ecological quality index by the CARLIT method indicated a good sea water quality for the municipality of Budva, while for the parts of the surveyed coast of the municipalities of Herceg Novi, Tivat, Kotor and Bar the evaluated ecological quality index was very good. On the basis of the above results, we conclude that the CARLIT method - with the adequate calibrations - could be implemented for the monitoring of the ecological status of the marine environment of the country as requested by the EU Water Directive.

During our survey in May 2014, and also later on, we communicated to the public media some preliminary results. These media reports are listed in the Annex. Furthermore, we participated in two international scientific congresses:

(1) 28th Annual Conference of the European Cetacean Society, Liege, Belgium, 5th to 9th, April 2014, and
(2) 1st Mediterranean Symposium on the conservation of the dark habitats, Portorož, Slovenia, 31 October 2014 (first poster award)

In the above congresses, the results of the last year's survey were presented and the findings are now available to the broad scientific community.

We expect that the results from this year's survey will be also published in scientific papers soon and that we will justify in this way the confidence of Jugopetrol AD Kotor in us by giving us a donation for a second time. Once again, we would like to thank Jugopetrol AD Kotor, hoping that our cooperation will be continued in the future.

Annex

10:01 | 29. maj 2014.

Nastavak istraživanja morskih pećina od rta Platamuni do rta Voluice

 foto: V.Mačić

dr Vesna Mačić

U Crnoj Gori još uvijek nema zaštićenog područja u moru, iako je u toku ili su završeni neki projekti kojima je cilj stvaranje zaštićenog područja (u okolini Petrovca i na području Donjeg Grblja), pa je jasno da je neophodno detaljnije izučiti ova područja i ustanoviti prisustvo važnih staništa i vrsta kako bi se obezbijedila njihova dalja zaštita prema domaćoj i EU legislativi.

Ovo je za Skala radio izjavila dr Vesna Mačić, naučna radnica u kotorskom Institutu za biologiju mora. Zahvaljujući donaciji Jugopetrola AD Kotor u 2013. godini je sproveden projekat "Istraživanje budućeg zaštićenog područja u moru Platamuni i susjednog poluostrva Luštica, sa posebnom pažnjom na morske pećine kao potencijalno stanište za ugroženog sredozemnog tuljana".

Institut za biologiju mora je zajedno sa kolegama iz grčke NVO Archipelagos i crnogorske NVO MedCEM tokom septembra prošle godine sproveo istraživanja morskih pećina u pomenutoj oblasti i po prvi put je stvorena evidencija ovih specifičnih staništa koja su inače jedno od prioritentih staništa prema EU Direktivi o staništima i važe za lokacije sa jedinstvenim i visokim biodiverzitetom neophodne i za opstanak tuljana (zaštićene vrste najrijeđeg morskog sisara u Sredozemlju).

U cilju podizanja svijesti o važnosti morskih pećina i zaštićene vrste morskih sisara – tuljana, urađene su i brošure koje su podijeljene u školama opština Kotor, Tivat i Herceg Novi u kojima se nalazi istraživano područje.

Izvještaji na našem i engleskom jeziku su predati nadležnim institucijama, a rezultati ovog projekta su predstavljeni i na 28. Konferenciji Evropskog društva morskih sisara koji je održan od 7. do 9. aprila, u Liježu, Belgija.

Zahvaljujući novoj donaciji Jugopetrola AD Kotor u toku je nastavak istraživanja morskih pećina. Ovih dana istražujemo područje na potezu od rta Platamuni do rta Voluice, a planiran je i obilazak nekih od najznačajnijih pećina koje smo istraživali prošle godine na području Luštice i Donjeg Grblja. I ove godine je, uz Institut za biologiju mora u ovo istraživanje uključena Aliki Panou iz grčke NVO Archipelagos, kao i Dušan Varda iz crnogorske NVO MedCEM.

Nakon završetka terenskog rada i obrade podataka široj javnosti će biti prezentirani rezultati, a izvještaji će kao i prošle godine biti dostavljeni nadležnim institucijama i objavljeni u naučnim časopisima, kazala je dr Mačić uz iskrenu zahvalnost Jugopetrolu AD Kotor na povjerenju i ovoj vrijednoj donaciji.


FOTO: Vesna Mačić; foto: A. Panou

http://skalaradio.com/2014/05/29/nastavak-istrazivanja-morskih-pecina-od-rta-platamuni-do-rta-voluice/

ISTRAŽIVANJE OD PLATAMUNA DO VOLUJICE

Autor Radio Kotor

29.05.2014

Institut za biologiju mora u Kotoru i ove godine je za svoje istraživačke projekte dobio donaciju kotorskog „Jugopetrola" a.d.
„Ovo preduzeće nas je i prošle godine podržalo u izučavanju morskih pećina od rta Arza do rta Platamuni jer su te pećine stanište koje je, prema Evropskoj direktivi o staništima, jedno od prioritetnih zbog svog biodiverziteta, specifičnih organizama koji tu žive i zbog činjenice da morske medvjedice kao zaštićena vrsta u njima uglavnom borave. Ova staništa su dosta ugrožena ekspanzijom gradnje na samoj obali" – rekla je Radio Kotoru dr Vesna Mačić iz istraživačkog tima u kome su još Aliki Panou iz grčke NVO „Arhipelagos" i Dušan Varda iz crnogorske NVO „MedCEM". Po njenim riječima, kod Platamuna je predviđeno da se kreira zaštićeno područje u moru. „Ove godine istražujemo prostor od Platamuna do rta Volujica kod Bara, a posjetićemo i neke pećine na Luštici koje smo ranije markirali" – rekla nam je Vesna Mačić. Kako je kazala, Institut veliku zahvalnost duguje „Jugopetrolu" koji je prepoznao značaj istraživanja mora na našem području.

http://radiokotor.info/mn/index.php?option=com_content&task=view&id=21072&Itemid=1

Objavljeno: Četvrtak, 29 Maj, 2014 - 17:35 Izvor: CdM

Nastavlja se istraživanje morskih pećina

Komentari (0)
A A A

Kotorski Institut za biologiju nastavio je istraživanje morskih pećina, a trenutno proučava područje od rta Platamuni do rta Volujice, saopštila je predstavnica Instituta Vesna Mačić.

On je kazala da je istraživanje nastavljeno zahvaljujući novoj donaciji Jugopetrola.

"Ovih dana istražujemo područje na potezu od rta Platamuni do rta Volujice, planiran je i obilazak nekih od najznačajnijih pećina koje smo istraživali prošle godine na području Luštice i Donjeg Grblja“, rekla je Mačić za agenciju MINA.

Prema njenim riječima, kao i prethodnih, i ove godine uz Institut za biologiju mora u ovo istraživanje uljučena je Aliki Panou iz grčke nevladina organizacija Archipelagos, kao i Dušan Varda iz crnogorske NVO MedCEM.

Mačić je navela da će rezultati biti prezentovani nakon završetka terenskog rada i obrade podataka, a izvještaji će kao i prošle godine biti dostavljeni nadležnim institucijama i objavljeni u naučnim časopisima.

Ona je podsjetila da u Crnoj Gori još nema zaštićenog područja u moru ZPM, iako je u toku, ili su završeni neki od projekata kojima je u okolini Petrovca i na području Donjeg Grblja njegovo stvaranje cilj.

"Zato je jasno da je neophodno detaljnije izučiti ova područja i ustanoviti prisustvo važnih staništa i vrsta kako bi se obezbijedila njihova dalja zaštita prema domaćoj i EU legislativi”, kazala je Mačić.

Prošle godine je, kako je dodala, zahvaljujući donaciji Jugopetrola, sproveden projekat Istraživanje budućeg zaštićenog područja u moru Platamuni i susjednog poluostrva Luštica sa posebnom pažnjom na morske pećine kao potencijalno stanište za ugroženog sredozemnog tuljana.

"Institut za biologiju mora je zajedno sa kolegama iz grčke NVO Archipelagos i crnogorske NVO MedCEM septembra prošle godine sproveo istraživanja morskih pećina u toj oblasti i prvi put je stvorena evidencija ovih specifičnih staništa koja su jedno od prioritentih staništa prema direktivi Evropske unije“, navela je Mačić.

Ona je kazala, da su u cilju podizanja svijesti o važnosti morskih pećina i zaštićene vrste morskih sisara - tuljana, urađene brošure koje su podijeljene u školama opština Kotor, Tivat i Herceg Novi u kojima se nalazi i istraživano područje.

"Ivještaji na našem i engleskom jeziku su predati nadležnim institucijama, a rezultati ovog projekta su predstavljeni i na 28. Konferenciji Evropskog društva morskih sisara koji je održan 7-9 Aprila, u Liježu, Belgija”, navela je Mačić.

http://www.cdm.me/turizam/nastavlja-se-istrazivanje-morskih-pecina

"NEAŽURAN"
3.11.2014 18:48

Mačić: Univerzitet spor u rješavanju statusa saradnika

„U sekciji za koraligen predstavljen je rad koji smo radili sa kolegama iz Italije”, kazala je ona

FOTO: BORIS PEJOVIĆ**AUTOR:** Mina

Univerzitet Crne Gore (UCG)neažuran je u rješavanju naučnog statusa saradnika na toj instituciji, ocijenila je Vesna Mačić sa Instituta za biologiju mora.

Mačić je, u saopštenju dostavljenom agenciji MINA, objasnila da se radi o saradnicima Instituta koji su završili doktorske disertacije, ali njihovo imenovanje u naučno zvanje još nije obavljeno.

„Čudi sporost UCG u riješavanju naučnog statusa nekih naših saradnika, koji su bez izbora u naučno zvanje, pa time sljedećeg mjeseca praktično ostaju bez posla”, ocijenila je ona.

Mačić je saopštila i da je u Portorožu u Sloveniji učestvovala na petodnevnom simpozijumu o očuvanju glavnih sredozemnih habitata, na kom se, kako je navela, Institut za biologiju mora predstavio sa dva naučna rada. „U sekciji za koraligen predstavljen je rad koji smo radili sa kolegama iz Italije”, kazala je ona.

Tu je predstavljena, kako je objasnila, metoda mapiranja biocenoza morskog dna primijenjena u Kotorskom i Risanskom zalivu i italijanskom zaštićenom području u moru. Predstavljen je i rad "Doprinos poznavanju morskih pećina na potezu od rta Arza do rta Platamuni", koje je Institut sproveo krajem prošle godine zahvaljujući donaciji Jugopetrola Kotor. Mačić je kazala da je istraživanje morskih pećina ove godine nastavljeno zahvaljujući novoj donaciji.

Za prezentaciju morskih pećina Institut je dobio nagradu za najbolji poster.

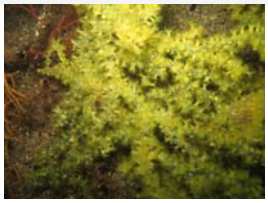
„To dodatno potvrđuje vrijednost naučnog rada koji se sprovodi u Institutu za biologiju mora”, navela je Mačić.

http://www.vijesti.me/vijesti/macic-univerzitet-spor-u-rjesavanju-statusa-saradnika-803511

Kategorija: Vijesti

DR MAČIĆ: SPOROST UNIVERZITETA U RJEŠAVANJU NAUČNOG STATUSA

Objavljeno 04 11 2014




Dr Vesna Mačić sa Instituta za biologiju mora prozvala je Univerzitet Crne Gore zbog sporosti u rješavanju naučnog statusa saradnika ove naučne instutucije sa sjedištem u Kotoru. U saopštenju proslijeđenom Radio Kotoru Mačić navodi da je riječ o saradnicima Instituta koji duži period posjeduju završene doktorske disertacije. „Čudi sporost Univerziteta Crne Gore u rješavanju naučnog statusa nekih naših saradnika, koji su bez izbora u naučno zvanje pa time sljedećeg mjeseca praktično ostaju bez posla", ocijenila je Mačić. Ona je protekle sedmice od 27.-31. oktobra u Portorožu učestvovala na petodnevnom simpozijumu o očuvanju glavnih sredozemnih habitata. „Na simpozijumu je uzelo učešće oko 150 naučnih radnika iz zemalja Sredozemlja čiji je rad bio podijeljen u tri sekcije, a to su: morska vegetacija, koraligen i tamna staništa.Institut za biologiju mora je učestvovao na ovom simpozijumu sa dva naučna rada. U sekciji za koraligen je predstavljen rad koji smo radili sa kolegama iz Italije. Tu je predstavljena metoda mapiranja biocenoza morskog dna koja je bila primijenjena u Kotorskom i Risanskom zalivu i italijanskom zaštićenom području u moru (ZPM) "Secche di Tor Paterno" u okviru projekta MedMPAnet koji je vodio RAC SPA centar iz Tunisa (Regionalni centar za zaštićena područja u Moru koji djeluje u okviru Barselonske konvencije)", kazala je Mačić.

Osim mapiranja Mačić ističe da su kao specifikum, ne samo Boke Kotorske nego i Sredozemlja, predstavljene biocenoze korala Savalia savalia (narodni naziv je lažni crni koral ili žuti koral). U Bokokotorskom zalivu naseljava lokacije u blizini vrulja. „Kod Dražin vrta i Strpa živi na dubinama od 15-ak metara što za sada nije poznato ni za jedno drugo mjesto u Sredozemlju", kazala je Mačić. Ona je naznačila da je pomenuto istraživanje zainteresovalo naučne radnike iz drugih zemalja „što puža nadu u cilju očuvanja tih lokacija u Boki i uopšte boljoj zaštiti mora". Drugi rad koji je bio predstavljen na pomenutom kongresu je Doprinos poznavanju morskih pećina na potezu od rta Arza do rta Platamuni, koje je Institut sproveo krajem prošle godine zahvaljujući donaciji Jugopetrola AD Kotor. Ove godine istraživanje morskih pećina nastavljeno je zahvaljujući novoj donaciji. „Vjerovatno će tokom sljedećeg mjeseca biti upriličena i zvanična prezentacija ovogodišnjih rezultata kako bi se Jugopetrolu AD Kotor još jednom zahvalili na ovim dragocjenim donacijama", kazala je Mačić. Za pomenutu prezentaciju morskih pećina Institut je dobio nagradu za najbolji poster. „To dodatno potvrđuje vrijednost naučnog rada koji se sprovodi u Institutu za biologiju mora", navela je Mačić.

http://www.radiokotor.info/radio/index.php/78-lokalne-vijesti/1854-dr-macic-sporost-univerziteta-u-rjesavanju-naucnog-statusa

NAUČNICI KOTORSKOG INSTITUTA NA KONGRESU U SLOVENIJI

4.11.2014 14:29

Veliko interesovanje za korale i morske pećine

Institut za biologiju mora je učestvovao na ovom simpozijumu sa dva naučna rada, od kojih se jedan odnosio na istraživanje crnih, odnosno žutih korala u podmorju Boke

117PREGLEDA

Sa skupa u Portorožu

FOTO: INSTITUT ZA BIOLOGIJU MORA KOTOR**AUTOR:** Siniša Luković

Naučnici Instituta za biologiju mora iz Kotora predstavili su dva svoja naučna rada na petodnevnom međunarodnom simpozijumu o očuvanju sredozemnih habitat, a koji je prošle nedjelje održan u Portorožu u Sloveniji.

Ovaj skup okupio je oko 150 naučnih radnika iz zemalja Sredozemlja a rad simpozijuma bio je podijeljen u tri sekcije - morska vegetacija, koraligen i tamna staništa.

Institut za biologiju mora je učestvovao na ovom simpozijumu sa dva naučna rada, od kojih se jedan odnosio na istraživanje crnih, odnosno žutih korala u podmorju Boke.

"U sekciji za koraligen je predstavljen rad koji smo radili sa kolegama iz Italije - metoda mapiranja biocenoza morskog dna koja je bila primijenjena u Kotorsko-Risanskom zalivu i italijanskom zaštićenom području u moru "Secche di Tor Paterno" u okviru projekta MedMPAnet koji je vodio RAC SPA centar iz Tunisa. Osim samog mapiranja važno je napomenuti da su, kao specifikum ne samo Boke Kotorske nego i Sredozemlja, predstavljene biocenoze korala Savalia savalia (narodni naziv je lažni crni koral ili žuti koral) koji u našem zalivu naseljava lokacije u blizini vrulja, a kod Dražin Vrta i Strpa živi na dubinama od 15-tak metara što za sada nije poznato za nijedno drugo mjesto u Sredozemlju. Osim što je ovo zainteresovalo naučne radnike iz drugih zemalja nadamo se da će doprinijeti i očuvanju tih lokacija u našem zalivu i uopšte boljoj zaštiti mora", kazala je tim povodom dr Vesna Mačić iz Kotorskog Instituta.

Drugi naučni rad iz Kotora koji je predstavljen na kongresu u Portorožu je "Doprinos poznavanju morskih pećina na potezu od rta Arza do rta Platamuni".

To istraživanje je Institut sproveo krajem prošle godine zahvaljujući donaciji "Jugopetrola" AD Kotor, a ove godine je istraživanje morskih pećina i nastavljeno zahvaljujući novoj donaciji.

Morske pećine veoma su vrijedna i specifična staništa u kojima žive posebne biljne i životinjske vrste, a neke od tih pećina koje u sebi imaju i malo žalo, mogu biti i stanište izuzetno rijetke i zaštićene vrste morskih sisara – sredozemne medvjedice, kako se naziva ta vrsta tuljana.

"Za prezentaciju morskih pećina dobili smo nagradu za najbolji poster, što dodatno potvrđuje vrijednost naučnog rada koji se sprovodi u Institutu za biologiju mora, a nažalost, ujedno i čudi sporost Univerziteta Crne Gore, u riješavanju naučnog statusa nekih naših saradnika koji su već duži period sa završenim doktorskim disertacijama, ali bez izbora u naučno zvanje pa time sledećeg mjeseca praktično ostaju bez posla", istakla je dr Vesna Mačić koja je vodila ovo istraživanje.

http://www.vijesti.me/vijesti/veliko-interesovanje-za-korale-i-morske-pecine-803636

Naučnici kotorskog Instituta za biologiju mora u Portorožu – Veliko interesovanje za korale i morske pećine

Vijesti 04/11/2014 14:49

Naučnici kotorsog Instituta za biologiju mora imali zapažen nastup na međunarodnom kongersu u Sloveniji








Naučnici Instituta za biologiju mora iz Kotora predstavili su dva svoja naučna rada na petodnevnom međunarodnom simpozijumu o očuvanju sredozemnih habitat, a koji je prošle nedjelje održan u Portorožu u Sloveniji. Ovaj skup okupio je oko 150 naučnih radnika iz zemalja Sredozemlja a rad simpozijuma bio je podijeljen u tri sekcije -morska vegetacija, koraligen i tamna staništa.

Institut za biologiju mora je učestvovao na ovom simpozijumu sa dva naučna rada, od kojih se jedan odnosio na istraživanje crnih, odnosno žutih korala u podmorju Boke.

“U sekciji za koraligen je predstavljen rad koji smo radili sa kolegama iz Italije -metoda mapiranja biocenoza morskog dna koja je bila primijenjena u Kotorsko-Risanskom zalivu i italijanskom zaštićenom području u moru “Secche di Tor Paterno” u okviru projekta MedMPAnet koji je vodio RAC SPA centar iz Tunisa. Osim samog mapiranja važno je napomenuti da su, kao specifikum ne samo Boke Kotorske nego i Sredozemlja, predstavljene biocenoze korala Savalia savalia (narodni naziv je lažni crni koral ili žuti koral) koji u našem zalivu naseljava lokacije u blizini vrulja, a kod Dražin Vrta i Strpa živi na dubinama od 15-tak metara što za sada nije poznato za nijedno drugo mjesto u Sredozemlju. Osim što je ovo zainteresovalo naučne radnike iz drugih zemalja nadamo se da će doprinijeti i očuvanju tih lokacija u našem zalivu i uopšte boljoj zaštiti mora.”- kazala je tim povodom danas dr Vesna Mačić iz Kotorskog Instituta.

Drugi naučni rad iz Kotora koji je predstavljen na kongresu u Portorožu je “Doprinos poznavanju morskih pećina na potezu od rta Arza do rta Platamuni”. To istraživanje je Institut sproveo krajem prošle godine zahvaljujući donaciji “Jugopetrola” AD Kotor, a ove godine je istraživanje morskih pećina i nastavljeno zahvaljujući novoj donaciji. Morske pećine veoma su vrijedna i specifična staništa u kojima žive posebne biljne i životinjske vrste, a neke od tih pećina koje u sebi imaju i malo žalo, mogu biti i stanište izuzetno rijetke i zaštićene vrste morskih sisara – sredozemne medvjedice, kako se naziva ta vrsta tuljana.

“Za prezentaciju morskih pećina dobili smo nagradu za najbolji poster, što dodatno potvrđuje vrijednost naučnog rada koji se sprovodi u Institutu za biologiju mora, a nažalost, ujedno i čudi sporost Univerziteta Crne Gore, u riješavanju naučnog statusa nekih naših saradnika koji su već duži period sa završenim doktorskim disertacijama, ali bez izbora u naučno zvanje pa time sledećeg mjeseca praktično ostaju bez posla.”- istakla je dr Vesna Mačić koja je vodila ovo istraživanje.

AUTOR SINIŠA LUKOVIĆ

http://www.bokanews.me/vijesti/naucnici-kotorsog-instituta-za-biologiju-mora-u-portorozu-veliko-interesovanje-za-korale-morske-pecine/

No. CONS - 16

HABITAT AVAILABILTY FOR THE MEDITERRANEAN MONK SEAL *MONACHUS MONACHUS* IN MONTENEGRO

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INTRODUCTION

The current world population of the critically endangered Mediterranean monk seal (*Monachus monachus*) is estimated to consist of 500-600 individuals, of which about 250-300 live in the Mediterranean basin (GFCM 2011). The species' former distribution extended throughout the Mediterranean, the Black Sea and the Atlantic coasts of NW Africa including the Cabo Verde Islands, Madeira and the Azores Islands (GFCM 2011). Nowadays, actively reproducing populations within the Mediterranean basin are found mainly in Greece and Turkey (GFCM 2011). Apart of the above well known populations, the species was considered extinct in most of its former range. However, recent sightings indicate that the species may still exist throughout its ancient habitat where it is considered extinct or of unknown status (Bundone *et al.* 2013a). Such areas are defined as "low density areas" characterized inter alia by the potential presence of monk seal populations and habitat availability (GFCM 2011). Most countries adjacent to the Adriatic Sea, i.e. Croatia, Italy and Albania, are among these "low density areas" (Bundone *et al.* 2013b, Mo 2011, White *et al.* 2005).

MATERIAL AND METHODS

From 16 to 22 September 2013, we systematically surveyed a coastline of ca. 35 km between cape Arza on the peninsula of Lustica and cape Platamuni on the peninsula of Donji Grbalj in Northern Montenegro coast using the boat of the IMB Kotor "Nemirna" and the institute's diving equipment, GPS and underwater camera. Whenever a marine cave with an entrance visible above sea level was noted, coordinates were taken with the GPS (a Garmin 76) and notes were taken on a nautical map. The caves were then carefully entered by snorkeling or diving. Wherever an internal beach was found, making the cave a potential monk seal habitat for reproduction and resting, the beach was inspected for seal evidence and the following additional data were noted: name of the specific coastline, exposure of the cave's entrance, dimensions of the cave, dimensions of the beach, type of beach (sand, pebbles, rock), sea conditions and general geomorphological characteristics of the cave.

Fig. 1. Caves in the study area marked as potential for the species' resting and reproduction.

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RESULTS AND RECOMMENDATIONS

Like all Pinnipedia, the Mediterranean monk seal needs to come onto the shore for resting and reproduction. The pups are suckled and need to learn how to swim and find their own food. Due to the disturbance by man over numerous open beaches, monk seals have mostly retreated into sea caves with a patch of beach. Thus, marine caves with a beach inside are imperative for the survival of the species.

The current situation in Montenegro with respect to monk seal presence and habitat availability was unknown. In September 2013, we systematically surveyed a part of the coastline in Montenegro for the first time and registered suitable terrestrial habitats.

Altogether 45 caves were entered. We did not find evidence of seal presence but nineteen caves had a beach inside: 1 with a sandy beach, 14 with pebbles and 4 with flat rocks. We also registered one cave with an underwater entrance known to us from the past. From these 19 caves, 11 had a beach suitable at least for resting – the other 8 were too small to be considered as a suitable monk seal habitat. It is worth mentioning here that the shape of the beaches changes according to sea currents and the general weather conditions over the years. Two caves were located between cape Žukovac and cape Platamuni where an MPA is planned to be established by the Ministry of Sustainable Development and Tourism of Montenegro

Thus, there are at least 11 caves in the study area suitable for the species' resting and reproduction. The presence of monk seals in this region until at least the 70's is well documented. The last known seal was killed in the area of Herceg Novi in the northwest of the peninsula of Luštica in the early 70's (photos above). Additionally, one marine cave further south of our study area is generally known as the "Seal Cave" ("Tuljanova pecina") indicating the former presence of seals in the greater area. It is also worth noting that an unverified sighting of a monk seal was reported in the local news from the wider area off the Bay of Kotor on the 4th of September 2008.

Single surveys may not detect seal evidence even in areas well known for their stable seal population, such as in the Northern Sporades, Greece, for instance (Harwood *et al.* 1984). Thus, further systematic surveys of our current study area in northern coast of Montenegro as well as the coast in Southern Montenegro and the involvement of the coastal residents for reporting potential seal sightings are strongly recommended in order to establish the real present situation.
The presence of monk seals in neighbouring Croatia is nowadays well documented including the southern part adjacent to our study area and also in Italy and Albania. Furthermore, there is an actively reproducing population in the Greek Ionian Sea (Panou 2009; Panou *et al.* 1993). Considering the ability of the species to travel over long distances within a short time (Adamantopoulou *et al.* 2011), we strongly believe that the area of study may be recolonized if appropriate protection measures are implemented.

Acknowledgements: Authors wish to thank Jugopetrol AD Kotor, Montenegro who financed this project. The University of Venice "Ca' Foscari", Dipartimento di Scienze Ambientali Informatica e Statistica financed the travel of Archipelagos' volunteer and PhD student Luigi Bundone.

CONTRIBUTION TO THE KNOWLEDGE OF RARE AND ENDANGERED HABITATS - MARINE CAVES (MONTENEGRO, SOUTH EAST ADRIATIC COAST)

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1st Mediterranean Symposium on the conservation of the dark habitats (Portorož, Slovenia, 31 October 2014)

INTRODUCTION

Marine caves are an important and endangered habitat listed in Annex I of the EU Habitat Directive (1992). They are also protected by the Montenegrin law on nature protection (Sl. list, 2013). Over two-thirds of the territory of Montenegro belongs to the karst formation of the south-eastern Dinarides with various and specific rocky forms including numerous caves. Data on marine caves in Montenegro are very scarce and, at present, there is no Marine Caves' Register (although it is planned by law). For all above reasons we surveyed the marine caves in the northern coast of Montenegro in order to:

(a) contribute to the knowledge of this important, but poorly studied habitat,
(b) to create the basis for the urgently needed Cave Register and
(c) to ensure a better management of this rare, endangered and protected habitat.

MATERIAL AND METHODS

We surveyed the area from cape Arza (peninsula of Luštica) down to cape Platamuni (peninsula of Donji Grbalj) (ca. 40km), in September 2013. Special attention was given to the area planned for the future MPA Platamuni (from cape Žukovac to cape Platamuni). For all registered caves (longer than 5m) and holes (less than 5m) the following basic data were noted: location name, geographic coordinates, dimensions (in meters), exposition, morphological characteristics, date of survey, and typical living organisms in the cave and in front of it. During the postprocessing of the collected data all locations were mapped by Quantum GIS software (2013).

RESULTS AND RECOMMENDATIONS

In the surveyed area we registered 20 marine caves one of which had an underwater entrance. Only few marine caves had a relatively deep submerged area (up to 30m depth below the sea level), while most of them were only a few meters deep. In some caves there was a small pebble or sandy beach and in others cave rock formations were found. Some beaches inside the caves were registered as potential habitats for the endangered Mediterranean monk seal, *Monachus monachus*.

No. 8	Location: **Plava špilja**
	 Foto: Aliki Panou
Coordinates	N 42° 22' 26.36" E 18° 35' 48.34"
Dimensions	Two entrances partially submerged. The bigger entrance is 9m wide x 6m high, while smaller entrance is 4m wide x 2m high. Cave is 60m long x 40m wide (depth of water 6m; height above the sea level is cc 25m).
Exposition	West (and east for the smaller entrance)
Morpho-characteristics	The cave has two entrances. A part of the cave floor is sandy but mostly it is rocky. There is a inflow of fresh water and some cave rock formations on the walls.
Living organisms	Close to the entrances there are many algae and sponges, deeper in the cave assemblages vary and are not very rich. Occasionally there are bats on the cave's walls.
Notes	Anthropogenic pressure from touristic boats in summer months is intensive.
Date of survey	18. 09. 2013.
In front of the cave	Rocks, boulders, barren area, *Padina pavonica*, *Cystoseira amentacea*, *Posidonia oceanica*, *Pinna nobilis*, little sandy areas, few *Lithophyllum byssoides* colonies.

No. 40	Location: **Krekavica cave**
	 Foto: Aliki Panou  Foto: Dušan Varda
Coordinates	N 42° 17' 02.59" E 18° 45' 24.77"
Dimensions	15m wide x 8m high x 15m long (depth of water 30m; height above the sea level is 4m)
Exposition	South
Morpho-characteristics	The cave is widely open to the south and the walls inside the cave in the water are vertical down to 30m depth. On the bottom and in a small area in front of the entrance there is sand. On the west side of the cave there is a cubical boulder creating almost an underwater bridge. Further inside the cave there is no air gap. On the east side, a part of the vertical rock divides the space so that one can enter the cave also from the smaller hole. Behind this part on the east side it is completely dark.
Living organisms	High biodiversity. The most abundant organisms are various species of sponges but also many other polychaetes, bryozoans, crustaceans and others.
Notes	This is the location with the richest cave biodiversity observed so far.
Date of survey	21. 09. 2013.
In front of the cave	Above the cave there are high vertical cliffs where some endemic plants were observed. For example, *Euphorbia dendroides* is very abundant. Also the area is suitable for some protected bird species.

Besides the marine caves we also registered 24 holes less than 5m long, but still important as potential habitat for some rare or endangered species. In the surveyed area, the following 7 marine protected species (Sl. list 2006) were registered inside or around the caves: *Lithophyllum byssoides*, *Cystoseira amentacea*, *Posidonia oceanica*, *Cymodocea nodosa*, *Pinna nobilis*, *Cladocora caespitosa* and *Lithophaga lithophaga*. Additionally, 2 species of protected terrestrial plants were noted, namely *Euphorbia dendroides* and *Limonium angustifolium*, 5 species of protected birds, namely *Ardeola ralloides*, *Alcedo athis*, *Phalacrocorax aristotelis*, *Acciptier gentilis* and *Corvus corax*, and one protected bat species (*Miniopterus schreibersii*). Furthermore, in few locations, in front of the caves we registered nursery areas for some key species (e.g. *Epinephelus costae*, *Epinephelus marginatus*).

CONCLUSIONS

Our data on marine caves in Montenegro will be used for the urgently needed creation of a Caves' Register and will substantially contribute to implement more efficient protection measures of this fragile and endangered habitat and the marine environment in general.

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