

ECOLOGICAL observing System in the Adriatic Sea: oceanographic observations for biodiversity

Priority Axis 3: Environment and cultural heritage

Specific Objective 3.2: Contribute to protect and restore biodiversity

# D5.1.1 Report on data/information availability and infrastructure/tools requirements

WP5 – Design and implementation of data infrastructure

A5.1 - Design of the data infrastructure

PP3 IZOR / Ivica Vilibić

LP, PP1, PP2, PP4, PP5, PP6, PP7, PP8, PP9

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## 1. INTRODUCTION

Within the frame of the Activity 5.1 Design and implementation of data infrastructure of the project ECOlogical observing System in the Adriatic Sea: oceanographic observations for biodiversity (ECOSS), this report aims to identify and analyze existing data infrastructures, portals, observing networks together with specific datasets and spatial information relevant for the project. In the same way, tools and workflows of analysis is identified and described to support WP4 objective.

To collect as much as possible information about data infrastructures, portals and observing networks, a questionnaire has been developed with the aim of collecting prescribed information necessary to build up the deliverable. For this deliverable, the questionnaire included the following information: the name of the data infrastructure or data portal, institutions maintaining the data infrastructure or data portal, ecological parameters stored by the data infrastructure or data portal, web page of the data infrastructure or data portal, accessibility of the data by the data infrastructure or data portal, data policy, and a description of the data infrastructure, portal or observing network.

This deliverable should be jointly analyzed with Deliverable 3.1.1, which contain report on the assessment of existing ecological monitoring programs and observing systems. In fact, a great number of the observing systems require a kind of data infrastructure or portal for visualizing or accessing the data. For that reason, some of the information presented in Deliverable 3.1.1 and relevant for this deliverable, is not presented here.

After presenting data infrastructures, portals and observing networks, all of the information has been assessed and a SWOT (strengths-weaknesses-opportunities-threats) matrix has been created. The SWOT analysis has been continued by assessing requirements for all the quoted items. Finally, a few conclusion is drawn from the presented documents and analysis.

## 2. EXISTING DATA INFRASTRUCTURES, PORTALS AND OBSERVING NETWORKS

### 2.1. Reporting system of the Adriatic Sea monitoring for MSFD

*The name of the data infrastructure or data portal:* Izvještajni sustav monitoringa Jadrana (Reporting system of the Adriatic Sea monitoring) web portal

*Institutions maintaining the data infrastructure or data portal:* Institute of Oceanography and Fisheries

*Ecological parameters stored by the data infrastructure or data portal:* Data obtained from “Monitoring and observation system for assessment of the Adriatic Sea state” in accordance with MSFD Monitoring Plan for Croatia (OG 153/2014) are grouped into parameters from physical oceanography, chemical oceanography, biological parameters, marine litter and underwater noise. Parameters are also connected with certain MSFD descriptor or group of descriptors.

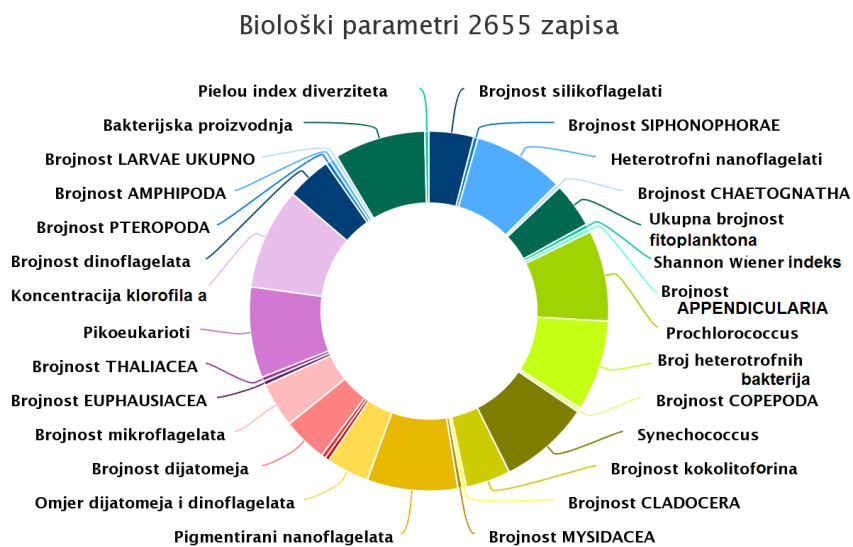
*Web page of the data infrastructure or data portal:* <http://faust.izor.hr/nmon/pocetna>, still under development

*Accessibility of the data by the data infrastructure or data portal, data policy:* Restricted, for now

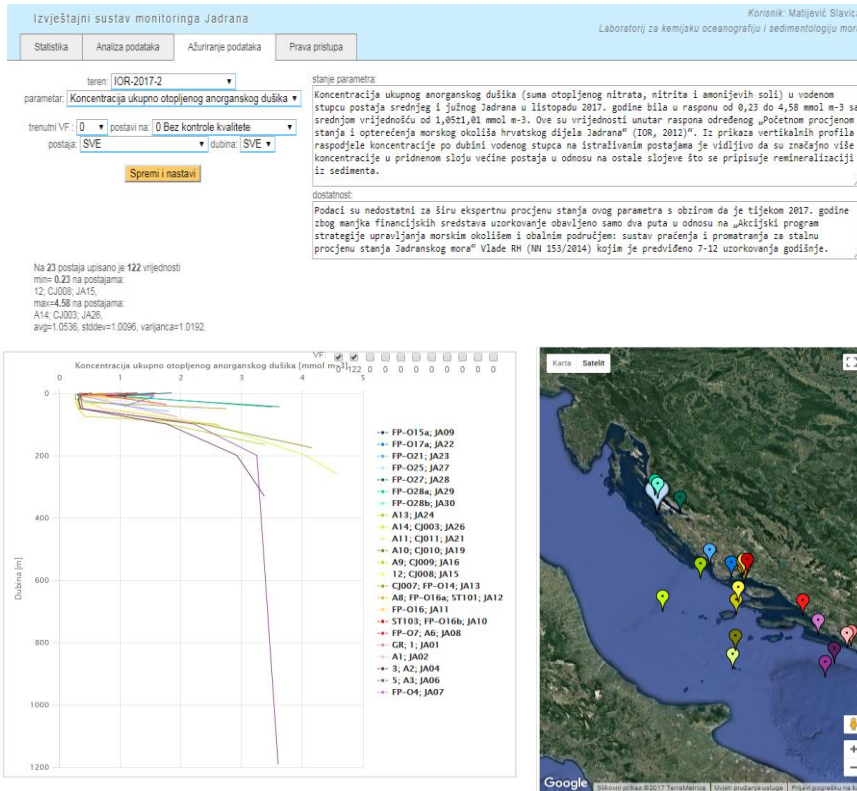
*Description:* Web portal *Izvještajni sustav monitoringa Jadrana (Reporting system of the Adriatic Sea monitoring)* is still under development. Data obtained from “Monitoring and observation system for assessment of the Adriatic Sea state” in accordance with MSFD Monitoring Plan for Croatia (OG 153/2014) are grouped into parameters from physical oceanography, chemical oceanography, biological parameters, marine litter and underwater noise (table in Annex). Parameters are also connected with certain MSFD descriptor or group of descriptors. Data obtained for coastal sites derived from monitoring according to WFD demands are also part of data base, considering the parameters that are covered by both directives. Data portal gives metadata presentation, data visualisation with connection between sites and parameters, data

QA/QC as well as “key of expert” through simple interpretation of parameters and processes at investigated sites based on scientific experience.

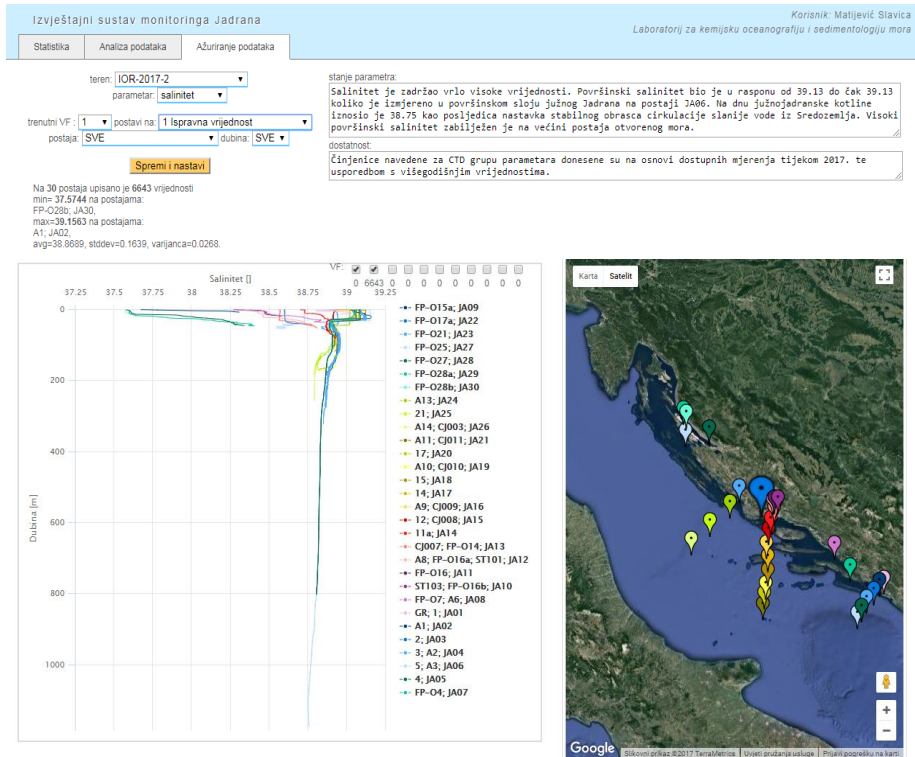
Examples of interpretation of data in web portal under development are shown in Figures.



*Number of records for biological parameters monitored according to MSFD demands – example of metadata visualisation.*

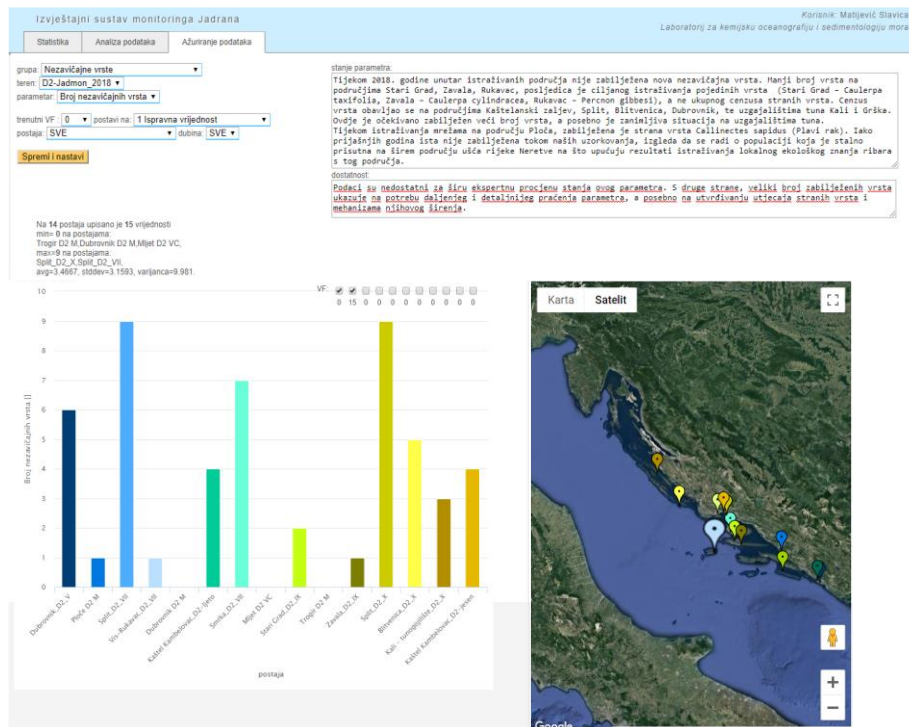


Example of data visualisation as vertical profile of total inorganic nitrogen at sites in middle and south Adriatic.



Example of data visualisation as vertical salinity profiles at sites in middle and south Adriatic.





Example of interpretation of invasive species at 10 sites investigated in middle and south Adriatic.



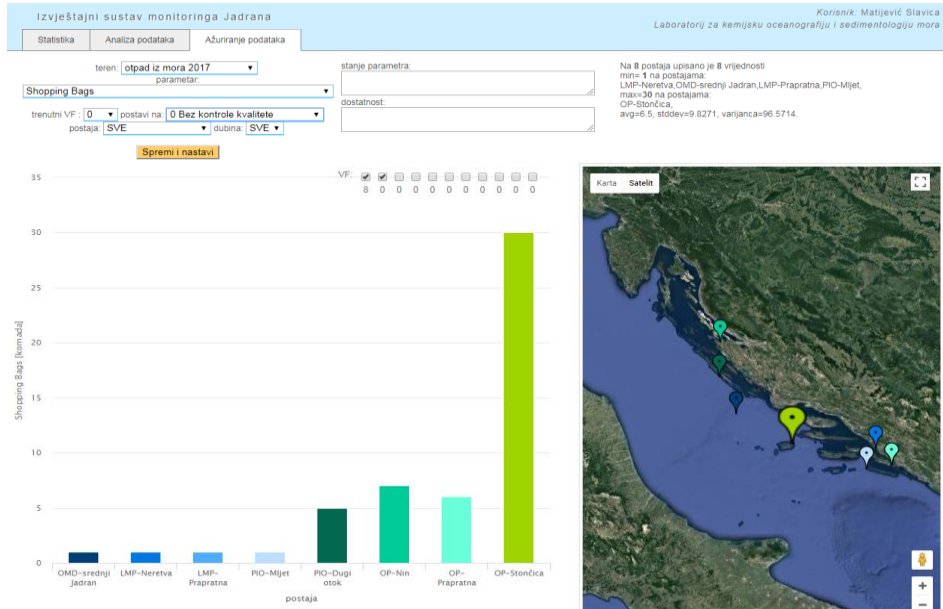


Figure 5. Example of interpretation of plastic bags on beaches at sites investigated in middle and south Adriatic.

## 2.2. Database and indicators of the state of the marine environment, mariculture and fisheries

*The name of the data infrastructure or data portal:* Fishery database for demersal, pelagic and coastal fisheries and for aquaculture

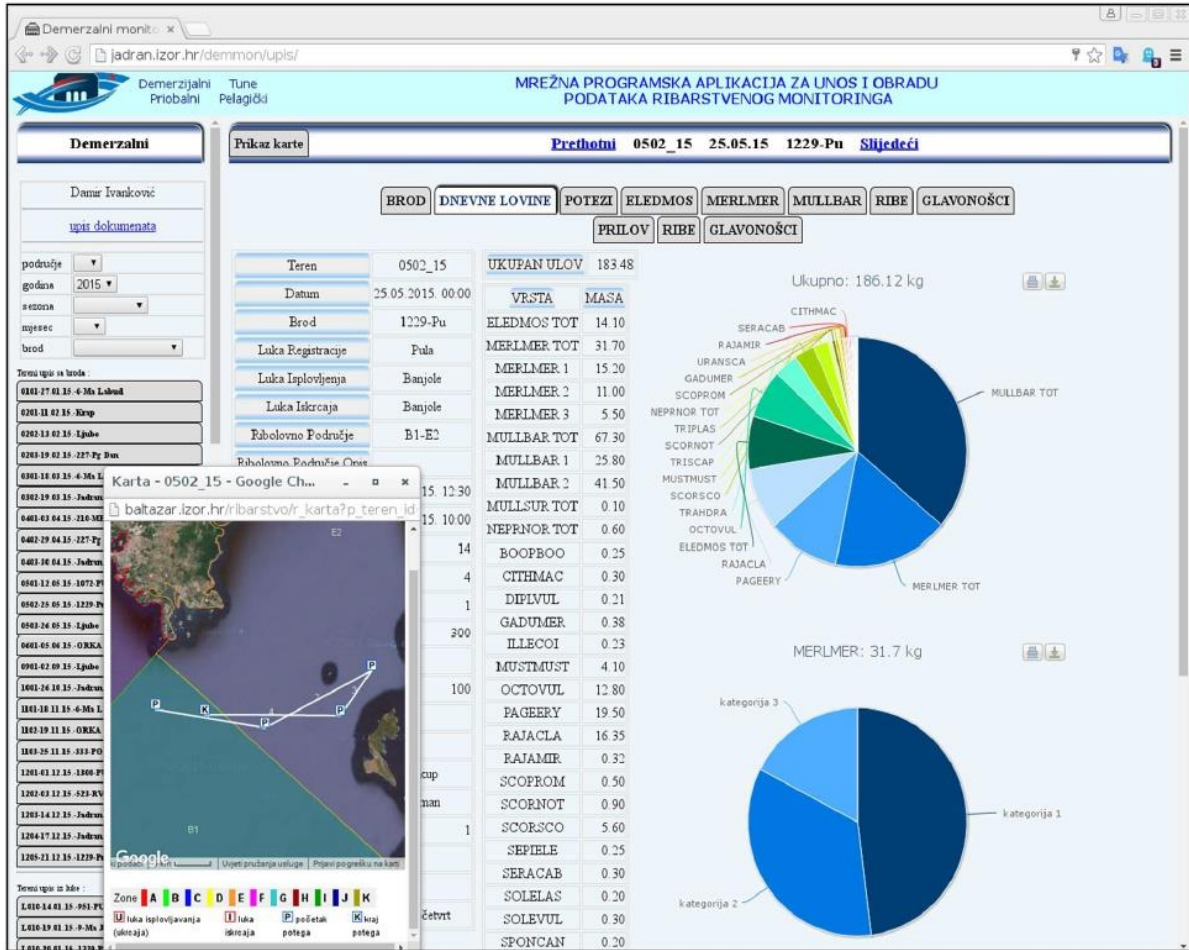
*Institutions maintaining the data infrastructure or data portal:* Institute of Oceanography and Fisheries

*Ecological parameters stored by the data infrastructure or data portal:* Temperature, Salinity, Visible pollution, Floating waste matter, Mineral fat, Suspended waste matter

*Web page of the data infrastructure or data portal:* <http://jadran.izor.hr/demmon>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Not available

*Description:* The database of fisheries data enables the entry and processing of data collected through field activities within the monitoring. Data include metadata (fishing time, place, ship, fishing coordinates, fishing gear) as well as data on long and massive catch frequencies. Based on the data and data obtained from the ministry on the basis of the reported catches, the fish population estimates are being analyzed. These data are also used for reporting to the European Commission.



The example of database record for a cruise.

### 2.3. MEDAS (Marine Environmental Database of the Adriatic Sea)

*The name of the data infrastructure or data portal:* MEDAS (Marine Environmental Database of the Adriatic Sea)

*Institutions maintaining the data infrastructure or data portal:* Institute of Oceanography and Fisheries

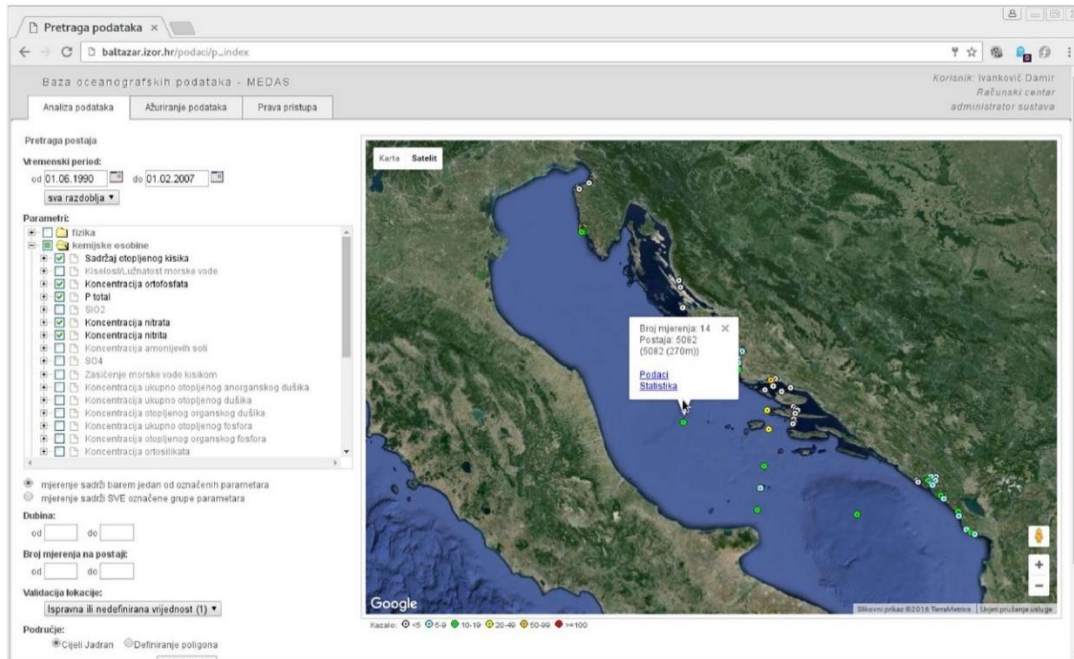
*Ecological parameters stored by the data infrastructure or data portal:* Temperature, Salinity, Visible pollution, Floating waste matter, Mineral fat, Suspended waste matter

*Web page of the data infrastructure or data portal:* [http://baltazar.izor.hr/podaci/p\\_index](http://baltazar.izor.hr/podaci/p_index)

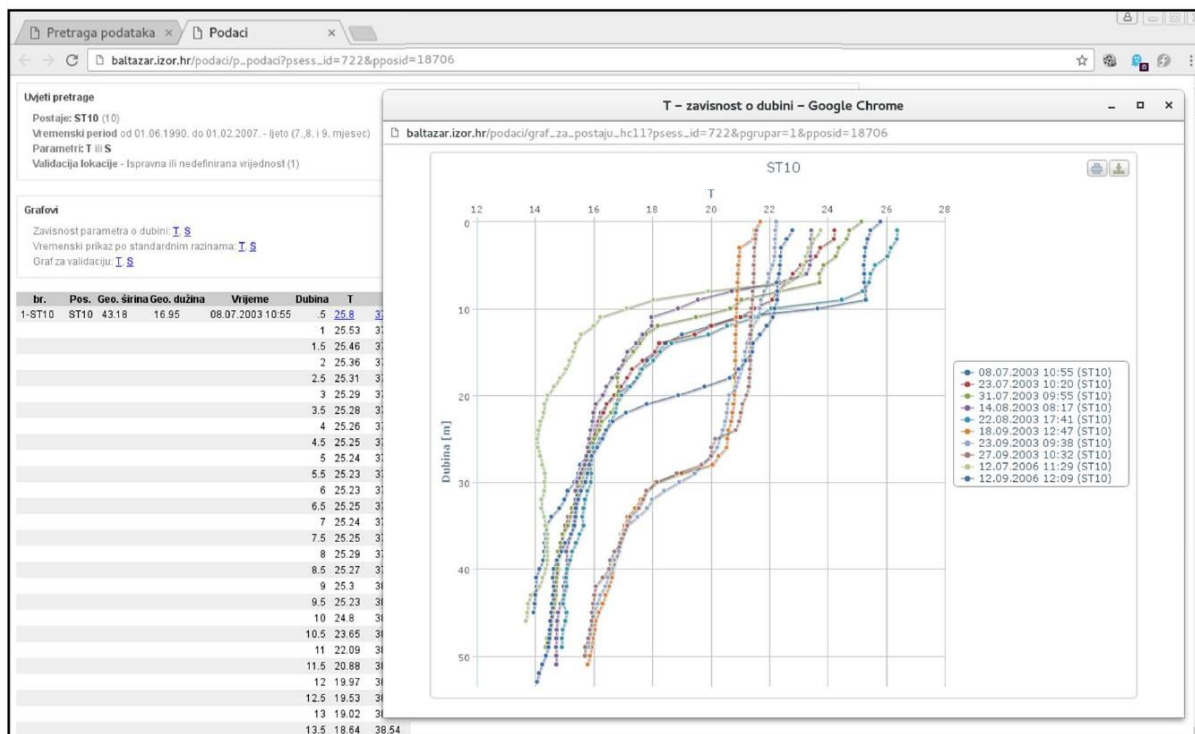
*Accessibility of the data by the data infrastructure or data portal, data policy:* Not available

*Description:* The MEDAS database has been measuring since the year 1900 to date. Its modular structure makes it easy to add new parameters. Data can be searched by parameter and metering method, parameter, and by parameter group with time and spatial conditions. The database validates data and statistical and climatological data analysis. This database is still in development.

MEDAS databases with individual thematic subdivisions are included in the distributed database of the SeaDataNet project (EU SF calls FP5, FP6, FP7) whereby certain measured data allowing for unlocked access can be retrieved from the database via the <http://www.seadatanet.org> located in the Netherlands.



The example of database record for a cruise.



*The example of temperature profile record in the database.*

## 2.4. Fishery database for demersal, pelagic and coastal fisheries and for aquaculture

*The name of the data infrastructure or data portal:* Fishery database for demersal, pelagic and coastal fisheries and for aquaculture

*Institutions maintaining the data infrastructure or data portal:* Institute of Oceanography and Fisheries

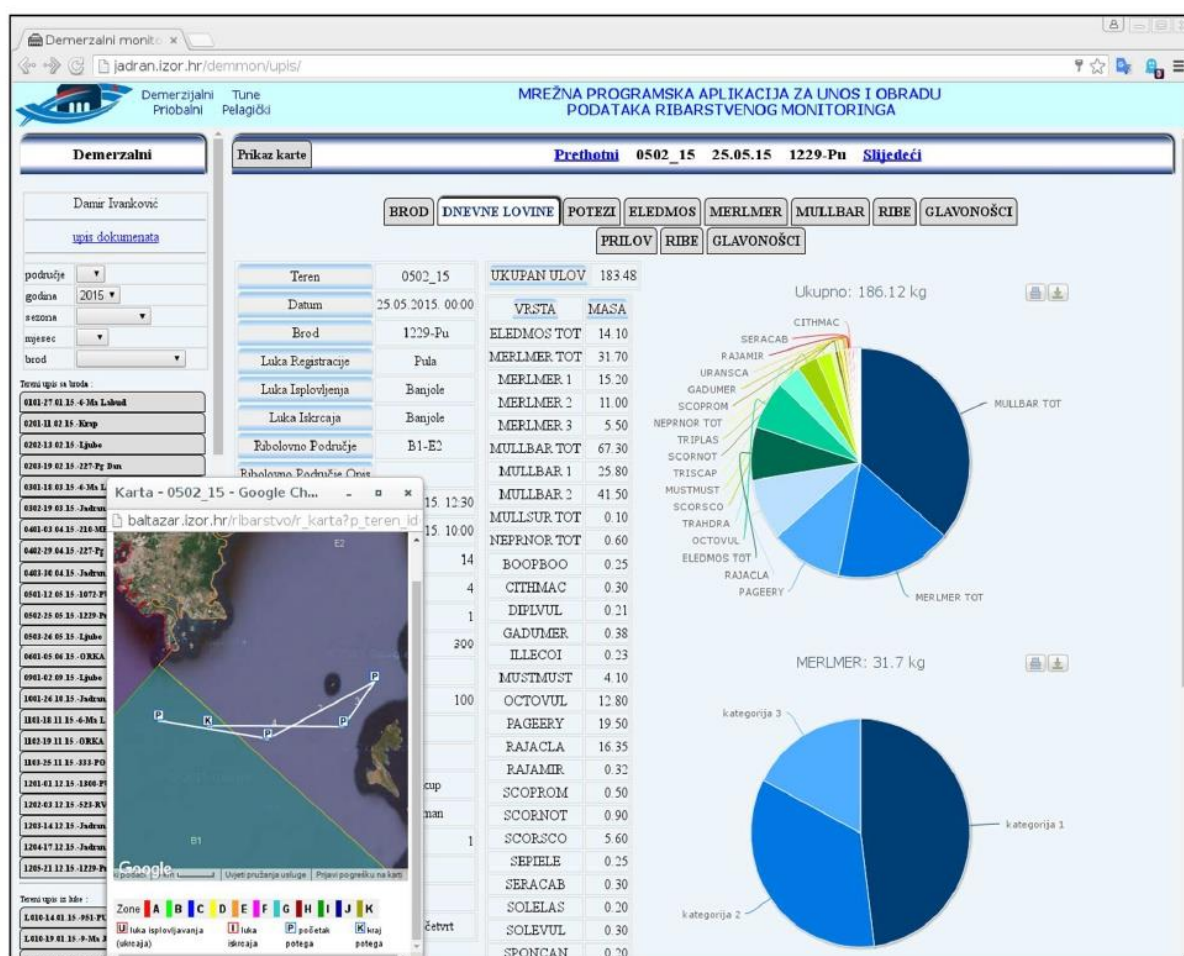
*Ecological parameters stored by the data infrastructure or data portal:* Temperature, Salinity, Visible pollution, Floating waste matter, Mineral fat, Suspended waste matter

*Web page of the data infrastructure or data portal:* <http://jadran.izor.hr/demmon>



*Accessibility of the data by the data infrastructure or data portal, data policy:* Not available

*Description:* The database of fisheries data enables the entry and processing of data collected through field activities within the monitoring. Data include metadata (fishing time, place, ship, fishing coordinates, fishing gear) as well as data on long and massive catch frequencies. Based on the data and data obtained from the ministry on the basis of the reported catches, the fish population estimates are being analyzed. These data are also used for reporting to the European Commission.



*The example of database record for a cruise.*



## 2.5. OGS-NODC

*The name of the data infrastructure or data portal:* OGS-NODC

Institutions maintaining the data infrastructure or data portal: National Institute for Oceanography and Seismology - OGS

*Ecological parameters stored by the data infrastructure or data portal:* OGS as part of the IOC's network of National Oceanographic Data Centres has designated responsibility for the coordination of data and information management at national level. The oceanographic database covers the fields of marine physics, chemical, biological, underway geophysics and general information on Italian oceanographic cruises and data sets.

*Web page of the data infrastructure or data portal:* <http://nodc.ogs.trieste.it>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Data use is permitted upon request by citing the source

*Description:* OGS is recognized as the Italian National Oceanographic Data Centre (OGS-NODC) within the International Oceanographic Data Exchange System of the UNESCO Intergovernmental Oceanographic Commission (IOC) since 27/6/2002.

OGS as part of the IOC's network of National Oceanographic Data Centres has designated responsibility for the coordination of data and information management at national level. The oceanographic database covers the fields of marine physics, chemical, biological, underway geophysics and general information on Italian oceanographic cruises and data sets.

The main objectives are (revision IODE-XXII, March 2013):

- Facilitate and promote the discovery, exchange of, and access to, marine data and information including metadata, products and information in real-time, near real time and delayed mode, through the use of international standards, and in compliance with the IOC Oceanographic Data Exchange Policy for the ocean research and observation community and other stakeholders;

- Encourage the long term archival, preservation, documentation, management and services of all marine data, data products, and information;
- Develop or use existing best practices for the discovery, management, exchange of, and access to marine data and information, including international standards, quality control and appropriate information technology;
- Assist Member States to acquire the necessary capacity to manage marine research and observation data and information and become partners in the IODE network;
- Support international scientific and operational marine programmes, including the Framework for Ocean Observing for the benefit of a wide range



## NODC - National Oceanographic Data Center

ISTITUTO NAZIONALE DI OCEANOGRAFIA E DI GEOFISICA SPERIMENTALE

### Data Access

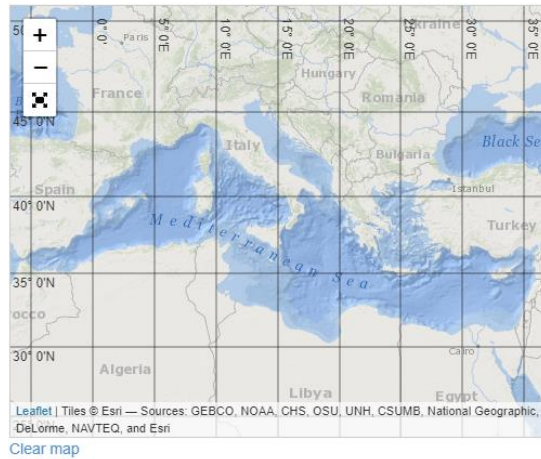
Last database synchronisation: 2019-04-12

By downloading a resource, you agree to [OGS copyright and data policy](#).

HELP +

#### Area selection

Simply hold the **Shift key** and drag the mouse over the map, or fill the coordinates values below. Full screen is recommended!



#### Coordinates (spatial and temporal)

N  S  E  W  [Reset the spatial filter](#)

Min. data start date 
 Max. data end date 

#### Parameter groups

*Screenshot of the OGS-NODC data access portal.*

## 2.6. Copernicus Marine Service

*The name of the data infrastructure or data portal:* Copernicus Marine Service

*Institutions maintaining the data infrastructure or data portal:* Mercator Ocean

*Ecological parameters stored by the data infrastructure or data portal:* Parameters provided by Copernicus Marine Services are: Temperature, Salinity, Currents, Sea Ice, Sea Level, Wind, Ocean Optics, Ocean Chemistry, Ocean Biology, Ocean Chlorophyll.

*Web page of the data infrastructure or data portal:* <http://marine.copernicus.eu/>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Products of Copernicus Marine Service are available to all registered users.

*Description:* Satellites and space technologies provide our societies with crucial services; they have a direct impact on your everyday lives, and the space industry is a source of economic growth and jobs. The EU relies on space technology for implementing its policies – protecting the marine and land environment and biodiversity, combating climate change, responding to disasters, managing transport ... To achieve this mission, the EU needed its own independent access to space-based services.

COPERNICUS, previously known as GMES (Global Monitoring for Environment and Security), is the European Programme for the establishment of a European capacity for Earth Observation and Monitoring. COPERNICUS encompasses 3 components: SPACE, INSITU and SERVICES.

#### The Copernicus Space Component:

It includes 1. The ESA's "Sentinels", which are currently being developed for the specific needs of the Copernicus programme and 2. The Contributing Missions, which are operated by national, European or international organisations and already provide a wealth of data for Copernicus services.

The European Space Agency (ESA) is responsible for the space component of the Copernicus programme. The European Organisation for the Exploitation of Meteorological Satellites

(EUMETSAT) is fundamental to the operational remit of Copernicus on account of their unparalleled experience and proven capability as a provider of operational meteorological satellite data, products and services.

#### The Copernicus InSitu component:

Copernicus services rely on data from in situ monitoring networks (e.g. maps, ground based weather stations, ocean buoys and air quality monitoring networks) to provide robust integrated information and to calibrate and validate the data from satellites.

The in situ networks are managed by Member States and international bodies and make data available to the services by agreement. The European Environment Agency (EEA) is leading work for Copernicus under the FP7 “GISC” project to catalogue the in situ requirements of the Copernicus services, develop frameworks and pilot agreements to ensure access to all the relevant data in a timely and sustainable way.

The Copernicus Service component: Copernicus services address six main thematic areas:

- Land Monitoring
- Emergency Management
- Marine Monitoring
- Atmosphere Monitoring
- Security
- Climate Change

These services have reached different degrees of maturity. Some are already operational (land monitoring and emergency management) while others are still in a pre-operational mode (atmosphere monitoring and marine monitoring), or in a development phase (climate change monitoring and services for security applications).

On November 11th, the European Commission and Mercator Ocean have signed an Agreement to implement and manage the Copernicus Marine Environment Monitoring Service. The latter is operational from early May 2015.



Today, the Copernicus Marine Service is provided on an operational mode by Mercator Ocean to more than 5000 subscribers worldwide.



The screenshot shows the homepage of the Copernicus Marine Environment Monitoring Service. At the top, it features the European Commission logo and the service title: "COPERNICUS MARINE ENVIRONMENT MONITORING SERVICE". Below this is a navigation menu with categories like "ABOUT US", "USE CASES & MARKETS", "NEWS", "SCIENCE & MONITORING", "TRAINING & EDUCATION", and "SERVICES PORTFOLIO".

The main content area is titled "ACCESS YOUR OCEAN INFORMATION" and includes several key sections:
 

- OCEAN PRODUCTS:** A link to an ocean product catalogue.
- OCEAN MONITORING INDICATORS:** A link to essential variables monitoring the health of the ocean.
- OCEAN STATE REPORT:** A link to an extensive annual analysis on the state of the ocean.
- DATA, TRENDS, EXPERTISE:** Three prominent buttons for further exploration.

On the right side, there is a "SHORT-CUT TO SERVICES" panel with links for "REGISTER NOW!", "SCIENTIFIC QUALITY", "ONLINE TUTORIALS", and "COLLABORATIVE FORUM". Below this is a "LATEST NEWS FLASH" section with a date of "2019 03 JUN." and a news item about "GLOBAL\_ANALYSIS\_FORECAST" regarding minor quality degradation.

At the bottom, there is an "EVENTS AGENDA" for Monday, June 23rd, featuring "PARTNERS AND STAKEHOLDERS", "FOCUS ON", and "TRAINING AGENDA". A central banner promotes an event titled "Copernicus Marine for Outermost and Maritime Regions" in the Azores, scheduled for June 6-7, 2019.

The footer contains a "SITE MAP - ALL RIGHTS RESERVED" notice, logos for the European Union and Copernicus, and navigation links for "ABOUT US", "PARTNERS & STAKEHOLDERS", "MARKETS", and "FEEDBACK SURVEY". A "ANY QUESTIONS? Ask the Service Desk" button is also present.

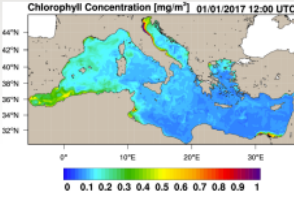
Screenshot of the Copernicus Marine Service portal.

Home > Services portfolio > Access to products

OCEAN PRODUCTS → OCEAN MONITORING INDICATORS → OCEAN STATE REPORT → GETTING STARTED → MY CART 0 Hello, Sign in

### MEDITERRANEAN SEA BIOGEOCHEMISTRY ANALYSIS AND FORECAST

Metadata provided by CMEMS  
Credits: E.U. Copernicus Marine Service Information



Chlorophyll Concentration [mg/m<sup>3</sup>] 01.01.2017 12:00 UTC

44°N  
42°N  
40°N  
38°N  
36°N  
34°N  
32°N

0° 10°E 20°E 30°E


0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1

BACK TO SEARCH

ADD TO CART

VIEW PRODUCT

DOWNLOAD PRODUCT

INFORMATION  DOCUMENTATION SERVICES NEWS FLASH

PRODUCT IDENTIFIER MEDSEA\_ANALYSIS\_FORECAST\_BIO\_006\_014

OVERVIEW

**Short description:**  
The biogeochemical analysis and forecasts for the Mediterranean Sea at 1/24 degree are produced by means of the MedBFM model system (i.e. the physical-biogeochemical OGSTM-BFM model coupled with the 3DVarBio assimilation scheme). MedBFM model is run by OGS and uses as physical forcing the outputs of the Med-PHY products (managed by CMCC). Seven days of analysis/hindcast and ten days of forecast are bi-weekly produced on Wednesday and on Saturday, with the assimilation of surface chlorophyll concentration from satellite observations (provided by the CMEMS-OCTAC).


**Product Citation:** Please refer to our Technical FAQ for citing products. <http://marine.copernicus.eu/faq/cite-cmems-products-cmems-credit/?idpage=169>

- DOI (Product): [https://doi.org/10.25423/CMCC/MEDSEA\\_ANALYSIS\\_FORECAST\\_BIO\\_006\\_014](https://doi.org/10.25423/CMCC/MEDSEA_ANALYSIS_FORECAST_BIO_006_014)
- Citation: Bolzon G., Cossarini G., Lazzari P., Salon S., Teruzzi A., Crise A., Solidoro C. (2017). "Mediterranean Sea biogeochemical Analysis and Forecast (CMEMS MED-Biogeochemistry 2015-2018)". [1]. Copernicus Monitoring Environment Marine Service. DOI: [https://doi.org/10.25423/CMCC/MEDSEA\\_ANALYSIS\\_FORECAST\\_BIO\\_006\\_014](https://doi.org/10.25423/CMCC/MEDSEA_ANALYSIS_FORECAST_BIO_006_014)

GEOGRAPHICAL COVERAGE

45.98

Areas:  
mediterranean-sea



-5.541

36.29

30.19

Copernicus Marine Service web page with the access to the biogeochemistry analysis and forecast product for the Mediterranean Sea.



## 2.7. Dynamic Ecological Information Management System - Site and dataset registry (DEIMS-SDR)

*The name of the data infrastructure or data portal:* Dynamic Ecological Information Management System - Site and dataset registry - DEIMS-SDR

*Institutions maintaining the data infrastructure or data portal:* CNR-IREA, LTER Europe, UBA, ILTER, KLIMETO

*Ecological parameters stored by the data infrastructure or data portal:* Physical parameters: density, water temperature, water salinity, water transparency, PAR; Chemical parameters: dissolved oxygen, pH, dissolved macronutrient concentration (N-NH<sub>4</sub>, N-NO<sub>3</sub>, N-NO<sub>2</sub>, P-PO<sub>4</sub>, Si-SiO<sub>4</sub>); Biological parameter: chlorophyll a, phytoplankton and zooplankton abundance and biomass

*Web page of the data infrastructure or data portal:* <https://deims.org/>

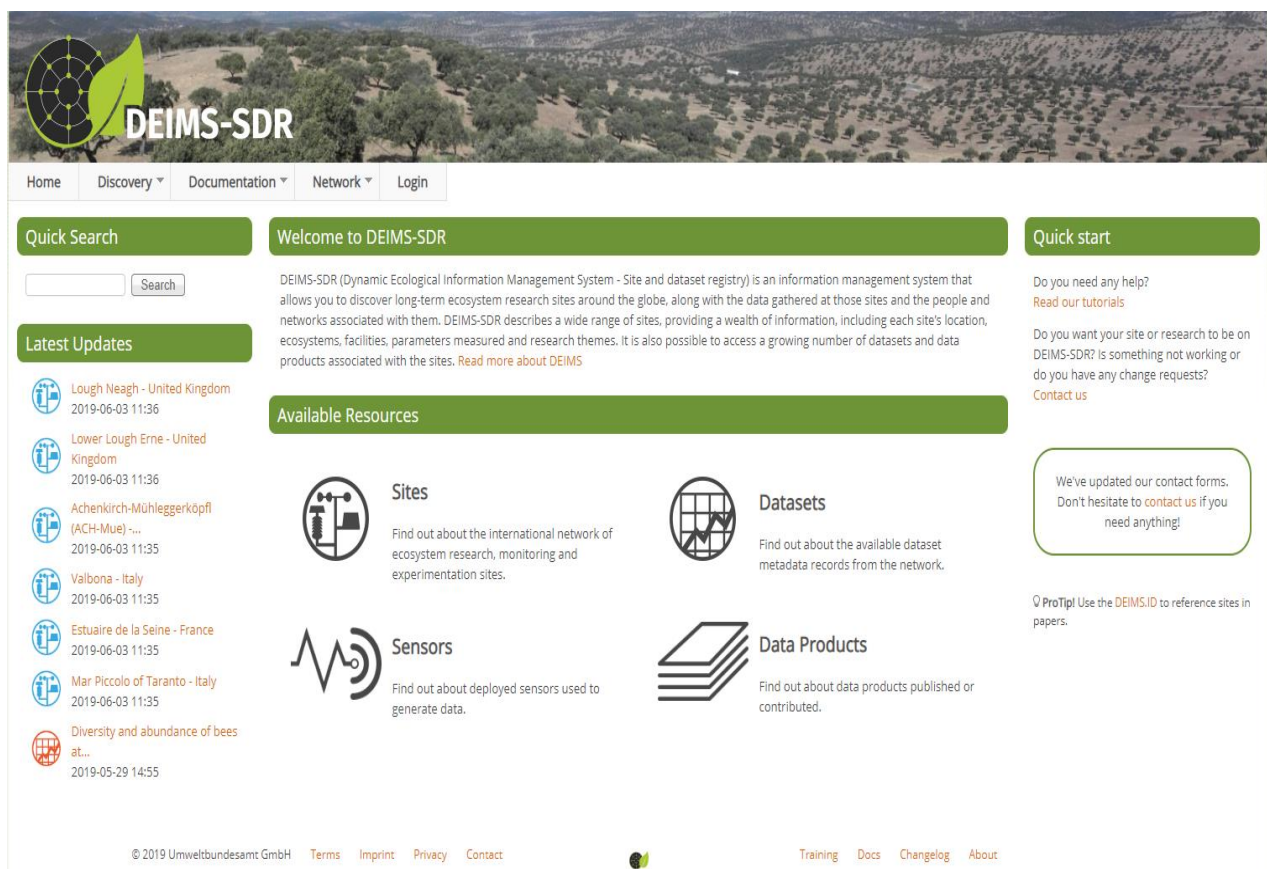
*Accessibility of the data by the data infrastructure or data portal, data policy:* Creative Commons (CC-BY) license

*Description:* DEIMS-SDR (Dynamic Ecological Information Management System - Site and dataset registry) is an information management system that allows you to discover long-term ecosystem research sites around the globe, along with the data gathered at those sites and the people and networks associated with them. DEIMS-SDR describes a wide range of sites, providing a wealth of information, including each site's location, ecosystems, facilities, parameters measured and research themes. It is also possible to access a growing number of datasets and data products associated with the sites.

All sites and dataset records can be referenced using unique identifiers that are generated by DEIMS-SDR. It is possible to search for sites via keyword, predefined filters or a map search.

By including accurate, up to date information in DEIMS, site managers benefit from greater visibility for their LTER site, LTSER platform and datasets, which can help attract funding to support site investments.

The aim of DEIMS-SDR is to be the globally most comprehensive catalogue of environmental research and monitoring facilities, featuring foremost but not exclusively information about all LTER sites on the globe and providing that information to science, politics and the public in general.



The screenshot shows the DEIMS-SDR portal homepage. At the top, there is a navigation menu with links for Home, Discovery, Documentation, Network, and Login. Below the navigation, there are several main sections:

- Quick Search:** A search bar with a 'Search' button.
- Welcome to DEIMS-SDR:** A central text block explaining the system: "DEIMS-SDR (Dynamic Ecological Information Management System - Site and dataset registry) is an information management system that allows you to discover long-term ecosystem research sites around the globe, along with the data gathered at those sites and the people and networks associated with them. DEIMS-SDR describes a wide range of sites, providing a wealth of information, including each site's location, ecosystems, facilities, parameters measured and research themes. It is also possible to access a growing number of datasets and data products associated with the sites. [Read more about DEIMS](#)"
- Quick start:** A section with links for "Do you need any help? [Read our tutorials](#)", "Do you want your site or research to be on DEIMS-SDR? Is something not working or do you have any change requests? [Contact us](#)", and a "ProTip!" section: "Use the [DEIMS.ID](#) to reference sites in papers."
- Latest Updates:** A list of recent updates with icons and dates:
  - Lough Neagh - United Kingdom (2019-06-03 11:36)
  - Lower Lough Erne - United Kingdom (2019-06-03 11:36)
  - Achenkirch-Mühleggerköpfl (ACH-Mue) ... (2019-06-03 11:35)
  - Valbona - Italy (2019-06-03 11:35)
  - Estuaire de la Seine - France (2019-06-03 11:35)
  - Mar Piccolo of Taranto - Italy (2019-06-03 11:35)
  - Diversity and abundance of bees at... (2019-05-29 14:55)
- Available Resources:** A section with four icons and descriptions:
  - Sites:** Find out about the international network of ecosystem research, monitoring and experimentation sites.
  - Datasets:** Find out about the available dataset metadata records from the network.
  - Sensors:** Find out about deployed sensors used to generate data.
  - Data Products:** Find out about data products published or contributed.

At the bottom of the page, there is a footer with copyright information: "© 2019 Umweltbundesamt GmbH" and links for Terms, Imprint, Privacy, Contact, Training, Docs, Changelog, and About.

Screenshot of the DEIMS-SDR portal.

## 2.8. GET-IT LTER-ITALIA

*The name of the data infrastructure or data portal:* GET-IT LTER-ITALIA

*Institutions maintaining the data infrastructure or data portal:* CNR-IREA, LTER-Italy

*Ecological parameters stored by the data infrastructure or data portal:* Physical parameters: air temperature

*Web page of the data infrastructure or data portal:* <http://getit.lteritalia.it>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Creative Commons (CC-BY) license

## GET-IT of LTER-Italy network




enables you to provide time series data from field-based environmental sensors. You can describe sensor and upload data that are then linked to the eLTER

**To start uploading your data please authenticate yourself with DEIMS credential**

You can view the [videotutorial](#) to learn more about how to upload your observatio

Need more help? Visit [GET-IT documentation](#)

### Featured Datasets

 <p><b>Sensors</b></p> <p>Add sensor information and observations collected by them, share yor data with others by standard service.</p> <p><a href="#">Explore sensors »</a></p>	 <p><b>17 Layers</b></p> <p>Click to search for geospatial data published by other users, organizations and public sources. Download data in standard formats.</p> <p><a href="#">Explore layers »</a></p>	 <p><b>No Maps</b></p> <p>Data is available for browsing, aggregating and styling to generate maps which can be saved, downloaded, shared publicly or restricted to specify users only.</p> <p><a href="#">Explore maps »</a></p>
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Screenshot of the GET-IT LTER-ITALIA portal.

## 2.9. GET-IT ISMAR Venezia

*The name of the data infrastructure or data portal:* GET-IT ISMAR Venezia

*Institutions maintaining the data infrastructure or data portal:* CNR-ISMAR

*Ecological parameters stored by the data infrastructure or data portal:* Physical parameters (atmosphere and sea): air humidity, air temperature, air pressure, wind direction, wind speed, wind gust, precipitation rate, thickness of precipitation amount, solar radiation; pressure, current speed, current direction, wave height, wave period, wave direction, water temperature, water salinity, water transparency, conductivity, fluorescence, turbidity; Chemical parameters: dissolved oxygen, pH, dissolved macronutrient concentration (N-NH<sub>4</sub>, N-NO<sub>3</sub>, N-NO<sub>2</sub>, P-PO<sub>4</sub>, Si-



SiO<sub>4</sub>), partial pressure of carbon dioxide (pCO<sub>2</sub>); Biological parameters: chlorophyll a, phyto- and zooplankton abundance and biomass.

*Web page of the data infrastructure or data portal:* <http://vesk.ve.ismar.cnr.it>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Creative Commons (CC-BY) license.

# VESK

## Starter Kit ISMAR Venezia

Upload your layers, your observations, create your maps and join the RITMARE interoperable Infrastructure.

GET-IT is developed in the context of Sub-Project 7 of RITMARE ([www.ritmare.it](http://www.ritmare.it)). It is based upon [GeoNode](http://geonode.org).

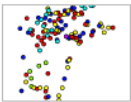
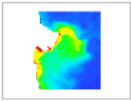

For more info visit the project site: [www.get-it.it](http://www.get-it.it).

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◇ LTER-Italy data in Get-It  
View from starterkit, 5 months, 2 weeks ago

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Screenshot of the GET-IT ISMAR Venezia portal.

## 2.10. IFON - Italian Fixed-point Observatories Network

*The name of the data infrastructure or data portal:* IFON - Italian Fixed-point Observatories Network

*Institutions maintaining the data infrastructure or data portal:* CNR-ISMAR, CNR-IRBIM

*Ecological parameters stored by the data infrastructure or data portal:* Physical parameters (atmosphere and sea): air humidity, air temperature, air pressure, wind direction, wind speed, wind gust, precipitation rate; pressure, current speed, current direction, wave height, wave period, wave direction, water temperature, water salinity, water transparency, conductivity, fluorescence, turbidity, CDOM; Chemical parameters: dissolved oxygen, pH, dissolved organic carbon, coloured dissolved organic carbon, inorganic carbon, dissolved macronutrient concentration (N-NH<sub>4</sub>, N-NO<sub>3</sub>, N-NO<sub>2</sub>, P-PO<sub>4</sub>, Si-SiO<sub>4</sub>); Biological parameters: chlorophyll a, phyto- and zooplankton abundance, and biomass, biodiversity, change in population size over time, community pattern, community structure, underwater video-monitoring of pelagic communities (e.g. fish, megazooplankton), benthic foraminifera abundance

*Web page of the data infrastructure or data portal:* <http://rmm.dati.ismar.cnr.it> (will be changed in <http://ifon.cnr.it>)

*Accessibility of the data by the data infrastructure or data portal, data policy:* Creative Commons (CC-BY) license.

*Description:* The Italian Fixed-Point Observatory Network (IFON) integrates well-established coastal and ocean infrastructures (buoys, platforms, moorings, mast platforms, etc.), most of them providing real-time multidisciplinary monitoring for a number of marine and atmospheric variables. Here, we describe the network characteristics and then discuss an example of its operation during the cold spell of winter 2012. One of the goals of the Italian Flagship Project Ricerca Italiana per il mare (RITMARE) is to create a common, validated IFON database able to fulfil both public and private demands, including validation of remotely sensed data and numerical models, environmental planning and management, and time-series analysis of climate and oceanographic data.



## 2.11. DEXT3R (Arpae-marefe network)

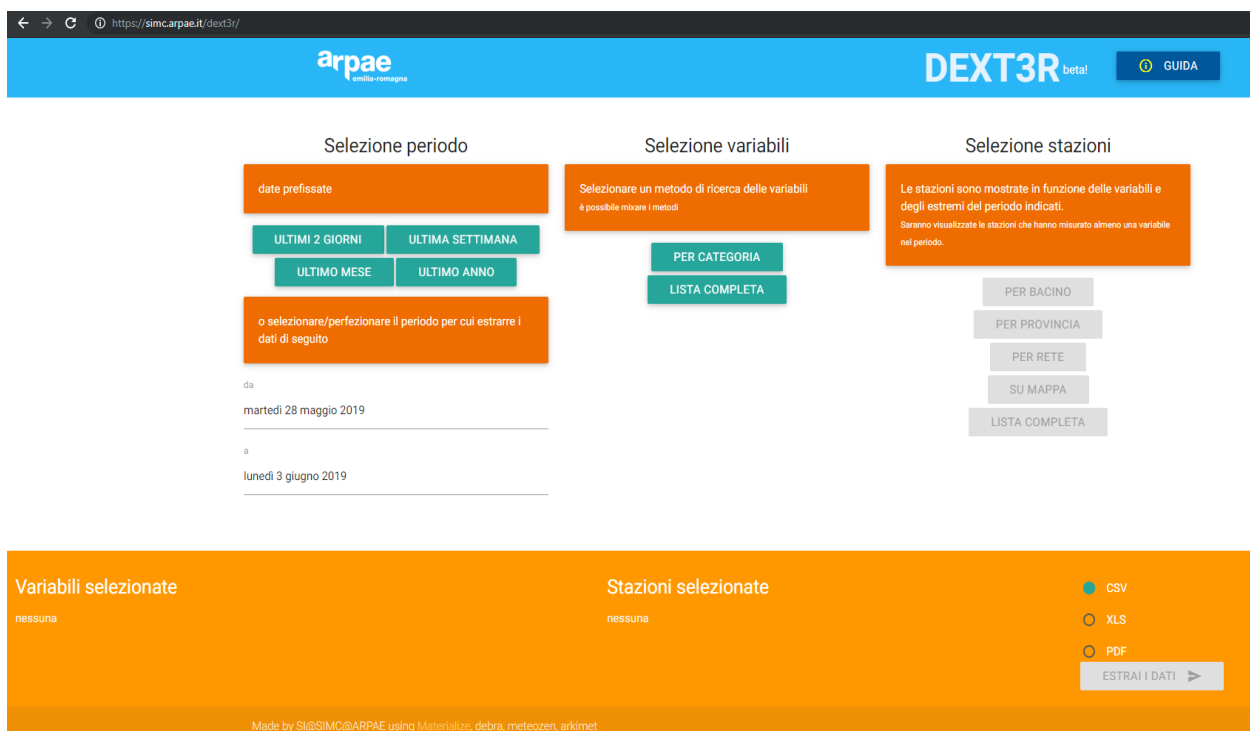
*The name of the data infrastructure or data portal:* 2.11. DEXT3R (Arpae-marefe network)

*Institutions maintaining the data infrastructure or data portal:* Arpae

*Ecological parameters stored by the data infrastructure or data portal:* physical parameters of pH, dissolved oxygen, temperature

*Web page of the data infrastructure or data portal:* <https://simc.arpae.it/dext3r/>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Free access, see <https://simc.arpae.it/dext3r/doc/GuidaDext3r.html> (only in Italian)



*Screenshot of the Arpae-marefe DEXT3R portal.*

## 2.12. NEURAL (neural network based) forecasting suite

*The name of the data infrastructure or data portal:* NEURAL (neural network based) forecasting suite

*Institutions maintaining the data infrastructure or data portal:* Institute of Oceanography and Fisheries

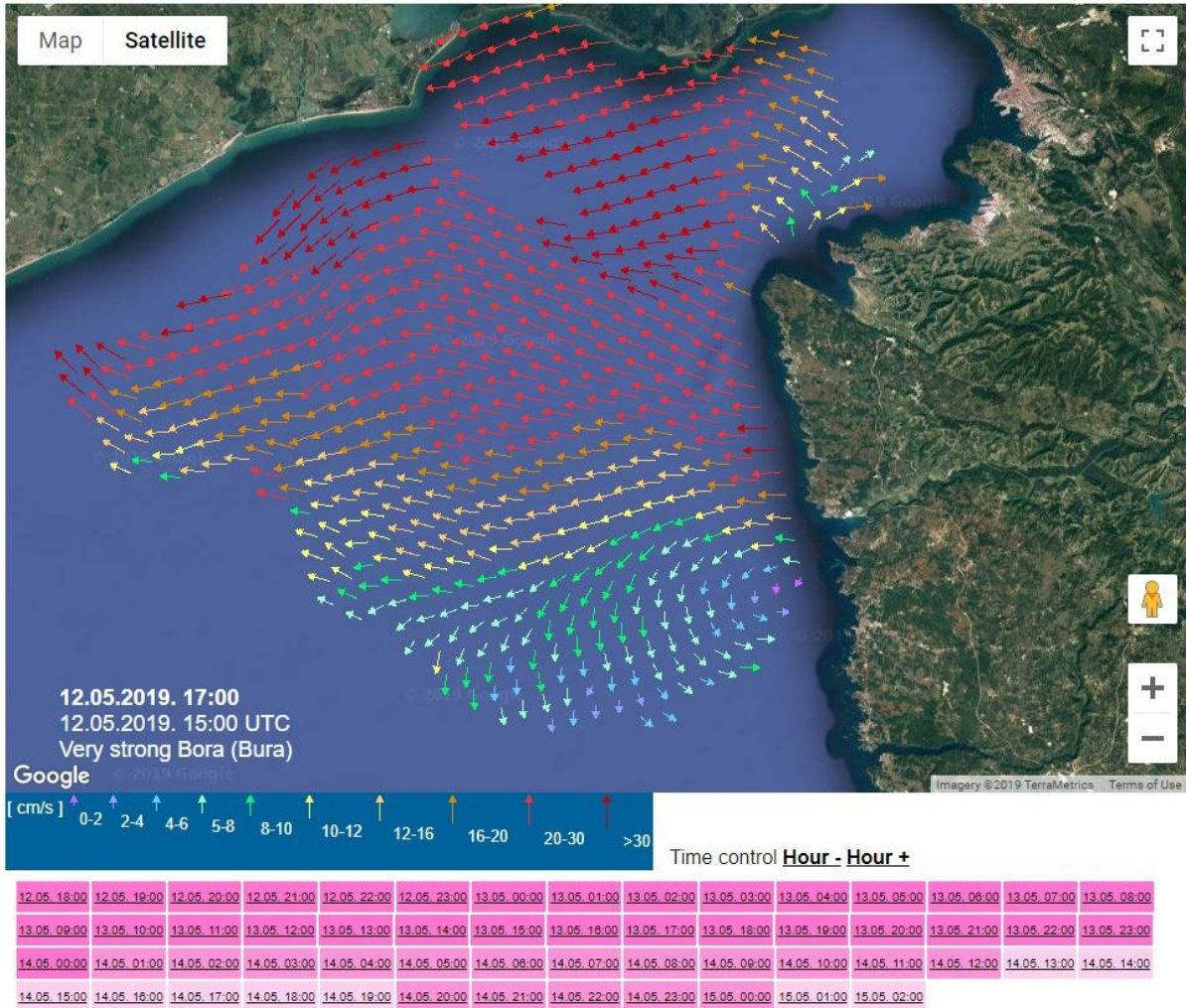
*Ecological parameters stored by the data infrastructure or data portal:* Currents

*Web page of the data infrastructure or data portal:* <http://www.izor.hr/neural>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Available on demand

*Description:* An operational oceanography forecasting service still does not exist in Croatia, an unacceptable omission for a country which has been investing major resources into its infrastructure in support to its development as a leading tourist destination, built on its natural beauty, climate and geographical position. The aim of this project is to investigate and to develop a hybrid ocean forecasting system for the eastern coastal regions of the Adriatic Sea based on the neural network approach. The project will use surface current fields measured by high-frequency oceanographic radars and mesoscale surface winds simulated by the high-resolution numerical weather prediction (NWP) models. A state-of-the-art atmospheric hydrostatic model Aladin/HR, which is used for the operational NWP at the Croatian national weather service (Meteorological and Hydrological Service, DHMZ, <http://meteo.hr>), will be used in the project. In addition, a high-resolution version of the non-hydrostatic research WRF-ARW model nested into the ALADIN model and operating in real time in a research mode will provide a complementary input wind dataset for validation and intercomparison. The models' outputs and the HF radar data will be introduced to the neural network and self-organizing maps algorithms to learn about the wind effects on the ocean and to create characteristic circulation patterns in the Adriatic. Once created through the learning process, the ocean current patterns will be forecasted by using outputs from the meteorological models only. The skill of the forecast will be estimated, and the models will be tuned to reach the best score. The forecast process will be in real-time and automatized, with forecasts published online and thus made available to numerous potential users.

Surface currents forecast



Operational forecast of surface currents in the northern Adriatic derived by the NEURAL operational system.

### 2.13. AdriSC (Adriatic Sea and Coasts) forecasting suite

*The name of the data infrastructure or data portal:* AdriSC (Adriatic Sea and Coasts) forecasting suite

*Institutions maintaining the data infrastructure or data portal:* Institute of Oceanography and Fisheries

*Ecological parameters stored by the data infrastructure or data portal:* Temperature, Salinity, Currents, Sea level

*Web page of the data infrastructure or data portal:* <http://www.izor.hr/adrisic>

*Accessibility of the data by the data infrastructure or data portal, data policy:* Available on demand

*Description:* The Adriatic Sea and Coast (AdriSC) Meteotsunami Forecast is a research product that was developed within the framework of two Croatian research projects: (1) project MESSI (<http://www.izor.hr/messi>), for reproduction and forecast of the Adriatic meteotsunamis, being a part of a pilot meteotsunami early warning system and (2) project ADIOS (<http://www.izor.hr/ADIOS>), with an ongoing effort to better understand the interactions between the Ionian and Adriatic Seas over interannual to decadal timescale and their potential effects on the ocean circulation along the Croatian coastline and islands.

Two different AdriSC modules have been developed: (1) a basic module using the COAWST model with WRF (3km highest resolution) for the atmosphere and ROMS (1km highest resolution) for the ocean (in blue in the figure) and (2) a dedicated meteotsunami module using WRF (1.5km resolution) for the atmosphere and ADCIRC (between 10m and 5km) for the ocean (in red in the figure).

Every day since the 15th of April, the following forecast data are published:

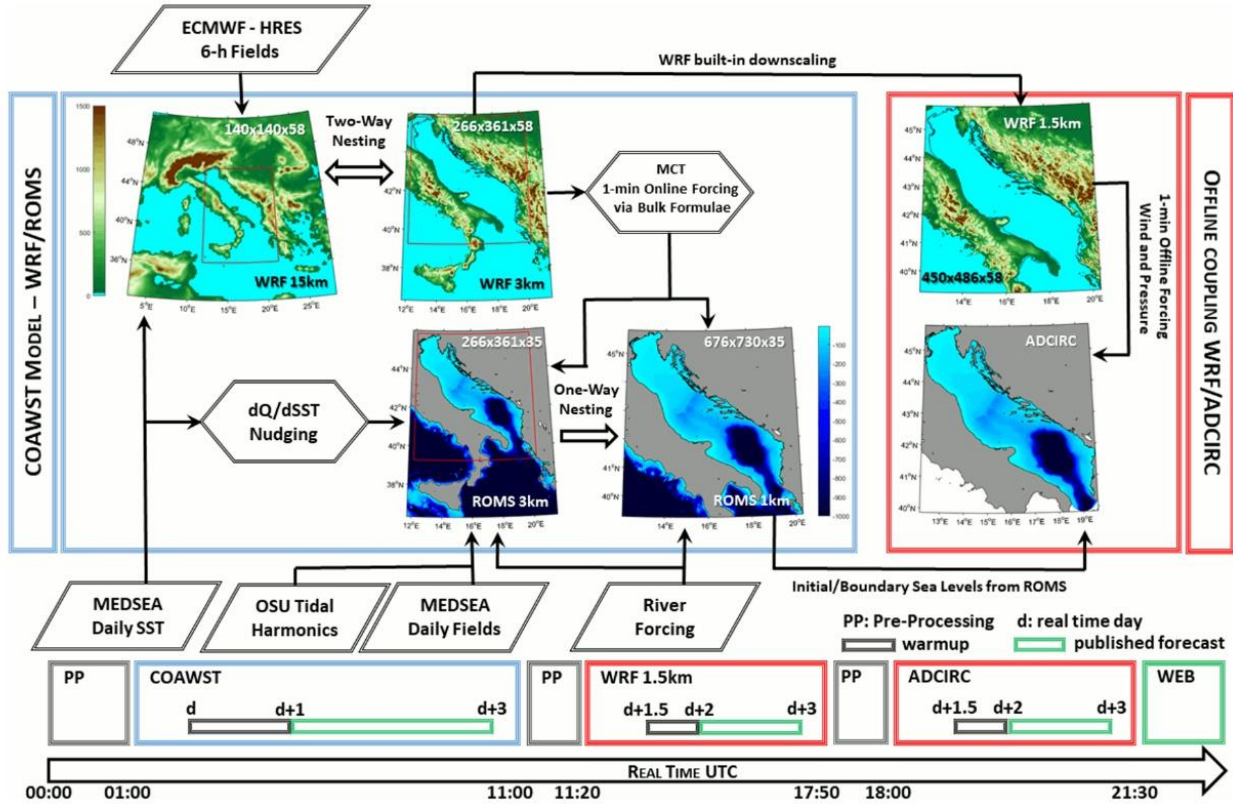
- 48h forecast of hourly atmospheric fields from the WRF model: air temperature at 2m (°C), air temperature at 850 mbar (°C), mean sea level air pressure (hPa), wind at 10m (m/s), wind at 500mbar (m/s), cloud coverage (%) and rain (mm per hour). The WRF results presented in

the website have a spatial resolution of 3km and thus cannot provide accurate fields at precise locations.

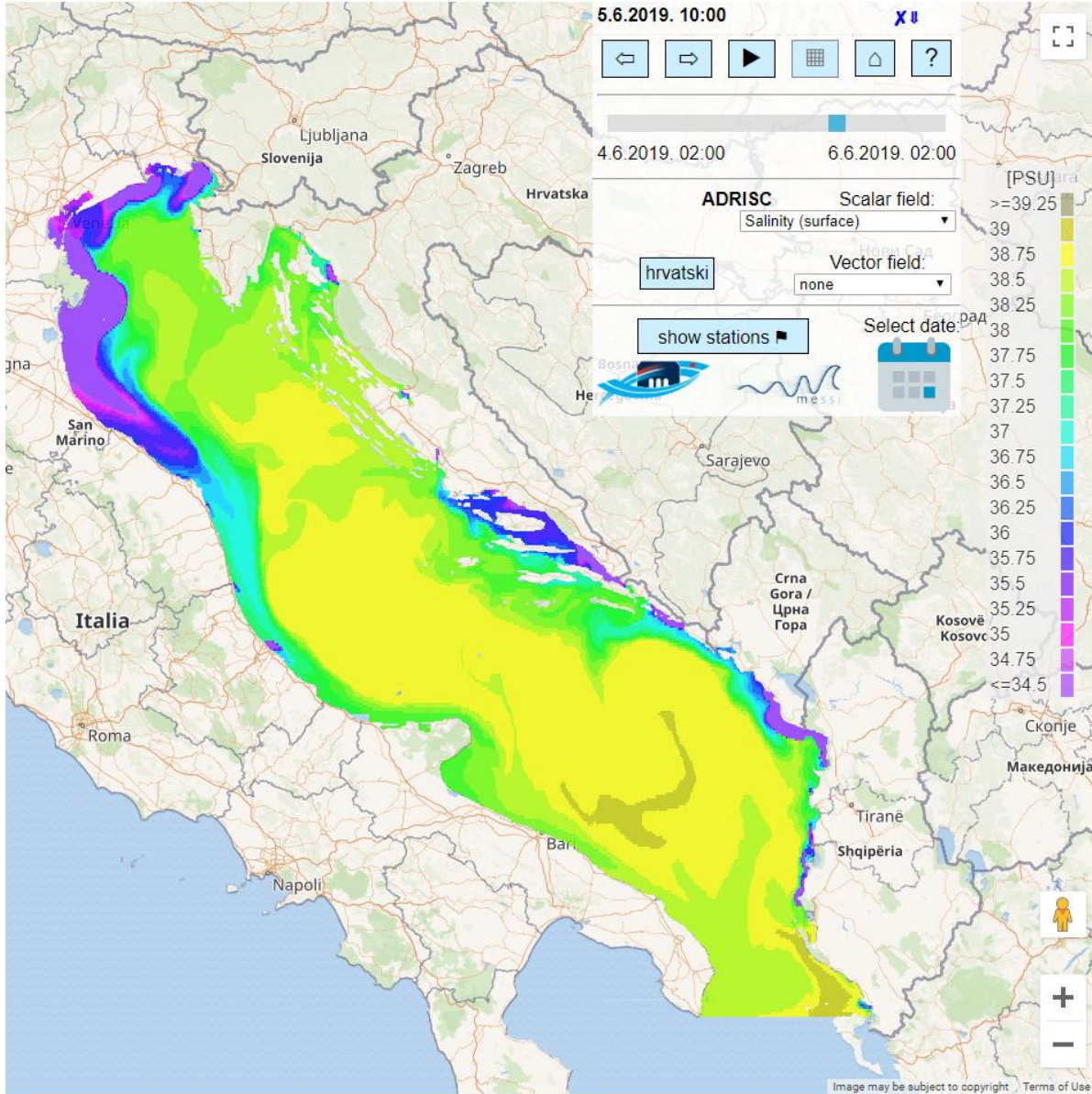
- 48h forecast of hourly ocean fields from the ROMS model: sea surface elevation (m, including tides), sea surface ocean currents (cm/s), barotropic ocean currents (cm/s, averaged value of the currents over the depth), sea surface ocean temperature (°C), salinity, significant wave height (m), wave period, wave length and wave direction. The ROMS results presented in the website have a spatial resolution of 1km and thus cannot resolve all the geographic features of the numerous Croatian Islands bays and harbors.

Three days after their date of publication on the website, the hourly results of WRF 3km and ROMS 1km are stored and displayed every 6h and the 15-min results of WRF 1.5km and ADCIRC are stored and displayed every hour.





Operational mode of the AdriSC Meteotsunami Forecast component. On the top, the flow chart represents the coupling between the different models (in blue COAWST, in red WRF/ADCIRC), their grids (plotted with topography/bathymetry data) and their forcing. On the bottom the timeline shows the different steps of the operational run starting every day  $d$  at 00:00 UTC (real time) and running from day  $d$  to day  $d+3$ . The forecast data is published on the web (in green) for days  $d+1$  to  $d+3$ .



Screenshot of the AdriSC web page ([www.izor.hr/adriSC](http://www.izor.hr/adriSC)).



## 2.14. Summary

From the collected information on available existing data infrastructures, portals and observing networks, the following information can be summarized:

- A great portion of the archived data in a data infrastructure is not accessible on the web
- The best accessibility of the data is provided for the established European or international platforms, with precisely-defined data sharing and usage policies (like Copernicus portal and different LTER portals)
- The most of the data infrastructure that are used for forecasting of ecological parameters are developed for forecasting of parameters of physical oceanography (temperature, salinity, currents, etc.)
- The most of the data stored and managed by existing data infrastructures, portals and observing systems is physical oceanography data (like water temperature, water salinity, water density, ...), then some chemical and biological parameters which are not so complicated to measure (like dissolved oxygen, pH, nutrients, chlorophyll a, phytoplankton and zooplankton abundance and biomass), while very little on data is available for description of species, i.e. on biodiversity. That is not just the case in the Adriatic Sea, but is a global bottleneck that threatens our knowledge on species, i.e. taxonomy
- A great portion of available data infrastructure has incorporated a kind of geo-spatial tools, which in some cases are unexploited in their usage in portals

### 3. SWOT ANALYSIS

#### **Strengths**

- There is a variety of observing networks, data and infrastructure in the Adriatic Sea, maintained by using state-of-the-art IT tools
- The organizations engaged in managing of observing networks, data and infrastructure is participating in a great number of local to international projects, programmes and initiatives, being at the forefront of the knowledge needed for proper monitoring and managing of environmental data and observational infrastructure
- The composition of the ECOSS partnership, from research-performing organizations through regional agencies, is enabling for exchange of ideas and practical procedures for proper maintenance of observing networks, data and infrastructure
- Both observations, numerical modelling tools, including forecasting of the ocean properties, are available for the Adriatic Sea

#### **Weaknesses**

- Long-term investment in maintenance of long-term ecological series, observing networks and data infrastructure is a low, and is dependable on short-term resources and projects rather than on a long-term
- Too many measured data in not available, publicly or for the research purposes only, which is a kind of obligation for data collection and monitoring programmes financed by taxpayers
- The collaboration between research groups and research institutes is not at the satisfactorily level
- The collaboration between research-performing organizations, agencies and regional/local authorities is not well established at some parts of the Interreg Italy-Croatia programme area
- The products coming from observing networks, data and infrastructure for the programme area is not well disseminated towards potential users and public

## **Opportunities**

- Composition of the partnership might be used for building an added value in design and implementation of future observing networks, data and infrastructure or development of the existing ones
- Merging the efforts might enable for development of better observational infrastructure and products to the potential users and products
- Collaboration between researchers and staff coming from different research and management systems may allow for new ideas and better performance of both Croatian and Italian systems and allow for their competitiveness on the European level
- An integrated platforms and programmes of observing networks, data and infrastructure may allow for boosting the importance of necessity of monitoring of ocean, which at end will results in better operational and forecasting systems following demands of the society
- Transfer of knowledge and information between partners from Croatia and Italy will allow for definition and creation of better environmental protection policies and strategies

## **Threats**

- Underfinancing of long-term activities necessary for proper observation and managements of the Adriatic Sea might lead to a deterioration of the level of protection of marine environment and habitats in the Adriatic Sea, ending with failing in preserving Good Environmental Status of the European seas and thus not fulfilling the European policies (e.g. Marine Strategy Framework Directive)
- Political situation at higher level might have a repercussion to the collaboration and maintenance of the research and other connection established for protection of the Adriatic Sea, and therefore impact a great number of activities related to the common sea
- Brain gain and leakage of competences towards the Western and Northern Europe, in particular present in Croatia, may reflect in a decrease of competences and level of maintenance of long-term ecological series, observing networks and data infrastructure in the future

## 4. REQUIREMENTS

From the analysis of the existing observational networks, data and infrastructure in the Adriatic Sea, and by acknowledging the state-of-the-art and practices in the European and world level, the following requirements might be seen for the future development of the observational ecological networks, data and infrastructure:

- *What type of information do you need to access in order to support the objective of the project?:*
  - Geospatial maps (coastal geomorphology, bathymetry, digital elevation model, coastal land use/land cover, marine and coastal habitat maps, protected areas, nursery areas for species with commercial importance)
  - Socio-economic data (e.g. tourist arrivals per coastal municipalities, coastal population, road infrastructures in coastal areas)
  - Time series data (storm surge, wave regime, dissolved oxygen, nutrient concentrations, nutrient loads from rivers, meteorological data - wind direction and intensity, currents, rainfall regime, air temperature)
  - Maps of spatial distribution of species, time series data of species diversity and composition.
- *Which environmental parameter are of primary importance for you to describe and manage the Natura 2000 sites?:*
  - Geospatial maps (coastal geomorphology, bathymetry, digital elevation model, coastal land use/land cover, marine and coastal habitat maps, protected areas, nursery areas for species with commercial importance)
  - Socio-economic data (e.g. tourist arrivals per coastal municipalities, coastal population, road infrastructures in coastal areas)

- Time series data (storm surge, wave regime, dissolved oxygen, nutrient concentrations, nutrient loads from rivers)
- Species diversity and composition at the Natura 2000 sites
- *What functionalities would be needed more in an infrastructure to access and use that information?:*
  - Visualization and download (including re-analysis)
  - Download of geospatial data (sea temperature, depth, chlorophyll) for analysis in relation to biological data
- *Who would be the main users of this infrastructure?:*
  - Researchers working in ecological/oceanographic fields, decision makers and researchers working on marine spatial planning
  - Scientists and Natura 2000 sites managing authorities
  - Fisherman/sea shell agriculture cooperative and communities

Going through available information on availability of the ecological data for the research, it comes out that a large amount of data is not available and is not accessible. Although the data is not collected exclusively through research projects which demand reproducibility of any research and results, the availability of the data is a demand for increasing quality of the research. Furthermore, open data and open science policy is one of key policies on the European level, as it is widely recognized that making research results more accessible contributes to better and more efficient science, and to innovation in the public and private sectors. That is the reason while open science is addressed in all data collection and research activities for projects financed by European taxpayers, like Horizon 2020 programme (<https://ec.europa.eu/research/openscience/index.cfm>). At end, better science ends with healthy, productive and sustainable oceans and seas in the Adriatic, Mediterranean and wider, recognized in a number of European and Mediterranean programmes and initiatives, like JPI-

Oceans (<http://www.jpi-oceans.eu/>) and BLUEMED Initiative (<http://www.blued-med-initiative.eu/>).

Therefore, the strong and most relevant requirement that emerge for our analysis is the requirement for data accessibility and availability, in particular for research. I.e. the data sharing and usage policy should be defined and agreed on the Adriatic level.

Another important issue is a variety of non-harmonized information systems and platforms (using different IT tools and concepts) that are collecting ecological data, which normally lower the data usage by users. It is not reasonable that these data infrastructures may be unified on the basin level. However, the development of an Adriatic data portal – one-stop shop for the data – may help users to access the data through a distributed ecological data Infrastructure, for the management of large and diverse sets of data deriving from in situ of the seas and oceans. That will follow global and European approach, as developed through SeaDataNet network (<https://www.seadatanet.org/>) or Mediterranean Operational Network for the Global Ocean Observing System (MONGOOS) (<http://www.mongoos.eu/>) or other, for a parts of the observational networks.

## 5. CONCLUSIONS

The presented review of existing observing networks, data and infrastructure in the Adriatic Sea, enlightens their variability coming from different background and involvement of ECOS partner organizations in the international projects, programmes and activities. Yet, the diversity between observing and operational networks, physical and ecological instrumentation, real-time and delayed observations, longevity of observations, common-used IT tools vs. the new developments, etc., might be used for providing added value to the management and maintenance of the Adriatic networks and marine-related infrastructure, potentially ending with the increased level of managements of the Adriatic living resources and biodiversity. Hopefully, this deliverable and the ECOS project will result in such an improvement, and more healthy and productive Adriatic Sea.