Work Package 3 – Mapping of Adriatic Reefs from different perspectives

Activity 1 – Reefs' Classification in the cooperation area

MAP OF ADRIATIC REEFS

Deliverable D3.1.4

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1. EXECUTIVE SUMMARY

The Map of Adriatic reefs (WP3.1 - Reefs Classification - Deliverable D3.1.4) webGis (https://adrireef.github.io/sandbox2/) is built with the purpose of geographically representing data regarding the Adriatic natural reefs, artificial reefs and wrecks and filtering them basing on some peculiar aspects. The input of the database upon which the webGis is built is composed by data coming from a wide survey conducted within Activity 3.1. Collected information are classifiable in four main groups: reef identification properties, area hosting the reef properties, reef properties and reef eventual exploitation. With the aim to augment the readability of data and basing on this subdivision, in the webGis we decided to filter data by type, country, usage, natural reef typology and artificial reef material. Moreover, we also filtered data by name, distance from the coastline (or from a specific address) and by depth. The technical solution adopted takes advantage of Google Maps APIs, JSON objects, Javascript and GitHub pages and it represent a rapid and easy-to-use option for our purposes.

2. INTRODUCTION

The current situation of natural reefs (NRs) and artificial reefs (ARs) in the Adriatic Sea is not yet clear and there is a need of collecting, organizing and capitalizing all the information produced within independent projects and research.

Starting from this assumption, the Map of Adriatic reefs webGis (https://adrireef.github.io/sandbox2/) has been built with the purpose of geographically representing data regarding the Adriatic natural reefs, artificial reefs and wrecks and making them accessible to scientists, public administrations and citizens.

3. INPUT DATA

Input data come from a wide recognition, both from literature review and from surveys conducted through the project partners (Ferrà et al., 2019). Moreover, data have undergone a necessary harmonization process that regarded almost all the parameters of the database considering the large amount and diverse information obtained from the survey.

Database building included three main steps: literature and available data review, questionnaire design and data aggregation.

Literature recognition involved mainly European environmental databases (Natura 2000, European Environmental Agency sites), ended and ongoing research projects (databases developed by CNR-IRBIM), scientific publications, grey literature and expertise knowledge in order to identify questions useful to better achieve a more complete knowledge on Adriatic reefs.

The questionnaire, developed using Google Forms infrastructure, required:

1. main identification and geolocalisation information such as: name, location, eventual region and coordinates;
2. summary of the characteristics of the area hosting the reef: depth, minimum distance from the coast, typology of surrounding seabed, presence of protected areas (for natural reefs), etc.;
3. aspects of the reefs that may also have an effect on the usage of the reef: typology of reef, origin of the reef (for natural reefs) and material used to build artificial reefs, dimensions of the reef etc.;
4. present and/or possible future reef exploitation.

Data from all the partners and involved institutions were then aggregated and homogenized in order to obtain the present version of the database.

The database counts for 58 columns, 55 of them containing data from the data collection and 3 created by the database responsible (Type of reef, Country, Region). From the total, 9 parameters were finally used for filtering data in the webGis application and/or for the reefs' classification, while

the remaining columns were only used as part of the technical information sheets of each single reef.

Table 1 reports some synthetic information about collected parameters, dividing them in the groups previously individuated (1. identification parameters; 2. characteristics of the area hosting the reef; 3. reef characteristics; 4. reef exploitation), individuating their unit of measure (where applicable), if they are used to create filers on data, and if they are used to create a synthetic report on each reef.

NAME OF PARAMETER	CORRESPONDING COLUMN NAME	TYPE OF PARAMETER	UNIT OF MEASURE	FILTERED PROPERTY	PROPERTY USED FOR TABLES
Type	Type	1	-	Yes	Yes
Country	Country	1	-	Yes	Yes
Region	Region	1	-	No	Yes
Location	Location	1	-	No	Yes
Name	Name	1	-	No	Yes
Latitude	Latitude	1	Decimal degrees	Yes	No
Longitude	Longitude	1	Decimal degrees	Yes	No
Year of deployment	year_deployment	1	-	No	Yes
Year of modification	year_modification	1	-	No	No
Minimum depth	min_depth_m	2	Meters	Yes	No
Depth	depth_m	2	Meters	No	Yes
Reef edge height	reef_edge_m	2	Meters	No	Yes
Distance from the coastline (for filter)	Min_dist_filt_km	2	Kilometers	Yes	No
Distance from the coastline	min_dist_km	2	Kilometers	No	Yes
Surrounding seabed type	surrounding_seabed	2	-	No	Yes
Presence of meadows	Meadows	2	-	No	Yes
Reef typology (for filter)	typo_filt	2	-	Yes	No
Reef typology	reef_typology	3	-	No	Yes
Structure of the wreck	structure_wreck	3	-	No	Yes
Material (for filter)	Material_simply	3	-	Yes	No
Material	Material	3	-	No	Yes
Arrangement of modules	Arrangement_modules	3	-	No	Yes
Origin of the reef	origin_reef	3	-	No	Yes
Total area of the reef	total_area_sqm	3	Squared meters	No	Yes
Total volume of the reef	total_volume_cubm	3	Cubic meters	No	Yes
Number of oases composing the reef	n_oases	3	-	No	Yes
Distance between oases	dist_between_oases_m	3	Meters	No	Yes
Oases dimensions	dimens_oases_sqm	3	Squared meters	No	Yes
Type of structures	type_structures	3	-	No	Yes

Table 1. List of columns composing the database reporting their significance, corresponding column name, type of parameter, unit of measure, if the property is filtered or not, if the property is used to create a summary table or not.

NAME OF PARAMETER	CORRESPONDING COLUMN NAME	TYPE OF PARAMETER	UNIT OF MEASURE	FILTERED PROPERTY	PROPERTY USED FOR TABLES
Number of structures	n_structures	3	-	No	Yes
Dimensions of the structures	dim_structures_m	3	Meters	No	Yes
Distance between structures	dist_between_structures_m	3	Meters	No	Yes
Modules shape	modules_shape	3	-	No	Yes
Number of modules	n_modules	3	-	No	Yes
Distance between modules	dist_between_modules_m	3	Meters	No	Yes
Length, height and width dimensions of modules	dimension_leng_width_heigh_m	3	Meters	No	Yes
Weight or displacement	weight_or_displacement_tons	3	Tons	No	Yes
Type of exploitation	experimental_professional	4	-	No	Yes
Scope	Scope	4	-	No	Yes
Exploitation	Exploitation	4	-	Yes	Yes
Possible exploitation	possible_exploitation	4	-	No	Yes
Observation	observations	3	-	No	Yes
Biocenosis	Biocenosis	2	-	No	Yes
Alien species	alien_species	2	-	No	No
Alien species (for form)	Alien species (form)	2	-	No	Yes
Protected species	protected_species	2	-	No	No
Protected species (for form)	Protected species (form)	2	-	No	Yes
Protected area (for form)	Protected area	2	-	No	Yes
Protected area	protect_area_y_n	2	-	No	No
Type of management (for form)	Management_program	2	-	No	Yes
Type of management	managment_prog_Y_N	2	-	No	Yes
Concession area	Concession_area_Y_N	2	-	No	Yes
Surveillance service (for form)	Surveillance_service	2	-	No	Yes
Surveillance service	Surveillance_service_Y_N	2	-	No	No
Monitoring program (for form)	Monitoring_program_Y_N	2	-	No	Yes
Monitoring program	Monitoring_program	2	-	No	No
Available data	Available data	-	-	No	Yes
Available literature	Available literature (Scientific or Grey)	-	-	No	Yes

Table 1. Continuation.

The total number of elements was 285, divided in: 129 natural reefs, 47 artificial reefs, and 109 wrecks along Italian and Croatian coasts. Data were passed to the webGis in a unique .csv file.

Analyzing data, we found that the most relevant parameters to our purposes were:
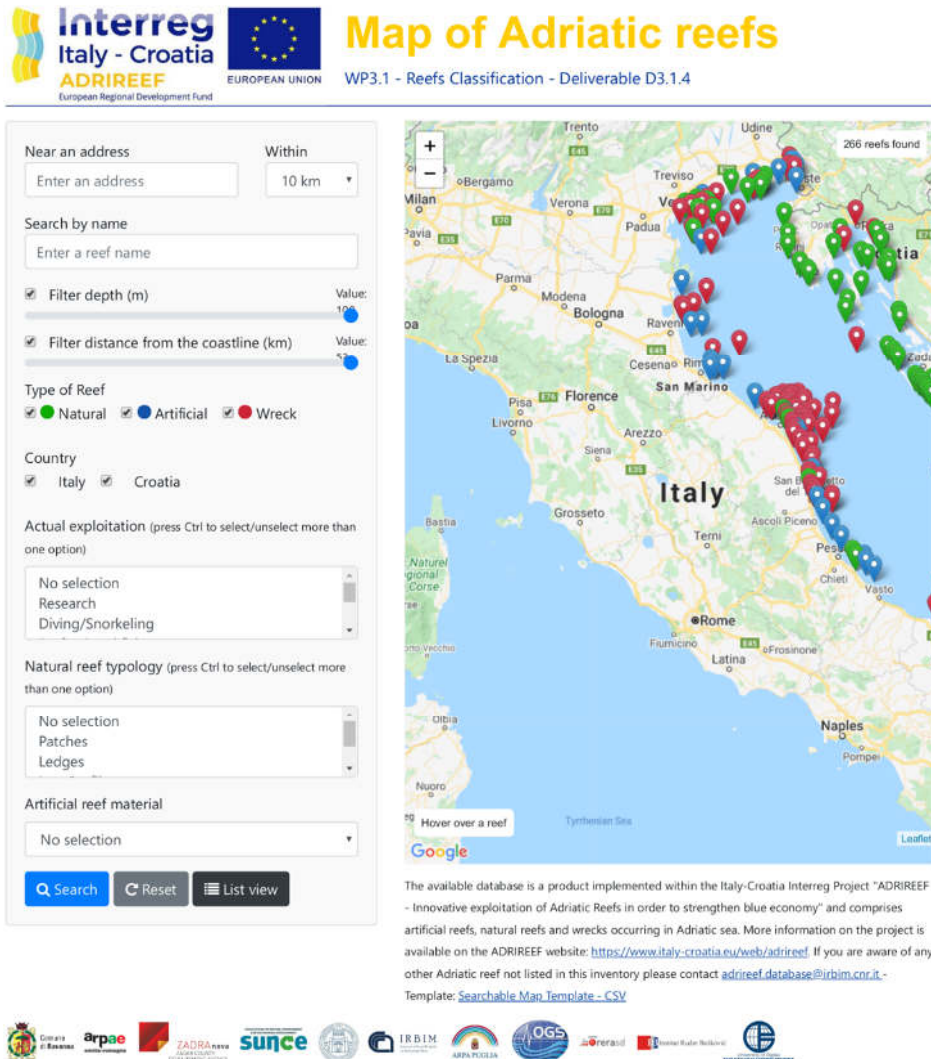
- Type of reef;
- Country,
- Minimum depth of the reef;
- Distance from the coastline;
- Usage of the reef;

- Reef typology (for natural reefs);
- Reef material (for artificial reefs).

Basing on these parameters, we implemented filters for the database in order to have both a generic and more specific overlook at reefs' characteristics.

4. WEBGIS FUNCTIONING

The webGis main page is reachable at the address: https://adrireef.github.io/sandbox2/ and it is composed by two windows: the one on the left reports all available filters for data, the one on the right reports the map where points, identifying elements, are divided by colour in Natural reefs (green), Artificial reefs (blue) and wrecks (red). Hovering on a reef with the mouse, Name and Location of the element appear in the left bottom corner of the map (Fig. 1).

Figure 1. The interface of webGis. On the left side: the filters window. On the right side: the map window with hover function (bottom left) and total number of identified elements (top right).

The total number of currently visualized elements is reported at the top right of the map. Moreover, when an element is clicked, a pop up appears reporting the associated relevant information (Fig. 2).
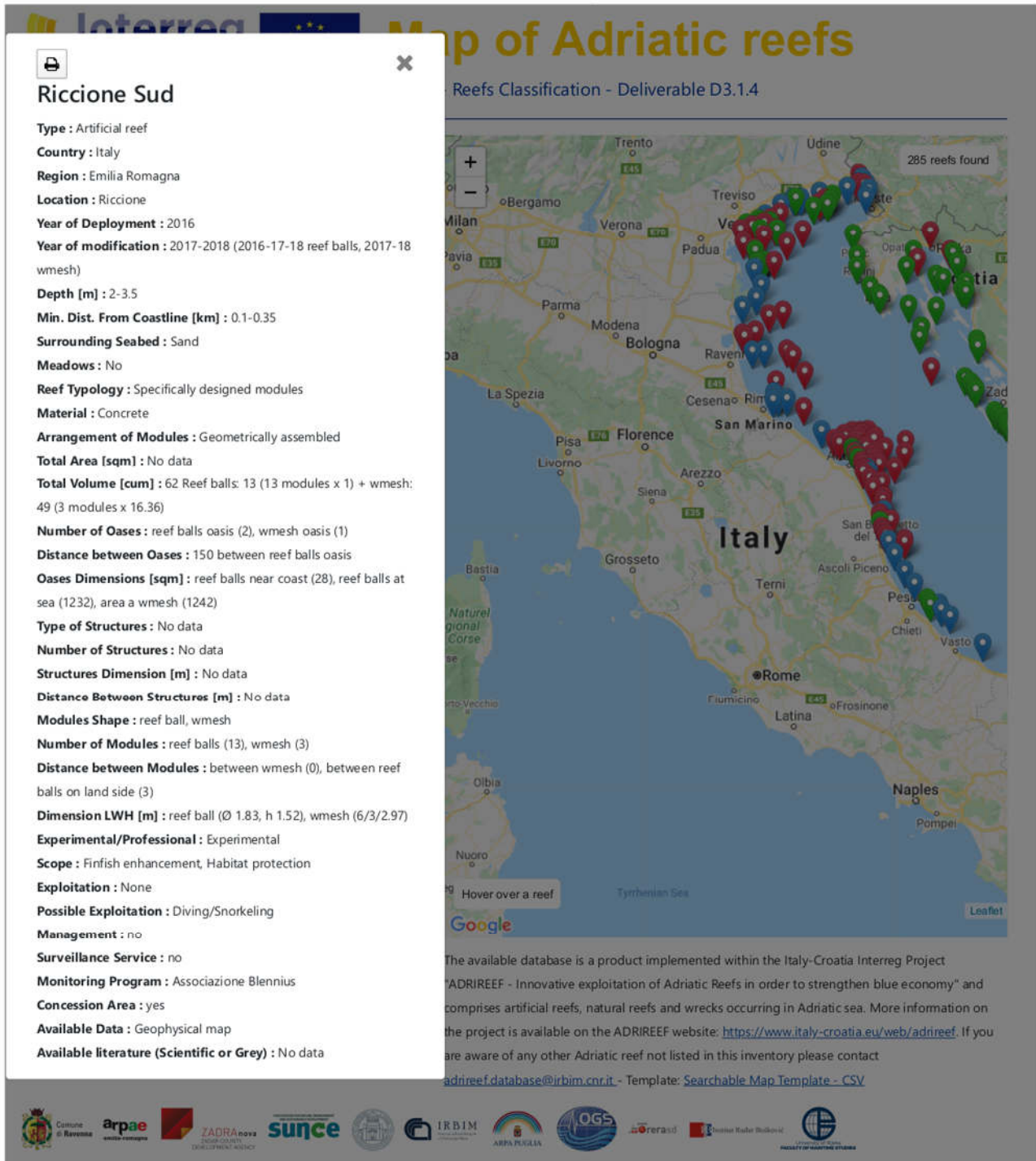

Figure 2: Example of a pop up that appears once an artificial reef is clicked.

In the left part of the page, all the filters we can apply on data are reported. From top to bottom:

- A filter that works by specifying an address and a search radius which returns all the elements in the nearby of a specified location. This filter exploits Latitude and Longitude coordinates of the reefs/wrecks and it can also be useful, for example, for touristic purposes. The filter returns, in the map window, a zoom to the selected area with evidenced the buffer and the reefs falling in it.
- A filter that finds elements by Name: this filter can be useful, for example, for reefs' managers or other administrative and scientific institutions, that want to find rapidly a specific element.
- A checkbox filter able to select elements by type (NRs, ARs or wrecks).
- A checkbox filter able to select data by country (Italy and Croatia).
- A slider filtering data by reef depth: this filter works on the bottom depth of the reef (auxiliary column "min_depth_m"). The range of the filter is [0-100] and the default value is 100 m. The filter is automatically active and, moving the slider, the selected value is reported in the field "Value", placed near the slider. Unselect the checkbox near the filter to switch off the filter.
- A slider filtering data by distance from the coastline: this filter works on "min_dist_km" column of the database. The range is [0-52] and the default value is set to 52 km. The filter is automatically active and, moving the slider, the selected value is reported in the field "Value", placed near the slider. Unselect the checkbox near the filter to switch off the filter.
- A dropdown menu filtering data by usage. For this filter, the "exploitation" column is used, and the possible cases are: research, diving/snorkeling, professional fishery, recreational fishery, mariculture and none. The selection of multiple cases is allowed.
- A dropdown menu filtering data by reef typology (only for natural reefs). For this filter, the "reef_typology" column is used, and the possible cases are: "Patches", "Ledges", "High profile" and "Low profile" reefs. The selection of multiple cases is allowed.
- A dropdown menu filtering data by reef material (only for artificial reefs). For this filter the "Material_simply" column is used, and the possible cases are: "Concrete", "Concrete & Other", "Concrete, Polyethylene", "Concrete, Rocks, Steel/Iron" and "Steel/Iron".

At the bottom of the page there are:

- Search button, which applies the selected filters.
- Reset button, which resets view and filters.
- List view button that shows, for the visualized elements, some common information through natural, artificial reefs and wrecks (Fig. 3). This button turns to a "Map view" button, when list view is active.

Number of visualized elements, in the top right corner of the map view, is updated accordingly to the output of data filtering operations.

Figure 3. Table view. Once elements are selected, it is possible to achieve some common information by clicking the "Table view" button at the bottom of the page.

5. TECHNICAL SOLUTIONS

Evaluating multiple technical solutions, we found that the most rapid and efficient way to put in place the portal was to use Google Maps APIs (https://developers.google.com/maps/documentation) and the Searchable Map Template – CSV (https://github.com/datamade/searchable-map-template-csv). Therefore, we built an HTML and Javascript portal where data were inserted in .csv format, then transformed in JSON objects as "Collection of Features" class, with prototype (generic) and object (specific) capabilities.

For each feature (reef) an integer and consecutive number, identifying the element, was assigned by default. GitHub Pages (https://pages.github.com/) also represents an easy and rapid way to get the portal online. More information about the functioning of the portal are available also in the README.md file, placed in the main folder of the project (https://github.com/adrireef/sandbox2).

6. REFERENCES

Ferrà Vega, C., Spagnolo, A., Fabi, G. (2019). D3.1.2 – Data collection, D3.1.3 – Reef classification. ADRIREEF Project. Final Draft Version.