RESULTS OF THE FIRST IMAP MARINE SURVEY IN PATOK-RODONI BAY, ALBANIA

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ABSTRACT

Rodoni Cape (Albania), located 30 km north of Durres and 30 km south of Montenegro's border splits Lalzit bay into two parts. The outflows of Ishmi and Mati rivers have an imapct on the Patok-Rodoni bay in the north, in spite of its relevant biodiversity and the presence of wetlands, complaints sedimentation effect on Posidonia meadows, geophysical disturbance due to various inland anthropogenic activities, contaminants and marine-litter. The first IMAP marine survey was carried outin October 2020 in the framework of the GEF Adriatic Project by an Albanian-Italian research team. A range of activities were required within the framework of IMAP and ICZM Protocol. The Survey was supported by UNEP/MAP, SPA/RAC, MEDPOL and NAPA, with the contribution of PAP/RAC. During the field phase, several IMAP Ecological Objectives were investigated, and environmental data collected to comply with all the relevant common indicators. There were 8 stations distributed along 3 transepts and monitoredfor the assessment of the good environmental status of the areaand identification of the main threats: off-shore,

inside Patok bay and near Cape Rodoni in Lalzi bay. Survey provided relevant scientific informations on EO1 Biodiversity, habitat and species, EO2 non-indigenous-species, EO5 eutrophication, EO7 hydrography, EO9 contaminants, EO10 marine-litter and provided preliminary data for fisheries. Important oceanographic equipments (Multi-probe-analyzers, water/sediment samplers, SSS, SBES, ROV) were used. Scientific divers and video-reporters were involved to realize both bionomic underwater LIT transects, both a video-documentary and an innovative 360-Interactive Virtual Tour as a new tool of scientific dissemination. All the data are integrated into the IMAP InfoSystem and the GIS-based maps showing both sensitive and high pressures areas.
Keywords: marine survey, Patok-Rodoni, IMAP, SPA/RAC, UNEP/MAP, GEF Adriatic, Ecological Objective, *Common Indicator, SSS, SBES, ROV, Underwater scientific divers*

1. INTRODUCTION

The GEF Adriatic project aims to support Maritime Spatial Planning (MSP) across the Adriatic region as a tool for sustainable development. It's among the first initiative of its kind, embedding national IMAPs developed within the Barcelona Convention into MSP to achieve good environmental status of the Mediterranean Sea. The project is implemented in Albania and Montenegro by the UNEP/MAP Coordinating Unit with PAP/RAC and SPA/RAC. The Patok-Rodoni Bay, theAlbanian surveyed area, is approximately 90 km^2, and includes the Rodoni Cape and the Rodoni Bay. The area is known for its relevant biodiversity including a 50 km^2 protected area in the coastline. Here, the anthropogenic activityhas been evident, in addition to the impact caused by the water exchanges with Patok Lagoon and the inflows from the river of Ishmi and Mati. The whole project was carried out in close cooperation with the SPA/RAC team and the National Agency for Protected Areas (NAPA) of the Albanian Ministry of Tourism and Environment. The present study involves theCertain Indicators (CI) of the IMAPEcological Objectives (EO) related to biodiversity, hydrology, contaminants and marine litter. The National and International Experts (an Italo- Albanian team) who were hired by SPA/RAC for the survey, employed various oceanographic and marine biology techniques.Final results from data analysis and laboratory work could be found in the Final Report, Annex Files (20), the Executive Summary, the Job Training Session, the complete GIS based Map Archive, the Monitoring Database aligned with IMAP Tables ready to IMAP Info Pilot System, high quality photographic Reportage, long videos from ROV and Scientific Divers investigations, a short promo videoclip, a long version of documentary-film and an experimental Interactive Virtual Tour based on VR360 8K pictures and videos, recorded during Project's field activities. Results and main recommendations area means to

address the pressure on the environment and identification of the most fragile areas of Patok-Rodoni Bay, andsketch the Albanian Integrated Monitoring Programme (IMP) within the area and proposal of measures that allowthe preservation of fragile marine areas and the development of sustainable economic activities.

Study area

The Figure 1 depicts the Rodoni Cape (Albania), located 30 km north of Durres and 30 km south of Montenegro's border splits Lalzit bay into two parts. The Rodoni Bay in the north includes the Patoku Lagoon and the MatiRiverin the north of the lagoon. The southern part, usually named Lalzi bay, is a long sandy beach of about 18 km. This part of the coast of Albania is characterized by an accumulative sandy coastline. The maximum depth of the bay is around -30 m, diminishing regularly towards the coast. The southern part of the bay is deeper than the eastern part. These depths come closer to each other and with the coast in the region of the Mati mouth. The seabed within the bay is completely silty and sandy: all homogeneous and flat without particular pre-coralligenous or coralligenous habitats. The two rivers and the lagoons have a strong influence on the shape of the coast and the sea bottom, as the rivers' mouth change often their position and can feed alternatively the sea or the lagoon located between them. The movements of the rivers' mouth create an instability of the coast with successive erosion and accretion periods, making the coastal area less safe for boats navigation or mooring. The Cape of Rodoni is a spectacular strip of land entering the Adriatic Sea. It is the outermost peninsula of Albania at north of Durres. The cape is a geological formation of Miocene sandstone-clay banks, strongly eroded and generally barren. The coastal area includes a very poor vegetation dominated by *Crithmummaritimum*, *Elymuspycnanthus*, etc. grows up in some segments. Over this narrow stage, only 3-4 m above sea level, starts another stage dominated by Mediterranean maquis and somewhere by *Quercuspubescens*. The most commune species of this type of vegetation are: strawberry tree (*Arbutusunedo*), tree heath (Erica arborea), Spanish broom (*Spartiumjunceum*), myrtle (*Myrtuscommunis*), mastic (*Pistacialentiscus*), phillyrea (*Phyllireaangustifolia*), laurel (*Laurusnobilis*), cistus (*Cistusincanus* and *C. salvifolius*), prickly juniper (*Juniperusoxycedrus*), blackberry (*Rubusfruticosus*) and holm oak (*Quercusilex*). Close to the sea, on sand or gravel, grow some other species like prickly saltwort (*Salsolakali*), yellow hornpoppy (*Glauciumflavum*), common sea-lavender (*Limoniumvulgare*), golden samphire (*Limbardacrithmoides*), cotton weed plant (*Otanthusmaritimus*), etc.

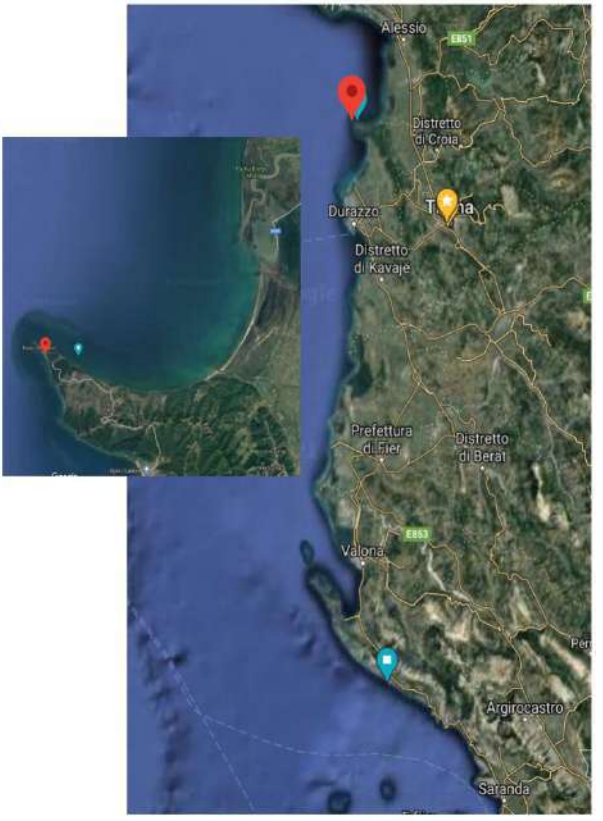

Fig. 1: Patok-Rodoni bay, Albania.

2. MATERIALS AND METHODS

Sampling, storage, analyses and taxonomic and marine litter and pollution classifications are based onSPA/RAC and UNEP/MAP indications, i.,e in line with the IMAP methodology as agreed by the Contracting Parties to the Barcelona Convention.Table 1reports briefly on the equipment used for the support of field survey mission, and the specific equipment, methodologies and protocols related to each Ecological Objectives are available in the full report (www.rac-spa.org).

Table 1. Equipment employed and methods appliedfor each Ecological Objective (EO) and Common Indicators (CI)

EO/CI	EQUIPMENT	METHOD FOR ANALYSIS
EO1 Positioning, Bathymetry Hydrography Geomorphology Mapping	- Side Scan Sonar – SSS - Navigation equipment and positioning DGPS system STONEX S990A with ATLAS satellite centimeter correction - Single Beam Echo-Sounder SBES for Depth sounder recorder (ODOM Hydrotrac hydrographic) with inertial sensor Motion Reference Unit (MRU) for angular and heading corrections (model Teledyne MARHS) - Geomorphological survey of the seabed was performed with TritechSeaKingTowfish (frequency325 Khz) - ROV Gladius Mini model from CHASING equipped with a 4k / 12MP UltraHD camera, two 1200 lumen front lights, with positioning system UBSL (Ultra Short Baseline System) model LinkQuest Inc. TrackLink 1500MA	*Hypack 2019 software PC acquisition and management by the Hypack 2019 software. Bathymetric data acquired simultaneously using "Nettuno 2", software produced by GeocosteSnc,* ***Réf**:* *IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries) : UNEP(DEPI)/MED WG.444/6/Rev.1*
Mapping benthic habitats	All previous equipment plus diving equipment using NOTROX – line intercept transects LIT, point intercept transect PIT, quadrants, photos, videos Scientific Diving Operators (OSS) with Advanced European Scientific Diver Certification by AIOSS (Italian Association of Scientific Divers),	*Peres Picard classification of Mediterranean biocenosis* *Standard IMAP methodology* ***Réf:*** *IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries) : UNEP(DEPI)/MED WG.444/6/Rev.1*
Sediment sampling	Van Veen Grab of 25 liters	*Laboratory standard analysis following IMAP recommendations* ***Réf**:* *IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries) : UNEP(DEPI)/MED WG.444/6/Rev.1*
Marine species such as marine mammals, birds and turtles	Literature review, interviews of fishermen and filed observations	***Réf**:* *IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries) : UNEP(DEPI)/MED*

		WG.444/6/Rev.1
EO2 Non indigenous species	ROV, diving surveys, photos and videos Sediment samples	*Laboratory standards recognition of species following IMAP recommendations* ***Réf**:* *IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries) : UNEP(DEPI)/MED WG.444/6/Rev.1*
EO3 Fisheries	Underwater observation and visualization with cameras, scientific divers and ROVs; Literature review Fish market data Interview of local fishermen and professional buyers sellers	***Réf**:* *IMAP Common Indicator Guidance Facts Sheets (Biodiversity and Fisheries) : UNEP(DEPI)/MED WG.444/6/Rev.1*
EO5 Eutrophication and other parameters: temperature, salinity, density Conductivity, transparency, turbidity, dissolved oxygen phosphate, total phosphorus, nitrates, nitrites, ammonia, total nitrogen, orthosilicates and chlorophyll a CI 13 CI 14	Measurement of sampling by means of the WTW 340 I Multimeter Sechi disk for transparency WTW Turb 430i DO Probe Water sampler bottle: Kemmerer and Niskin Chlorophyll "a" samples were stored in black nontransparent PTFE bottles Van Veen grab sampler for sediment CTD Multi-parametric probe model YSI 6600 V2 Probe	*ISO standards 5667 for water analysis* *Standard Methods for the Examination of Water and Wastewater, 23th edition, 2017 of the American Public Health Association (APHA/AWWA, 2017)* *WTW Photolab 7600 UV-VIS Spectrophotometer* *Laboratory standard analysis following IMAP recommendations* ***Réf:*** *IMAP Guidance fact sheets UNEP/MED WG.467/5* *Monitoring Guidelines/Protocols for sampling and sample preservation of seawater for the analysis of CI13 and C14: concentration of key nutrients and chlorophyll a: UNEP/MED WG.482/5* *Monitoring Guidelines/Protocols for Determination of Concentration of Key nutrients in Seawater – Nitrogen Compounds: UNEP/MED WG.482/8*

		Monitoring Guidelines/Protocols for Determination of Concentration of Key Nutrients in Seawater – Phosphorous and Silica Compounds: UNEP/MED WG.482/9 *Monitoring Guidelines/Protocols for Determination of Chlorophyll a in Seawater: UNEP/MED WG.482/10*
EO7 Hydrography CI 15	See EO1	***Réf**:* *IMAP Common Indicator Guidance Facts Sheets (Coast and Hydrography): UNEP(DEPI)/MED WG.444/7* *Monitoring Guidelines/Protocols for Determination of Hydrographic Physical Parameters: UNEP/MED WG.482/6* *Monitoring Guidelines/Protocols for Determination of Hydrographic Chemical Parameters: UNEP/MED WG.482/7*
E09 Contaminants CI 17 CI 18	BIOTA & SEDIMENTS: - Trace/Heavy Metals (TM): Total mercury (HgT), Cadmium (Cd) and Lead (Pb) - Organochlorinated compounds (PCBs, Hexachlorobenzene, Lindane and ∑DDTs) - Polycyclic aromatic hydrocarbons (US EPA 16 PAHs Compounds) SPECIFIC FOR BIOTA - Lipid content, flesh fresh/dry weight ratio for normalization purpose SPECIFIC FOR SEDIMENTS: - Aluminium (Al), Total Organic Carbon (TOC) in the <2mm particle size fraction for normalization purpose for TM and OCs, respectively. The<63µm sediment fraction is recommended to be complementary for metals - Lyophilization ratio (dry/wet sediment ratio)	*To fully comply with IMAP requirements, contaminants should be selected in accordance with UNEP (DEPI)/MED WG.444/5, Directive 2000/60/EC, EC Regulation 853/2004 and 1881/2006.* ***Réf:*** *IMAP Guidance fact sheets UNEP/MED WG.467/5* *Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Sediment for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminant: UNEP/MED WG.482/11* *Monitoring Guidelines/Protocols for*

		Sample Preparation and Analysis of Sediment for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants: UNEP/MED WG.482/11 *Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Marine Biota for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants: UNEP/MED WG.482/14* *Monitoring Guidelines/Protocols for Sampling and Sample Preservation of Seawater for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants: UNEP/MED WG.482/15* *Monitoring Guidelines/Protocols for Sample Preparation and Analysis of Seawater for IMAP Common Indicator 17: Heavy and Trace Elements and Organic Contaminants: UNEP/MED WG.482/16*
E10 Marine litter	Line intercept transect, coastal surveys and diving surveys ROV surveys Manta trawl net	*IMAP standards* *Réf:* *IMAP Guidance fact sheets UNEP/MED WG.467/5*

3. CONCLUSIONS AND DISCUSSION

The project was carried out in three phases.

Phase I concerned the preparation of Inception Report that included collection and analyses of all the previous available studies related to selected areas of Patok-Rodoni Bay, in particular, those relating to marine biodiversity and habitats, pollution, fisheries and hydrography, based on the National Data GAP assessments reports and the Integrated National Monitoringprograms elaborated by the GEF Adriatic National and International team of experts provided by SPA/RAC and PAP/RAC.

Phase II concerned the marine Survey which included collecting additional data during this First Albanian IMAP Marine Survey through sampling in the selected stations and lab tests, concerning the IMAP Common Indicators identified for specific Ecological Objectives. During field activities the Team worked in order to obtain scientific data was obtained in full compiliance with demands of the project from SPA-RAC, PAP-RAC, MEDPOL, UNEP-MAP and NAPA, so data have allowed to: i) assess the GES of the study area (Good Environmental Status); ii) provide reports and GIS based maps related to the data collected; iii) provide high-resolution pictures and video report of the field survey; iv) provide on the Job Trainings to local experts and representative of National Institutions in Albania on the monitoring techniques used; v) support the Integrated National Monitoring Program in Albania; and vi)provide data to implement the database at national and regional level.

Phase III concerned the Validation Meeting and Final Report and Deliverables submission, Annexes Files and specific Recommendations.

Fig.2: Echo mosaic of the SSS investigation.

Fig. 3: A first map of the distribution of Caulerpa

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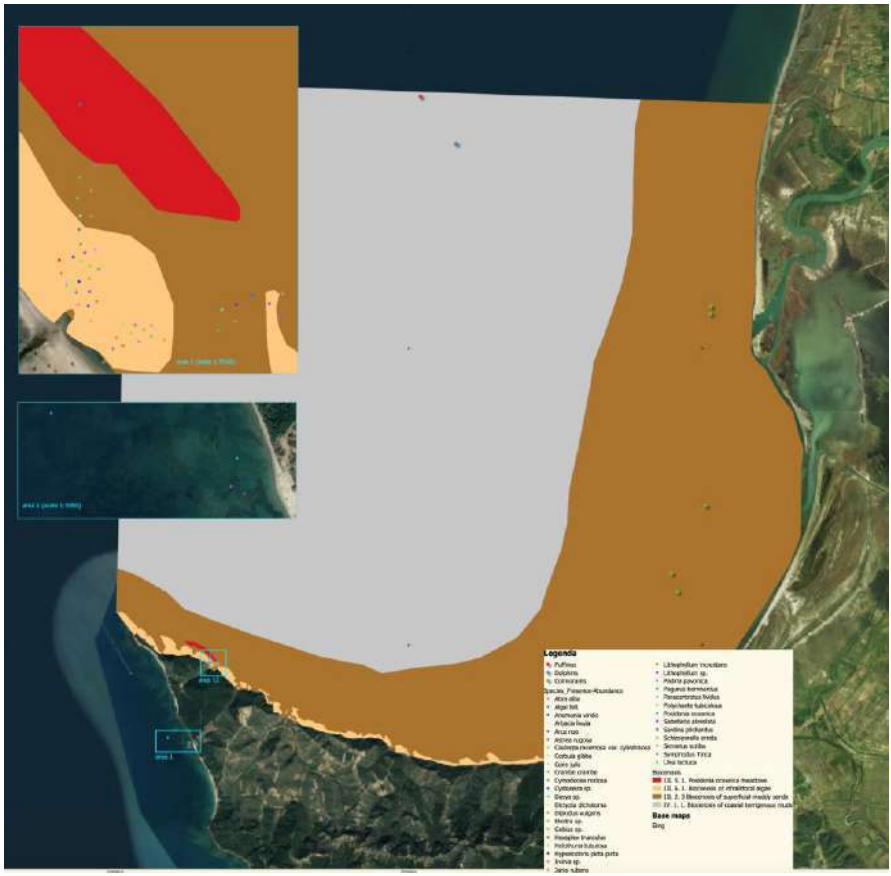

Fig.4: A first map of the distribution of biodiversity and biocenosis in the area.

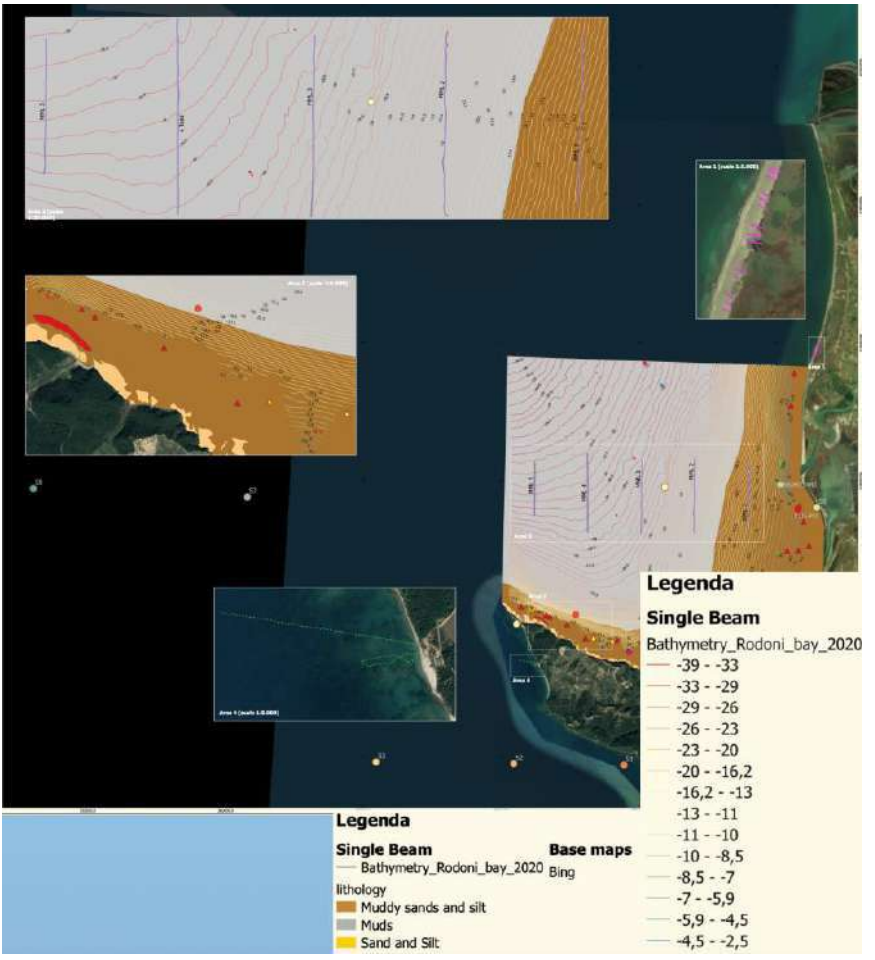

Fig. 5: Map of bathymetry and geological information from the SBES and Scientific Diving surveys.

4. CONCLUSIONS

Conclusions on themarine survey, i.e., of IMAP Ecological Objectives and the relative Common Indicators the arein the forthcoming paragraphs described.

EO1 Biodiversity (Habitat and species) - Common indicators 1, 2, 3

Regardless the growing interest in these last years on the distribution of marine habitats, the data remainscarce and limited, especially in the north of Albania and restricted to data about the benthicmacro-fauna in the *Posidoniaoceanica* meadows in the Patok and Lalzit bays.The area is under

the influence of riversoutputs, and characterized mainly by the presence of superficial muddy sands biocenosis in sheltered waters(identification code III.2.3) in the coastal sector and by the biocenosis of coastal terrigenous muds(identification code IV.1.1) for the deeper depths. Near the southern part of the coast, small rocky outcropsemerge from the soft bottom and are characterized by the dominant presence of Ulvaceae and the polychaete*Sabellariaalveolata*. Colonies of this polychaete form bio-constructions with a diameter of up to 50 cmemerging from the bottom. The biocenosis of superficial muddy sands in sheltered waters have alwayscharacterized by the not continuous presence of *Cymodoceanodosa* on superficial muddy sands in shelteredwaters (identification code III.2.3.4). The seagrass *P. oceanica* is present within the study area only asisolated small patches, both on rocky and sandy bottom, but not asa continuous meadow asobserved for the south of RodoniCape.

Within the study area, due to the important flow of fresh water and sediment from the coastal rivers, great part of *P. oceanica* arereplaced by other seagrasses such as *C. nodosa*, species considered more tolerant, but never growing indense meadows, and particularly algae as Ulvaceae and Caulerpaceae. Soft bottoms present heterogeneouspopulations both in terms of community structure and in terms of species diversity. The number of speciesper sample vary over a very wide range. Hard bottoms host photophilic algal populations mainly representedby *Ulva* sp., while the faunal component is mainly represented by Polychaete*S. alveolata*. The brown algaCystoseira shows an intermittent distribution with consequent low coverage values of hard substrates. Theirregular presence of *P. oceanica* as scattered patches is due to changes in salinity and poor transparency ofthe waters, the abundance of *C. nodosa* and the dominance of *Ulva* sp. are closely linked to the riverssupplies, in particular Drini, and to anthropic activities in the coastal area and upstream of the rivers, whichlead to the alteration of sedimentation and the presence of nutrients and pollutants in the water. According tothe present study, the conservation state of the *P. oceanica* meadow, in the area of Cape Rodoni is notcompletely satisfying, and the many key species observed (*P. lividus, Chondrillanucula, Caulerpacylindracea*), suggested the need to realize a detailed digital mapping of the seabed with particular attentionto the *P. oceanica* range of distribution area.

The results of the sightings have allowed to identify a stationary population of cormorants (*Phalacrocoraxcarbo*) near the eastern coastal sector of the survey area. Most of them are using the fixed fishing systemsinstalled on the coast or in the lagoons. The sighting of a single specimen of share-waters (*Puffinus* sp.)underlines the presence of this species in the area. Several sightings of small groups of the dolphin *Tursiopstruncatus* suggest a constant presence of marine mammals in the waters under study. No

specimens of seaturtles and/or sharks were recorded during the survey, although their presence in the area seems to beascertained from previous observations made by fishermen and Albanian scientists.

EO2 Non Indigenous Species (NIS) - Common Indicator 6

The invasive species recorded in Rodoni area during the surveyare the alga *C. cylindracea* and the blue crabs *Callinectes sapidus* that have been recorded in most of theAlbanian coast recently. *C. cylindracea* is widely distributed throughout the area, both on soft bottoms and onrocky outcrops, where it forms extensive carpets. Its presence is also observed in concomitance withphotophilic algal populations and/or with the phanerogams*Posidoniaoceanica* and *C. nodosa*.

EO3 Fisheries

Only the variability of fish assemblages will be assessed. In all the investigated sites, the census of fishfauna shows a very low abundance in terms of number of species and number of specimens. The causeprobably lies in the intense fishing pressure exerted on the entire area under survey. This is highlightedby the huge amount of fishing gear scattered throughout the area (coast and sea) between Rodoni Capeand Patok Lagoon. The size of the observed specimens varies from medium to small, if we consider theaverage size, and constitutes further evidence of the high fishing pressure to which this coastal zone issubjected. Implementing measures to reduce fishing pressure in the study area and in the contiguousones could induce an increase in fish stocks in terms of both the number of species and their size.

EO5 Eutrophication - Common Indicator 13- Common Indicator 14

The investigations carried out show a progressive increase ofpresence of silt and mud both in the water column and in the sediments, following a transect that goes fromthe coast to the open sea. During sampling period, a constant and high turbidity of the surface waters and ofwhole water column was observed. Total nitrogen, phosphorus and other parameters levels, plus all thechemical-physical parameters, show a gradual increase in hypertrophy in the center of Patok bay and alongthe coasts, where the river deltas and lagoons are present. The values of chlorophyll-*a* and phytoplanktonpopulation show the same pattern of increase. Patok Bay appears as a wide area of sea and coast that has astrong influence of sedimentary supply, of organic and inorganic material, from the rivers and lagoons. Withthe lack of control of water discharges (rain and sewage water) in the river and at sea, and the lack ofpermanent monitoring of the marine environment, the situation of trophy and hypertrophy could increasegreatly depending on the season, rainfall and temperature.

EO7 Hydrography - Common indicator 15

The analysis of bathymetric data together with those relating to transparency, temperature, salinity and tidelevels doesn't seem to highlight particular anomalies within the study area. The presence of rivers andabundant fluvial inputs deeply affect the area between Patok Lagoon and Rodoni Cape as regards both thecontributions of sediments and the chemical-physical parameters of the water column. The sedimentstransported by the rivers are then distributed in the Patok Bay forming a flat seabed that slowly deepens formthe shore to off-shore. The granulometry analysis of the sediments highlight a preponderance of silt and claycomponent versus a limited presence of larger size classes. This suggests that the fluvial inputs are mainlymade up of fine material easily transported or re-suspended over long distances by waves and currents.

EO9 Contaminants - Common Indicator 17, 18

The survey showed a relatively low pollution level in 2020 and, as this was the firstdetailed survey organized in the PatokRodoni area, there are no means to compare with previous data.Amongst the information that could have been useful to understand the patterns in the Patok Bay are maps ofgeneral currents, micro-currents and tidal currents. This could assist for identifying areas of dispersion andareas of concentration of pollutants coming from the rivers and/or the lagoons. By the way, all valuesregistered appeared within the national limits. PCBs, PCAs and heavy metals values in the biota, as well asall the analysis related to the evaluation of genotoxic effects performed on filter feeders sampled in the area,were found to be very limited or, furthermore, negative-not relevant. All tests on Lysosomal MembraneStability (LMS), AcetylCholinesEterase (AChE) assay and Micronucleus assay in haemocytes resultedcompletely negative. These data remind that pollution level could be controllable yet if some management,conservation and protection program starts.

EO10 Marine litter - Common Indicator 22, 23

Thestudy area is strongly impacted by anthropogenic activities, not only directly carried out on site but also frominland or coastal activities north of the surveyed areal, transported by the currents that appear to bedominantly from north to south. The main impacts are linked to the marine litter conveyed/transported by therivers (Drin, Mat and Ishmi) that flow along the coast, or occasionally in the two coastal lagoons (Tale andPatok) and are blocked in the southern part of the Patok bay by Rodoni Cape.A map of the beach marine litter survey, located in Annexes 006 was drafted based on 5 transects of 100m.Considering each transect perpendicular to the coast, a total of 506 m of beach was sampled.

There were carried out 5 linear paths for sampling the micro-plastics on

the marine surface at 5 stationsrespectively located at 2 km, 4 km, 6 km, 8 km and 10 km from the coast and the distance covered has a totallength of 12652 m. The results of the analysis of the collected micro-plastic samples and of the observationsregarding floating macro-plastics are reported in respective tables together with the details of the distancecovered by each linear path and the volume of filtered water. The concentration of micro-plastics in thesample, by shape and by color, is expressed as the number of items per transect. While the concentration ofmicro-plastics at each transect is expressed as the number of items per m^2 of sampled seawater. The resultsshow that within the project area micro-plastic contamination level is much lower compared to Mediterraneanlevel.

5. CONCLUSIONS AND RECOMMENDATIONS

The forthcoming paragraphs provide some insights on both planning, future management and interventions that, in the long term, could guarantee an improvement both in the habitats present and in the organisms living in the area. At the same time, they are a means to addressthe developing or controlling of socio-economic activities (tourism, fisheries, nautical sports) and environmental protection (coastal and marine protected areas) in the area of PatokRodoni Bay, as currently considered by the national authorities.

Recommendation for the monitoring of the area - The scientific research works carried out up to now is insufficient. The existing data could not be validated due to lack of information on positioning and methodology for analysis. This Marine Survey, constituting a baseline for the IMAP process, allowed highlighting some ecological characteristics, which do not sufficiently inform us about the full functioning of the area. It is important forthe next monitoring processes to cover the same stations and look for the same elements, by seasons and/or year cycle, while adding additional long periodic or permanent measurements, such as meteorological data (wind, rain, temperature), hydrological data at different stations (sea water temperature, currents, swell and waves, river flow, turbidity, etc.). It is very important to make a calculation of Annual Marine Monitoring Budget to continue evaluating the area in the near future.

Recommendation about the inclusion of the local survey stations in the national monitoring network. The ecosystem on both sides of Rodoni Capeare market plays, disruptive growth opportunities with significant revenue potential for ecosystem participants,even though the fluvial supply and the management dynamics of coastal lagoons have a great effecton the north side of the cape. Although the pollution level appears nowadays limited,both the organic and inorganic pollution remain the principal concern which requires appropriate monitoring, management, and control and must be

resolved in a near future. All the selected sampling stations can be included in the national monitoring network for the monitoring of the quality of the marine environment, responding to the participation of the country to the IMAP process except for Posidonia due to the scarce presence on the species. Other stations should be added in the future on the basis of the main results.

Recommendation for the development of a MCPAs. Albania has identified several sites along its coast for declaring future MPAs, and theRodoniCape is one of them. As shown in the survey of the northern part of Cape Rodoni, the Patok bay shows a limited number of point of interest due to the uniformity of the sea bottoms (sandy, muddy) and the limited variety of biocenosis. The extension to the southern part of RodoniCape, the Lalzit Bay represents the specificities of the Mediterranean region, including an area of bio-construction with the presence of *P. oceanica* meadows. The marine and coastal protected area centered on RodoniCape could associate the marine interests of the north and south of the Cape. In addition, other point of interest are present in the surrounding for developing ecotourism activities, the lagoons or Tale and Patok with their fishing activities and the presence of numerous wild birds and the rivers and their rims.

Recommendation on MSP and link to ICZM. Studieson coastal processes along the Albanian coastline show that the coastal defenses that address coastal erosion are not the main concern, but anthropogenic activities are. Environmental indicators within economic budgets, andthe ecological constraints at a macroeconomic level are a means to address the negative impacts. Multidisciplinary investigations at a large scale for the environmental impact assessments of development projects, both on land and at sea are of primary importance.

Recommendation for additional marine hydrographic and sedimentologic studies. Planning and management of the coastal area require further in-depth studies addressing coastal dynamics and geomorphological evolution. Here, combining the morphological data already acquired (bathymetric and side scan sonar survey) with new data and specific studies is necessary.

Recommendations for innovative ecological studies. The preliminary data obtained on the contaminants and possible pollution impacts show that further investigations about the circulation, storage and accumulation of the main pollutants in water and sediment are needed. Heavy metals are one of the existing pollutants in the area, as the survey data report. Their distribution and origin are not very clear, but it is plausible that they are transported by floods of rivers. Once in the sea, they are transported and deposited according to currents. A detailed survey on currents and hydrography, associated with the data obtained from the geomorphological study of this project would help us understand better the distribution of heavy metals, developing proposals for

the improvement and protection of the area and the coasts.

Recommendation on sites of underwater historical and cultural value. The survey area encompasses several submerged wrecks of different periods. A dedicated study on the colonization and conservation of these wrecks could be very important, not only for their historical and cultural value, but also for their ecological role within this habitats.

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