

REPORT ON THE STATE OF THE MARINE AND COASTAL ENVIRONMENT IN 2014

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SUMMARY

The **Report on the State of the Marine And Coastal Environment in 2014** is a complex work, summing-up the result of a large team of experts from NIMRD "Grigore Antipa" Constanta. It is an overview of the current status of the Romanian Black Sea ecosystem, structured on chapters and substantiated by the most novel scientific data available.

The state and evolution trends of the marine and coastal environment in the **Vama Veche - 2 Mai Marine Littoral Aquatory (ROSCI0269**, under NIMRD's custody) continued to be monitored in 2014, from the physical, chemical and biological point of view. No extraordinary events, likely to modify/alter marine habitats, were recorded within the Vama Veche - 2 Mai Marine Littoral Aquatory area. The monitoring of the marine environment did not point-out any alarming parameters concerning species and habitats in the reserve. No particular issues were reported in the relationship with tourists in the beach area of the reserve, nor with local authorities, who were supportive with the custodian.

The **monitoring of marine habitats** in 2014 was made by NIMRD within the project NUCLEUS NP 09 32 02 07: "Obtaining updated information with the aim of extending the Natura 2000 European ecological network (Special Areas of Conservation). More updated information were obtained in 2011, in the frame of the SOP Environment project "Integrated management of the Natura 2000 marine sites (SCI) network at the Romanian coast", SMIS code: 7039, implemented within the University for Agronomical Sciences and Veterinary Medicine (USAMV) Bucharest, NIMRD being an active partner in the project. The final data, however, are not available to date, USAMV Bucharest being due to deliver, by the end of 2015, the Management Plan of the marine SCIs, including ROSCI0269, under NIMRD's custody

The evolution of the main **hydrological indicators** at the Romanian coast and on the Romanian coastal shelf was determined, in 2014, based on the observations and measurements of parameters such as: sea state; seawater temperature, from the network comprising 35 stations located in the Sulina - Vama Veche area.

The **sea state** is a result of waves higher than 1 m. In 2014, the sea state was smooth in June (55.26%) and February (53.57%). Wind waves were minimum during summer (3.95% in June) and moderate during the other months, when their frequency did not exceed 28% (except for October and November, with peaks of 37.65% and 33.33%, respectively). Seawater temperature in Constanta, during the 12 months of the analyzed period, was 1.7°C higher than the reference temperature (1959 - 2013). The maximum daily temperature of 27.1°C was recorded on 31 July 2014, not surprisingly, given the evolution of air temperature

Three typical **water masses** were identified in the Western Black Sea in 2014: the upper quasi-homogeneous layer (UQL), the cold intermediate layer (CIL) and the seasonal thermocline. During the warm season (July), the cold intermediate layer reached depths beyond 20 m.



The littoral **upwelling process**, under the action of western and south-western winds, contributes to the rise of deep water masses (low temperatures and high salinities), favoring algal bloom phenomena due to high nutrient input. Compared to previous years, in 2014, the intensity of upwelling was low (≤ 5 days) in May (3-8 May 2014), with a temperature drop of only 0.6°C in 24 hours.

The **physical-chemical** and **eutrophication indicators** investigated in 2014 to monitor the transitional, coastal and marine waters quality from the Romanian Black Sea littoral were achieved from 219 water samples analysis. The samples were collected from the water column (0-50 m) during three cruises (May, N=104; July, N=18; December, N=99) from the 38 stations network located between Sulina and Vama Veche. The network covers all water bodies included in the Water Framework Directive (WFD) and Marine Strategy Framework Directive (MSFD).

The distribution of the annual means of seawater **transparency** reveals low levels compared to the target values of GES (Descriptor 5 - Eutrophication), with the largest negative deviation in marine waters (in the northern area), under the influence of river inputs from the whole north-western Black Sea catchment area.

The **salinity** of surface waters falls within the specific range of variation of the Black Sea's brackish waters, being influenced in 2014 mainly by the freshwater river input, extended in spring up to the coastal area of Constanța.

The surface waters from the Romanian Black Sea littoral were well **oxygenated**. In the water column levels below the permissible values (80%) for both environmental status and for the impact of human activities (Order 161/2006) were recorded, due to the layering of water masses. There were no anoxic events.

The seawater's **pH** from the Romanian Black Sea coast was within normal values.

Phosphate concentrations in the Romanian littoral waters recorded values close to those of the reference period of the 1960s, slightly higher.

The concentrations of **nitrates** continued to decline, recording the lowest historical mean value of the interval 1976-2014.

Silicates showed low concentrations, with higher values in the Danube's influence area.

Regarding **nutrients** in coastal waters, the local influence of the waste water treatment plant and the port area resulted in higher values in the Constanta South station.

Generally, in the Romanian Black Sea waters the reduced river and anthropogenic nutrient input were observed. Higher levels may occur due to the emergence of extreme events influenced by climate factors (hydrological regime of the Danube, temperature regime, the regime of wind, waves, currents and precipitations) that can seasonally destabilize the GES of waters in relation with Descriptor 5 - Eutrophication.

The distribution of **heavy metals** in marine waters and sediments along the Romanian coast revealed some differences between different sectors of the coast: generally, there were observed slightly elevated concentrations in certain coastal areas subjected to different anthropogenic pressures (ports, wastewater discharges) and in the marine area under the influence of the Danube.



In 2014, the median values of **Total Petroleum Hydrocarbons (TPH)** ($\mu\text{g L}^{-1}$) in transitional, marine and coastal waters did not exceed the levels chosen as references and quality standards for priority substances. Data analysis of total petroleum hydrocarbons concentrations in the sediments from the Romanian Black Sea sector during 2006-2014 shows that the pollution level recorded in 2010-2013 is significantly lower compared to 2006-2009, with means of 73.5 ± 98.5 and $183,1 \pm 153,3$ ($\mu\text{g g}^{-1}$), respectively. In 2014, the mean value of TPHs is comparable to that recorded in the last period (2010-2013), with the downward trend of petroleum hydrocarbons pollution.

The **Polycyclic Aromatic Hydrocarbon (PAHs)** pollution level in water, recorded in 2014, is significantly lower ($p < 0.05$) compared to that in 2006-2007 and continues the evolution of decreasing polynuclear aromatic hydrocarbons in recent years (2008-2013). The sediment quality assessment based on the evaluation criteria, in 2014, indicates good environmental status (GES) for 46% of sediment samples from the Romanian sector of the Black Sea with a moderate level of pollution of polycyclic aromatic hydrocarbons in which biological effects are unlikely reduced (Table 2.1.4.10). For sediments with bad ecological status (BES) the dominant individual compound are naphthalene and phenanthrene.

Concerning **organochlorine pesticides**, in 2014, coastal waters were dominated by the presence of lindane and in sediment higher concentrations were measured for HCB (in the north), lindane and aldrin (to the south). Exceedances of the suggested threshold values for defining good environmental status are common in water for lindane (78% of measurements), both in the north and in the south. For the other parameters, exceedances of the regulated threshold values were less than 23% of the measurements for water and not more than 21% of the sediment measurements.

The results of the **radioactivity** of the marine environment components were achieved within the project BS ERA NET 041 "Radiation background of Black Sea coastal environment (RACE)".

The marine and coastal environment radioactivity is generated by the occurrence of natural and artificial radionuclides in the environment. The developments in nuclear energy and the Chernobyl accident produced deep radioactive footprints in the environment. Nowadays, the risk of exposure to ionizing radiations in the environment is significantly lower, compared to the threshold values stipulated and has become a term of reference for nuclear activities and practices. The activity level of tritium in seawater ranged between 3.8-14.3 UT, being largely influenced by river and rainfall input. The constant values of the marine environment in 2014 are close to the natural radioactivity background and do not pose any threat to the environment and human health. Cs-137 recorded in sediments values between 1-5 Bq/kg dry sediment. Slightly higher values were recorded by wet sediments which may reach dry land, under the action of waves and wind. The ionizing radiation dose rate measured in the coastal zone ranged within 35-198 nSv/h (within the natural environmental background variation limits), being smaller in beach areas. There is an increasing trend northwards, where small areas (Chituc Levee) with relatively higher dose rates can be encountered, by the contribution of natural radionuclides (mainly Ra-226), richer in alluvial sediments.



The **microbiological load**, a state indicator of contaminants in the marine environment, was good in the southern part of the Romanian Black Sea during 2014; the concentrations of enteric bacteria [total coliforms (TC), faecal coliforms (FC), faecal streptococci (FS)] were generally found varying below the limits of the National Regulations and EC Bathing Water Directive and the values indicating the level of faecal pollution of bathing seawater.

Coastal processes were also monitored in 2014. For the northern shoreline, accumulation areas covered ~ 50 ha, while erosion areas ~ 80 ha. Shoreline advancement on distances > 10 m was recorded on ~ 10% of the total length, shoreline retreat by > 10 m on ~ 53%, the remaining shoreline (38%) being in dynamic balance. Compared to previous years, an increase of erosion sectors and a drop in the intensity of processes were recorded. In the southern unit (Cape Midia - Vama Veche), erosion processes were prevalent, with a lower intensity compared to the northern sector.

In the southern part of the Romanian coast the planned works of five priority projects have started (Coastal Zone Master Plan), with the aim of mitigating erosion and rehabilitating the coastal zone, in the Mamaia South, Tomis North, Tomis Center, Tomis South and Eforie North locations. In November 2014, in order to continue the monitoring of coastal erosion in the protection dams area (planned on the short term), NIMRD designed and emplaced 51 benchmarks. Beach profile measurements based on these benchmarks were initiated in November 2014 and will continue seasonally.

Sea level, as one of the main indicators of the coastal zone state, presented one major characteristic during 2014 reported to the monthly long term averages (1933 - 2013, 80 years!) and this consisted of a constant positive overflow. The maximum deviation was recorded in October, 18.5 cm, and August +17.0 cm.

In 2014, the **phytoplankton community** was characterised by a higher development than the last two years. Thus, the annual average in the surface layer was 107.34 cells/L and 0.061 g/m³ compared to the average values recorded in 2013 (39.67·10³ cells/L and 0.037 g/m³) and in 2012 (82.84·10³ cells/L and 0.040 g/m³). **132 species**, varieties and forms, were identified in the phytoplankton composition, belonging to **seven taxonomic groups** (Bacillariophyta, Dinoflagellata, Chlorophyta, Cyanobacteria, Chrysophyta, Euglenophyta and Cryptophyta). The highest diversity was found in coastal and marine waters, where the dinoflagellates were dominant (with 46 and 45 species, respectively), being followed by diatoms. In 2014, four species developed more than 1 million cells per liter (algal blooms), less than in 2013 (five species).

At the total of 19 **zooplankton** species identified in the course of 2014 we can add the gelatinous coelenterata species *Aurelia aurita* and *Rhizostoma pulmo* and the gelatinous ctenophora species *Mnemiopsis leidyi*, *Beroe ovata* and *Pleurobrachia rhodopis*. In terms of qualitative and quantitative composition of fodder zooplankton, 2014 was a poor year, with low values comparable to those registered in 2004. Also, in terms of number of species, 2014 was a very poor year, the poorest in 10 years. Among non-native species that have been identified we are mentioning the ctenophors *Mnemiopsis leidyi*, *Beroe ovata* and the copepod *Oithona davisae*.

The monitoring program for the macroalgae and marine phanerogams (**phytobenthos**) continued in 2014, with qualitative observations and sampling from the



representative profiles along the coastal strip Năvodari-Vama Veche. The available data belong to the midilittoral and infralittoral zone and, regarding the substrate, both the rough, rocky and sandy substrate were analyzed. Based on the collected data, the Ecological Index (EI) was applied, which classifies the water bodies from an ecological point of view and also meet the requirements of the Descriptor 1, according to the MSFD. The index is based on the fresh biomass values of perennial and opportunistic species and has limits between 0-10, where 0 includes areas with Bad Ecological Status and 10 are areas with High Ecological Status. Based on the presence of perennial key species, certain environmental targets in order to achieve good environmental status (GES) can be set: the average fresh biomass for the perennial species *Cystoseira barbata* (without taking into account the epiphytes biomass) $\geq 2,500 \text{ g/m}^2$, estimated in a compact field. The species *Cystoseira barbata* is in a regeneration process at the Romanian shore, but remains particularly sensitive to human activities (e.g. dams construction, excavations port), that generates turbidity, a disturbing phenomenon of the biological processes for this important perennial species. *C. barbata* develops in the southern part of the Romanian coast, gradually increasing its biomass towards the Vama Veche - 2 Mai Marine Reserve. Regarding *Zostera noltei*, the average foliar biomass must be $\geq 1,500 \text{ g/m}^2$, in order to be an indicator of a good environmental status (GES). This target has been achieved in the past years at Mangalia, where three *Zostera noltei* meadows exist. In summer 2014, a slight decrease of the opportunistic species average biomass compared to the previous year was noticed, this being another environmental target in achieving good environmental status.

Zoobenthos, as eutrophication status indicator, still showed a constant positive evolution in 2014, in terms of species diversity increase. The qualitative assessment in all monitored areas (Sulina- Vama Veche) led to the record of **75 macrozoobenthic species**, the faunistic array keeping the characteristics of previous years. In 2014, a higher diversity was recorded in transitional and marine waters, where 38 and 50 macrozoobenthos species, respectively, were identified, compared to previous year. The qualitative structure of **meiobenthos** in areas with a sandy bottom comprised 12 meiobenthic organisms groups, of which 5 are classified as permanent meiobenthos (eumeiobenthos) and the other 7 as temporary meiobenthos (pseudomeiobenthos).

In the 1980s, studies performed by Russian scientists revealed that, in the north-eastern Black Sea, approximately 166 **fish species** are present, of which 11 of Atlantic origin, 20 Ponto-Caspian species, 6 acclimated, 9 endemic and 23 local species. Currently, after having analyzed the results of experts from Bulgaria, Turkey, Ukraine, Romania, Georgia and Russia, 185 species have been identified at Black Sea basin level, of which 75 species (40.54%) are commercial fish species. The main peculiarity of fish fauna in the Romanian marine sector is the occurrence of a large number of species (more than 50), of which small-sized species are the most significant (sprat, anchovy, whiting, gobies). It must be pointed out that the share of valuable commercial species (turbot, spiny dogfish, sturgeons, horse mackerel, garfish, Danube shad, mullets, bluefish) continues to be low, whereas their stocks, despite the slight recovery trend, continue to be in a critical state.



In recent years, the prevalence in catches was held mainly by the species: sprat / *Sprattus sprattus*, turbot / *Psetta maeotica* and Danube shad / *Alosa pontica*, along with the traditional species: anchovy / *Engraulis encrasicolus*, whiting / *Merlangius merlangus ponticus*, gobies / *Gobiidae*, horse mackerel / *Trachurus mediterraneus ponticus*, spiny dogfish / *Squalus acanthias*, mullets / *Mugilidae* and others.

In 2014, in the Romanian marine sector, the **fishing industry** practiced by fishermen was done in two ways: active fishing gear with coastal trawler vessels, made at depths of 20 m, and fixed fishing gear, practiced along the coastline in 18 fishing points, located between Sulina and Vama Veche, in shallow waters (3-11 m pound nets), but also at 20-60 m depths/gillnets and long lines).

A consortium of partners from Romania, Bulgaria, Turkey, Ukraine and Moldova implemented during 2013-2014 a relevant coastal zone project on the “**Improvement of the Integrated Coastal Zone Management in the Black Sea Region ICZM**“, funded under the Joint Operational Programme Black Sea Basin 2007 - 2013. The main objective of the project was strengthening the joint knowledge and information base, needed to address common challenges in the environmental protection of river and maritime systems. Within the project framework, an experts’ team from NIRDEP - the National Institute for Marine Research and Development “Grigore Antipa” Constanta elaborated the “*Study on Integrated Coastal Zone Management in Black Sea region*“. The work focuses on the current legal and institutional frameworks for international and cross-border cooperation and analysis of problems and opportunities in terms of the introduction of ICZM in the Black Sea Region. The Study also identifies suggestions to the national governments on how to improve national policies towards ICZM. Additionally, suggestions on improving intergovernmental and international cooperation are also delineated, in order to propose an integrated approach of ICZM in the Black Sea region, based on bringing together stakeholders from different sectors, administrative levels and civil society, towards communication and cooperation.

In 2014, the **Maritime Spatial Planning** activity was linked with the elaborated EU regulations concerning maritime space in the frame of Integrated Maritime Policy - IMP. In July 23, 2014 it was elaborated the Directive 2014/89 / EU establishing the frame of Maritime Spatial Planning. It underlined important objectives and stages for maritime spatial plans applicable in all European Union countries and seas, including Romania.

The MSP Directive implementation is a priority for government and research institutions, as well as for stakeholders of the marine environment; it is conditioned, by:

- Inventory of existing measures applied in coastal areas;
- Spatial and temporal distribution mapping of current and potential maritime activities;
- Existing tools and developed strategies using, established under EU projects and initiatives;
- Needs for further actions analyze regarding the coastal and maritime activities management;
- Coordination of maritime spatial plan and strategies for the Directive integration and review;



- Stakeholders and authorities consulting on maritime spatial plans and strategies with available results;
- Cooperation for MSP strategies consistency, with Member States and with third countries of the Black Sea basin, after designating authority/authorities for MSP.

Approaching **anthropogenic impact** was done in close relation to the two distinct sectors of the Romanian coastline, the southern and and northern. Impact intensity was classified in accordance with the system currently agreed by the Ministry of Environment, Water and Forestry, namely the SINCRON Programme, where human impact is listed as high, medium or low. Concerning the northern sector of the coast, it must be had in view that it is included within the perimeter of national and Community interest protected areas - Danube Delta Biosphere Reserve (DDBR) and the Site of Community Importance (SCI) Danube Delta, both the terrestrial and marine zones, and the Special Protection Area for birds (SPA) Danube Delta - Razelm-Sinoe Complex. Theoretically, human activities are regulated in compliance with the management plan of the respective Community interest protected area, yet there are many pressures acting on the environment: pollutant input of the Danube, illegal waste dumps, soil erosion, poaching, pasturing, urbanization and human habitation, mass tourism development trend etc.

In the southern sector of the coast, anthropogenic impact is represented mainly by the ongoing coastal protection and sanding works, with a high impact in the worksite areas. In the marine environment, the likelihood of recovery of benthic organisms' populations is high, except for the bivalve *Donacilla cornea*, with no planktonic larval stage - populations occurring in Eforie North - Eforie South. Other human pressures identified in the south are: sand extraction from beaches, developing road infrastructure in the coastal zone, pollution of the marine environment by significant nutrient sources from the Constanța and Mangalia urban agglomerations, waste water treatment plants and large ports, the Midia - Năvodari industrial zone, illegal fishing and poaching, mass tourism and population overcrowding, uncontrolled development of tourism facilities outside the legal framework of the approved urban plans - especially in the southern part of the coast (Vama Veche - 2 Mai) etc.

Overall, the state of the marine and coastal environment in **2014** confirms the general trend of slight improvement of the monitored parameters. The synthesis of data for 2014, compared to historical data, on the state and evolution trends of the Romanian coastal and marine environment is part of the "***Romanian Environmental Factors State Report***".

KEY WORDS: *Black Sea, Romanian coastal area, eutrophication, contamination, biodiversity, endangered species, habitats, protected areas, marine living resources, sustainable development, maritime spatial planning, anthropogenic pressures*