



## Lesson Plan for Positive Actions

Please send your Queries/Submit the lesson plan to Dr Pramod Kumar Sharma at [pramod@fee.global](mailto:pramod@fee.global)

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### 2. Has the lesson plan tried in a classroom (Please write a brief)

#### ENVIRONMENTAL VOLUNTEERING FOR WATER QUALITY - AN INTERDISCIPLINARY CLASS DAY (GEOGRAPHY AND CHEMICAL PHYSICS) ON CULATRA ISLAND

We have been planning and executing this field lesson plan for 7 years, to include new work procedures and to streamline them:

- the previous class: preparation of volunteer action and learning about the context;
- the field class: two activities in the morning, and two in the afternoon;
- the subsequent class: where the report is made, the article for publication and the critical balance of work, done by each of the participants.

In this plan we will show what is done only on the day of the field work.

### 3. The lesson plan

#### A. Introduction:

The island of Culatra is one of the many islands of the geomorphological system "Lido de Faro", with a sea and a Ria front. It is located in the Ria Formosa Natural Park in the Algarve region, in the south of Portugal. This territory is part of the "Natura 2000 Network" and the "Ramsar Sites" for their biodiversity richness. In turn, the Ria Formosa is the livelihood of the population living in Culatra Island, approximately 750 inhabitants, who are dedicated to activities related to the sea: oyster farming and clams, salt exploration, samphire production, tuna trap, fishing, in addition to tourist activities on the water and on land.

The purposes of this pedagogical work are the acquisition of knowledge, attitudes and values:

- To identify environmental problems and seek their resolution through voluntary stock valuation, passing by civic participation, informing the Project promoter entities - the Portuguese Environment Agency.
- Recognize the coastal ecosystems as forms of renewable natural capital, that depends on the biodiversity and whose preservation and restoration should be done, at the local level, geared to nature conservation, water resources and ways of life. This good management contributes decisively to the improvement of the water cycle and biodiversity;
- Promote a territorial civic culture that considers land use planning, landscape and environment at the centre of the choices of location and distribution of human activities - a culture that values

the territory of its traditions and values, knowing its problems and possible solutions, base sustainable development.

The actions are developed with the necessary scientific rigor, after the initial training of teachers / monitors by teachers / researchers of the University of the Algarve (UALG), in order to learn the necessary scientific procedures.

### B. Students age group

The age range is 12 to 17 years.

Primary and secondary school students

### C. Objectives or learning outcomes

- Promote environmental volunteering and citizen science (voluntary monitoring network).
- Contributing to the sustainability of aquatic ecosystems under the WFD;
- To monitor the water quality, using benthic saltwater macroinvertebrates as a bioindicator and to know the importance of this procedure.
- To deepen the knowledge of the biocenoses of Ria's mobile substrate, its trophic relationships, dependence on pollution and anthropic impacts.
- Reveal critical attitudes, based on reflection on environmental problems caused by human activity;
- Sensitize students and populations to the double aspect of protection and enhancement of our classified areas, through the services provided by their ecosystems;
- Contribute to the implementation of Agenda 2030 - Sustainable Development Objectives:



### SDG Learning Outcome (Benthic Saltwater Macroinvertebrates Protocol and Microplastic Observation – UALG)



Assessment of the ecological status of water using benthic saltwater macroinvertebrates as a bioindicator:

- The water is very bad; the water is not good; the water is fine; the water is excellent (software program AMBI -UALG).
- Contaminants: anthropic, climatic, soil and water (filling the field card).
- Determination of physic - chemical parameters (pH determination, water temperature and salinity).
- Microplastics are a growing concern, being particularly severe in coastal waters where plastics account for about 80% of human waste (microplastics are polymers of plastics between 1  $\mu$  and 5 mm that float in the sea and are drawn by the chains). Their characteristics make them have the same dimension as the zooplankton, being mistaken as food for many sea animals.

- With a hammock we will make harvests in the water column and later the samples will be observed (fresh) in a binocular loupe or microscope.

Our workplace is divided into the following locations:

- On their way to the island, by boat, students observe the Ria Formosa ecosystem and record what they freely observe (drawing, text, phrases, words, photographs), send to the teacher;
- Primary school (work centre) where tables are available, with equipment (computer and magnifying glass-binocular), necessary for the identification of benthic macroinvertebrates and microplastic.
- Vale Covo, a coastal area, on the Ria side, which is exposed in the empty tide, allowing the collection of the sediment (macroinvertebrates) and the collection of water to observe the microplastics;
- Travel between the places and to the beach, where garbage and invasive plants are collected, in the course;
- Beach, on the side of the Ria or on the sea side, where the marine litter is collected (according to the needs defined by the local entities);
- Return trip, talk about the impressions of the work with the teachers (oral evaluation).

#### **D. Time required to carry out the field lesson plan:**

1 day (8h) of empty tide between 8am and 10am

#### **E. Resources needed to complete the activity / lesson plan**

##### **Humans:**

Partnerships with the University of Algarve (UALG) - 2 technicians specialized in the identification of macroinvertebrates;

Faro Town Hall - free tickets to Culatra Island;

Parish Council of Culatra - local support of garbage bags and gloves and indication of the place of collection and disposal of garbage;

Elementary School Principal - host of 30 students; transfer of tables;

2 teachers - 1 of basic education in Physics-Chemistry and 1 of secondary education in Geography;

30 students: 20 from secondary education and 10 from basic education approximately

##### **Recourses:**

2 fisherman rubber suits or 2 pairs of high-heeled rubber boots (no summer is needed)

- Tape measure of 20 meters;
- Small plastic shovel;
- 2 Coras;
- 2 nets to wash the sediment;
- Plastic boxes to collect the sediment;
- Marker pen;
- 15 trays
- 30 ice cubes (for placing macroinvertebrates)
- manual loupes, one per student;
- Pin tweezers, one per student;
- Kitchen paper roll;
- Disposable gloves;
- 2 binocular magnifiers;
- 1 Computer with the software program AMBI -UALG.
- 2 macroinvertebrate identification books.
- Water collection kit for observation of microplastics:

## F. Activity

8.30 - Departure to Culatra Island

9.30 - Arrival at the base - primary school - each student performs the preparation tasks assigned to him;

10h - Displacement to the collection site: collection of sediment and water sample based on protocols and with specific materials.

11.30 am - return to primary school to begin observation of sediment, collection and identification of macroinvertebrates; observation of water sample and identification of microplastics. 1st task - two to two students, rotating, observe the microplastics in the binocular loupe; 2nd task - search on a tray with sediment, select the macroinvertebrates. Through a manual they try to identify themselves, being helped by the professors and researchers, and register in a file.

13.30 / 15h - lunch and rest.

15h - Removal of invasive plants from dunes and selective collection of garbage - analysis of the type of garbage, identification of its origin.

14.30h - Return to Faro.

## Scientific methodology of collection and analysis

### 1 - Benthic saltwater macroinvertebrates steps:

1st - delimit the sampling transept.

2nd - 6 sediment collection in cora, along the transept.

3rd - washing of each sample in a network bag and

placing in a plastic box with numeric identification.

4th - Placing on a board to select live macroinvertebrates, identification and registration.

5th - introduction of the data in the software program AMBI -UALG index table for water quality determination.

6th - discussion of the results and evaluation of field work.

### 2 - Microplastics

1st - dragging on the water column for the collection of microplastics.

2nd - Collection of the sample obtained by dragging.

3rd - Observation of collected microplastics.



	WB1_ quinta		WB1_ Iha
	1	2	1
Palaeomonidae	1		
Elasmopus rapax	2		
Nereididae	12	3	
Gibbula umbilicalis	2		
Hydrobia ulvae	17		
Cerithiidae	5		
Neghtyidae	5		
Cirratulidae	2		
Scrobicularia plana	1		
Caprellida	5		
Bitthium reticulatum		22	
Hydrobia ulvae		57	
Abra segmentum		1	
Mesalia brevisalis		1	
Glycera concoluta			6
Glyceridae			1
Hesionidae			2
Ophelidae			2
Phylodocidae			1
Carcinus maenas			1
Cerastoderma edule			4
Veneridae aurea			2
Nassarius pfeifferi			1



## G. Assessment

It is observed the interest, commitment and the accomplishment of the work of the students in the activities distributed to each one.

In the next class, in working groups, conclusions are drawn on water quality.

The reports are made with the collected materials, also articles for the exhibition, for the journal and the page of the Grouping are made.

## H. Additional Suggestions

We can consider this activity in partnership with the disciplines of Geography and Natural Sciences.

## **I. Reading References**

SALDANHA, L. (1995). Fauna submarina atlântica. Edição revista e aumentada. Publicações Europa América, Lisboa: 364 pp.

MUZAVOR et al. (2000, 2001, 2003, 2006). Roteiro Ecológico da Ria Formosa, Vol. I, II, III, IV, V. Edição Universidade do Algarve/CIMA.

GAMITO, S. (2007). Fichas de apoio Fundamentos de Ecologia. Fauna da Ria Formosa.

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<http://www.Marbef.org/>

<http://species-identification.org/>

<http://www.apambiente.pt/dqa/>

<http://voluntariadoambientalagua.apambiente.pt/Site/FrontOffice/default.aspx?clear=yes>

<http://www.unric.org/en/subjective-development-engineers>

[http://www.nhmc.uoc.gr/confresh/www2.nhmc.uoc.gr/confresh/CARDS\\_PORTO.pdf](http://www.nhmc.uoc.gr/confresh/www2.nhmc.uoc.gr/confresh/CARDS_PORTO.pdf)

[https://www.apambiente.pt/\\_zdata/DESTAQUES/2016/ENEA\\_final.pdf](https://www.apambiente.pt/_zdata/DESTAQUES/2016/ENEA_final.pdf)

<https://www.casadasciencias.org/cc/redindex.php?err=1>

<http://www.dge.mec.pt/autonomia-e-flexibilidadecurricular>

School textbooks adopted in the disciplines: Physics-Chemistry, 8th and 9th, Natural Sciences 8th year and Geography 9th year.