MARE NOSTRUM

COMENIUS MULTILATERAL PROJECT

4TH MOBILITY

ATHENS – GREECE

13TH - 17TH OCTOBER 2014

Algae and the Human Impact on Coastal Ecosystems

Algae observation – River Tagus Lisboa (Vasco da Gama Bridge - Expo 98)

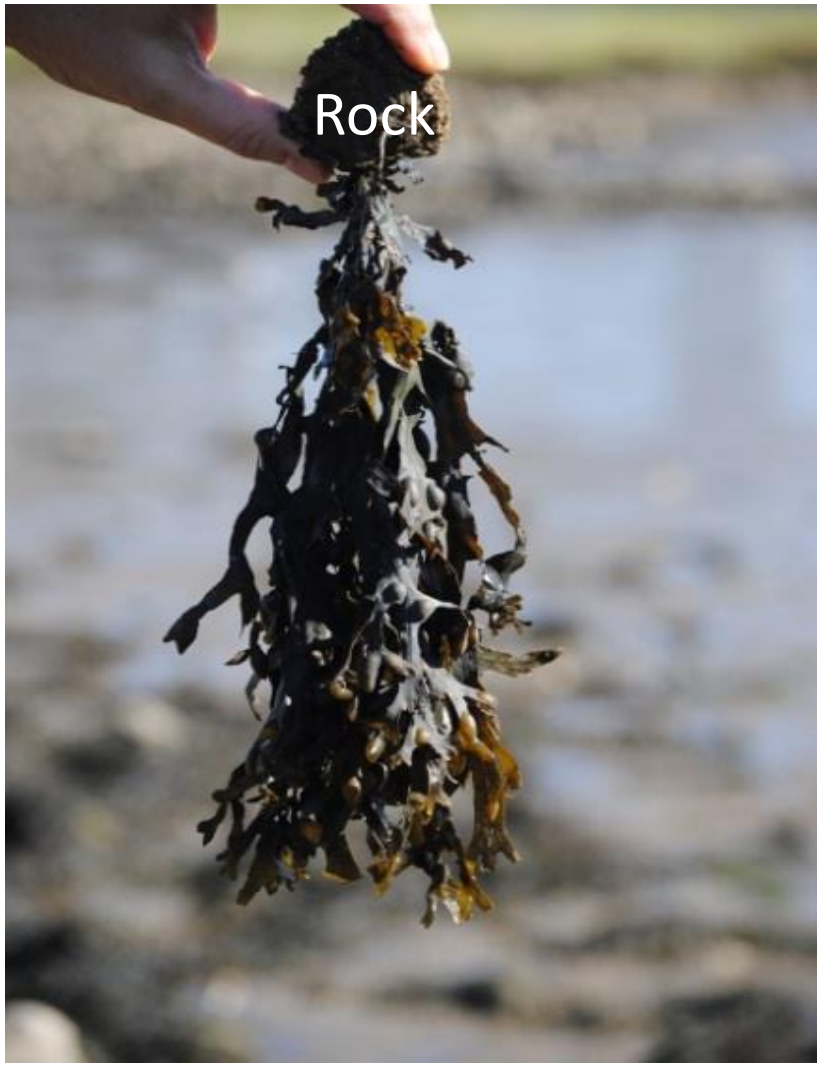
Algae Observation – River Tagus Lisboa

- A visit to Parque das Nações, the site of Expo 98, during low tide to observe the algae.
- Students and teachers were accompanied by MSc Ricardo Melo from the Faculty of Science, University of Lisbon.

Field Trip – Algae Observation – River Tagus

What are algae?

- Algae are beings that live in a sweet or salty water environment.
- Their body is a stalk**.**
- Autotrophyc and photosynthetic.
- Macroalgae or microalgae.
- Algae need solid terrain, just like rocks, to settle themselves.



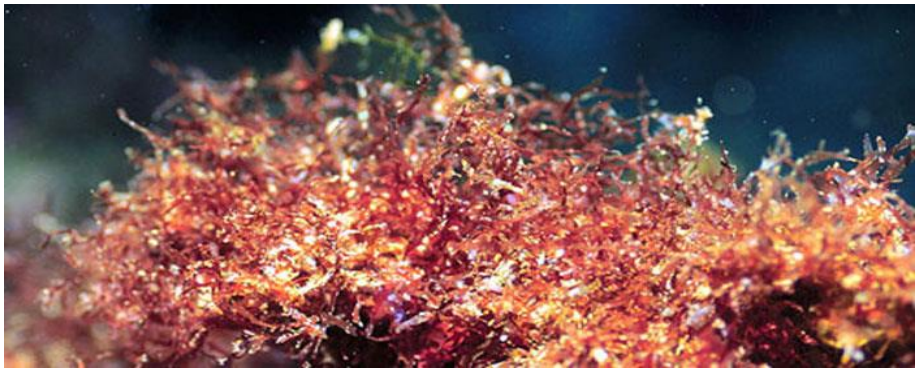
Algae taxidermy

- Green Algae – **Clorophyta**

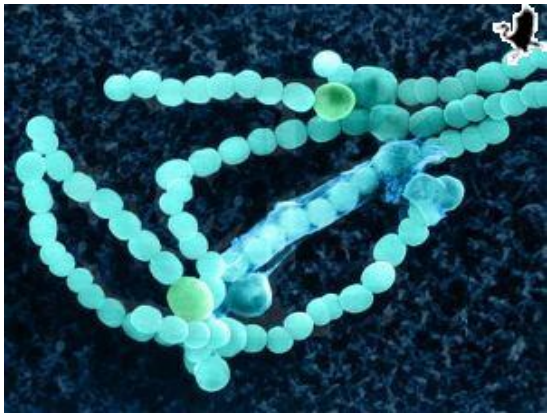
- Brown Algae – **Pheophyta**

Algae

- Red Algae – **Rodophyta**



- Blue Algae – **Cyanophyta**, although nowadays they are called **Cyanobacteria.**



Visiting the Faculty of Science University of Lisbon

Algoteca

ALISU – *The Algae Culture Collection of the University of Lisbon started in 1997 and its objective is to preserve species of phytoplankton* in culture from the Portuguese coast, particularly *some harmful algae (HABs).*

The Algoteca is a scientific platform which houses a collection of microalgae in culture: samples of marine phytoplankton, some sweet water species and from the estuaries which live in the zones between the tides (microphitobents).

The Importance of the Algoteca:

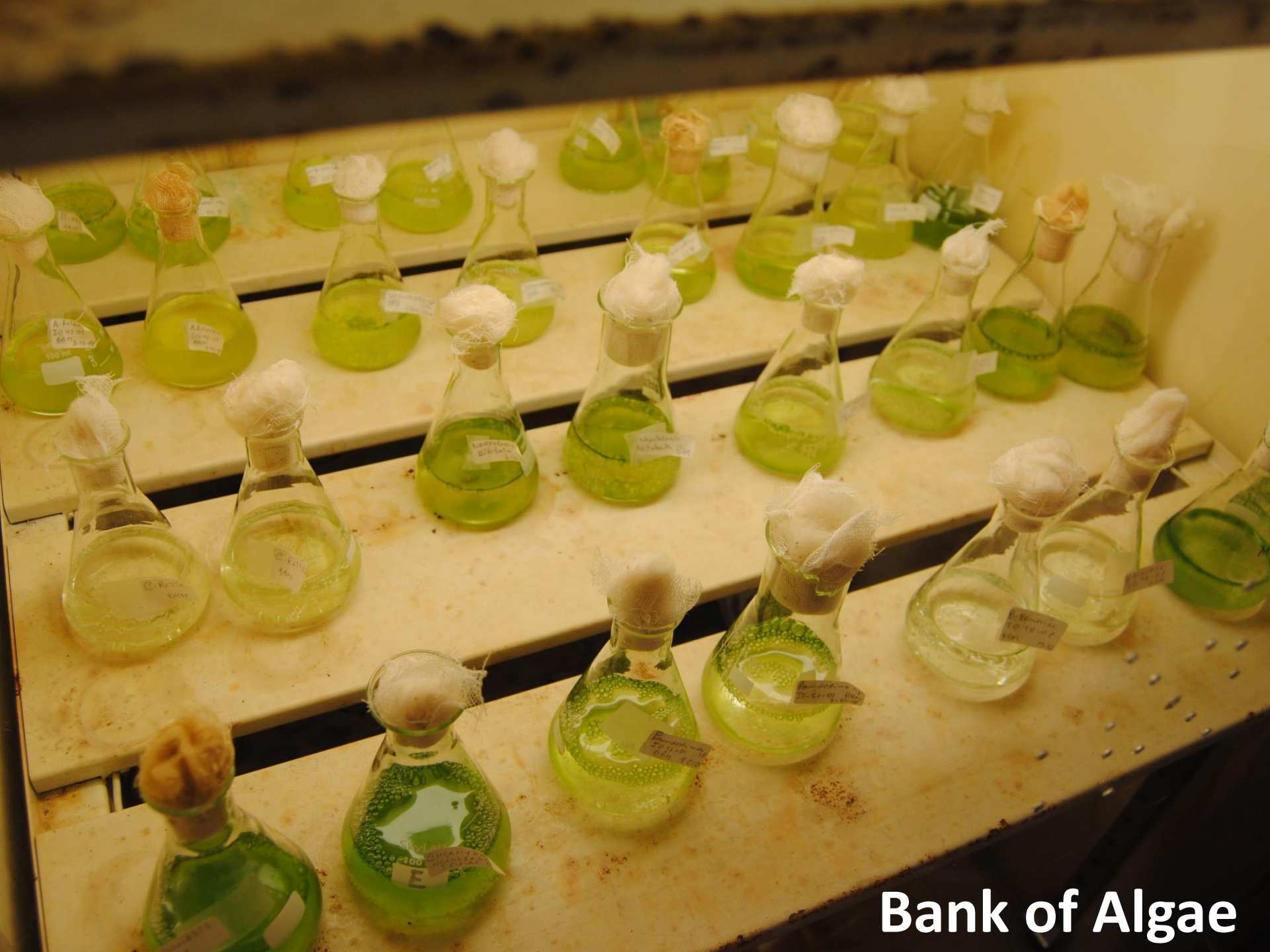
- It studies, identifies and keeps different types of algae of the Portuguese coast.

- It is of great interest in identifying species of contaminating bivalves, which fishing can be prohibited, in order to prevent illneess or even death.
- ALISU regularly provides samples strains to be used in research projects and lab classes at Lisbon University, not forgetting other institutions, both national and international.

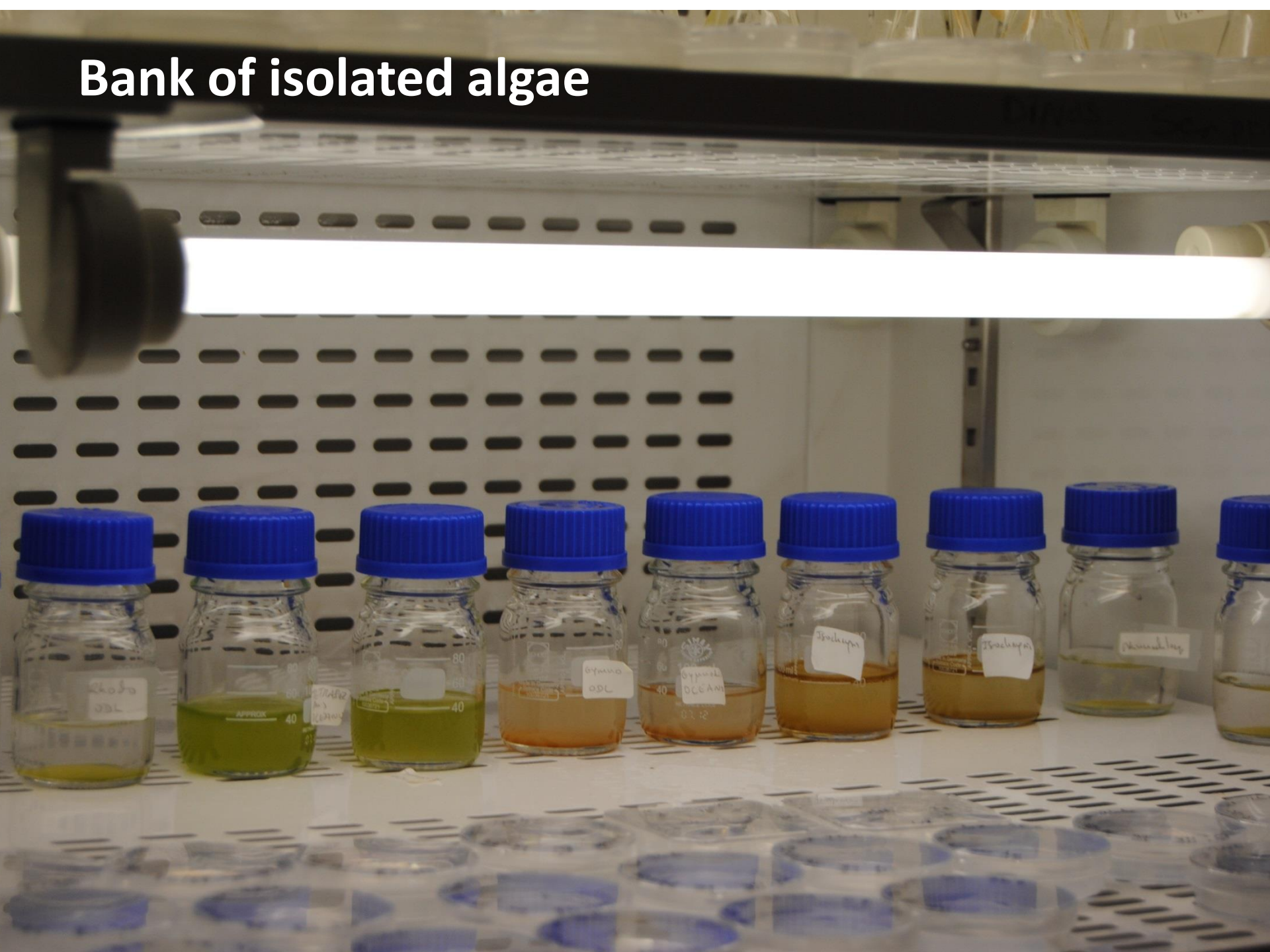
- ALISU also provides conditions to maintain samples which belong to other institutions.

Bank of Algae


Bank of Algae
38

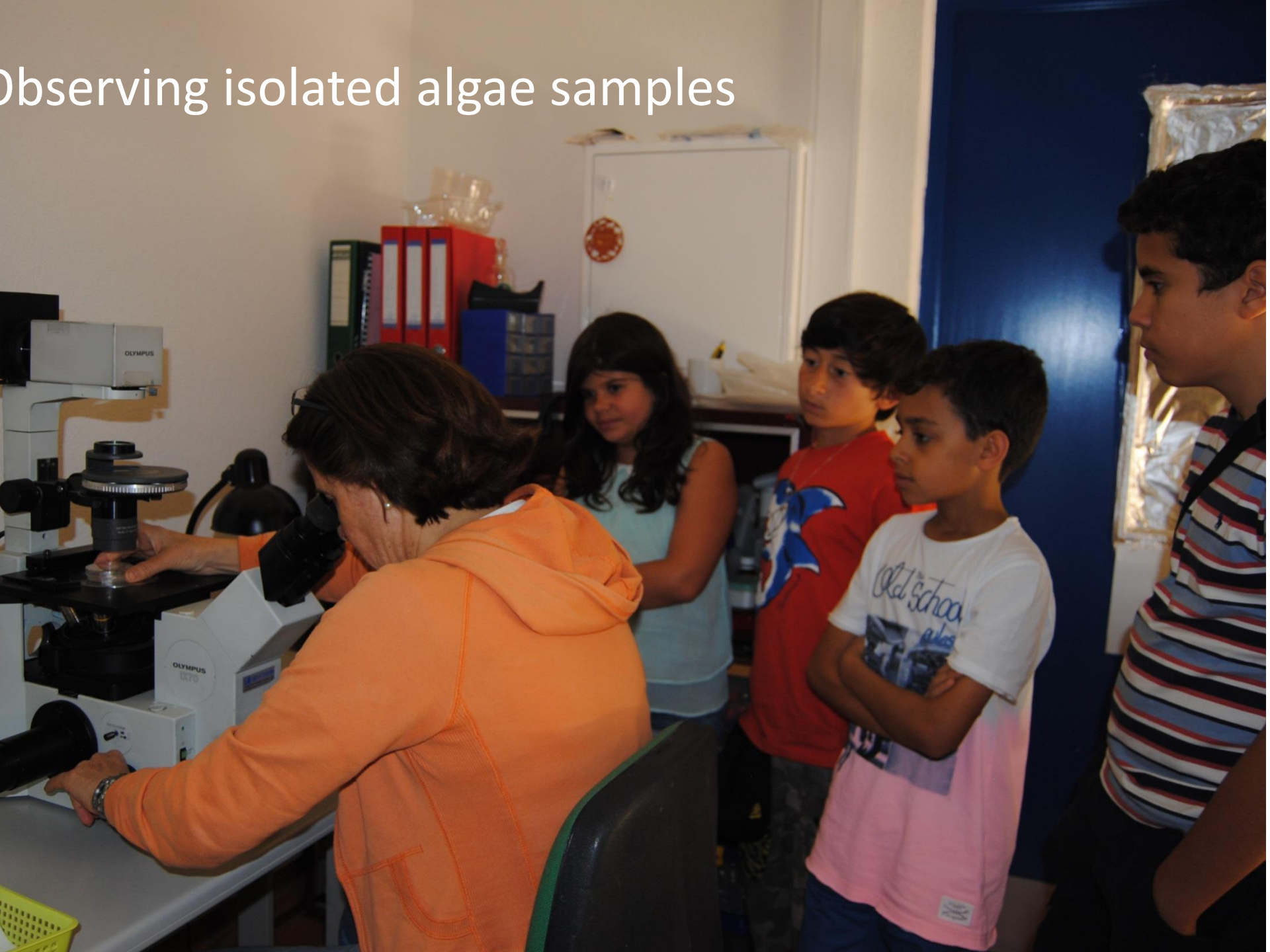

Bank of Algae

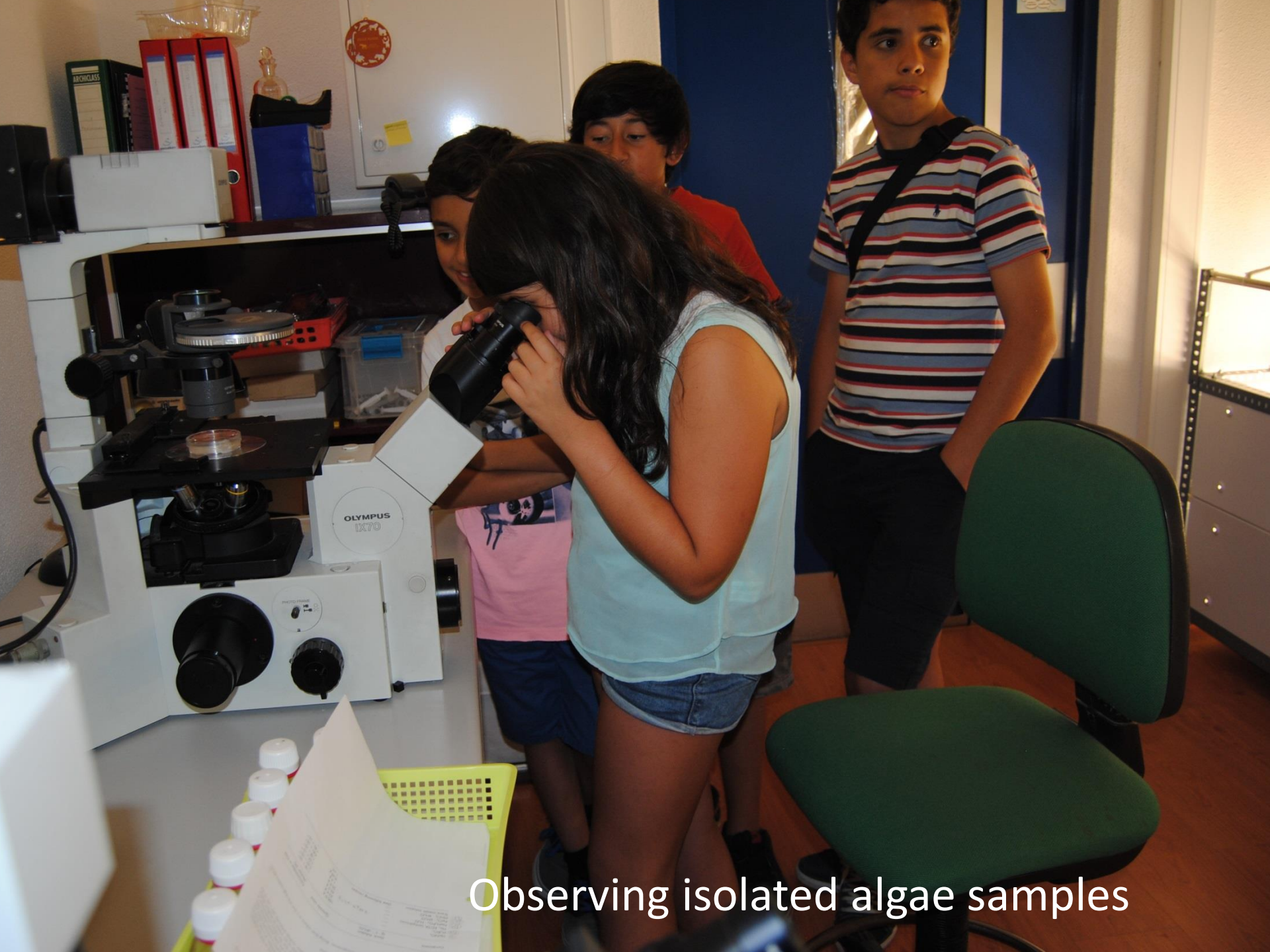
Bank of isolated algae




Bank of isolated algae

Observing isolated algae samples





Observing isolated algae samples

Observing isolated algae samples

Identified algae in the *Algae Bank*

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Bacillariophyta

- *Bacillaria paxillifer*
- *Caloneis westii*
- *Cylindrotheca closterium*
- *Diploneis dydima*
- *Ditylum brightwellii*
- *Entomoneis* sp.
- *Gyrosigma attenuatum*
- *Gyrosigma limosum*
- *Hyalodiscus scoticus*
- *Navicula gregaria*
- *Nitzschia* sp.
- *Petroneis humerosa*
- *Pleurosigma salinarum*
- *Pseudo-nitzschia* spp. (6)
- *Pseudo-nitzschia fraudulenta* (2)
- *Surirella fortuosa*
- *Thalassiosira* sp.
- *Tryblionella littoralis*

Chlorophyta

- *Ankistrodesmus falcatus*
- *Chlorella vulgaris*
- *Coelastrum reticulatum*
- *Dunaliella salina*
- *Eudorina* sp.
- *Haematococcus pluvialis*
- *Neochloris bilobata*
- *Monoraphidium arcuatum*
- *Pandorina* sp.
- *Pediastrum boryanum*
- *Pediastrum duplex* var. *gracillimum*
- *Pediastrum simplex*
- *Scenedesmus* sp.
- *Scenedesmus quadricauda*

ALISU

The Algae Culture Collection at the University of Lisbon was started in 1997 and is dedicated to marine phytoplankton from Portuguese waters, with emphasis on Harmful Algae (HABs).

In addition, several freshwater and estuarine microphytobenthos species are kept in culture for teaching or research purposes.

Cultures

ALISU currently hosts 57 species and a total of 88 strains (numbers in brackets). Some strains are still in the process of being described or studied.

Cultures are unialgal but non-axenic.

Main objectives

- *ex situ* conservation of regional representatives of HAB species and other biological or ecological relevant groups
- contribute for research activities at the University of Lisbon on the biology, ecology and taxonomy of marine and estuarine microalgae
- support undergraduate, graduate, MSc and PhD research projects

Dinophyceae

- *Akashivo sanguinea* (2)
- *Alexandrium affine*
- *Alexandrium minutum*
- *Alexandrium pseudogonyaulax* (2)
- *Amphidinium carterea*
- *Coolia monotis*
- *Fragilidium* sp.
- *Gymnodinium catenatum* (14)
- *Gymnodinium impudicum*
- *Lingulodinum polyedrum* (4)
- *Prorocentrum* sp.
- *Prorocentrum lima*
- *Prorocentrum micans*
- *Prorocentrum scutellum*
- *Scrippsiella* spp. (6)
- *Scrippsiella lachrymosa* (2)
- *Scrippsiella trochoidea* (2)

Others

Cyanobacteria
Arthrospira maxima
Spirulina sp.

Haptophyta
Emiliana huxleyi
Phaeocystis globosa

Raphidophyceae
Fibrocapsa japonica

Cryptophyceae
Rhinomonas sp.
Rhodomonas sp.

Acknowledgements

- HABCOL- Marine HAB culture COLlection – a critical tool for

Frequently Used *Algae*

Spirulling sp **is often used as a food suplement**

Frequently Used *Algae*

***Durvillae antarctica* , known as cochayuyo in Chile and used in human nourishment.**

Frequently Used *Algae*

Frequently Used *Algae*

- ***Spirulina*** **–** It is commercialized as a microalgae, although nowadays scientifically it belongs to a different group.

- ***Spirulina*** is a cynobacterium which belongs to the *Cyanobacteria group.* They are photoautrophyc and unicelular organisms, which although unicelular group themselves forming trycoms or philamentar forms.


Simão
Teacher Conceição
Teacher Cri
Alice
Samuel
Tomás

Algae Ecology

- Algae have an important role in biosphera.
- They provide big amounts of oxygen to our planet.
- They are basic producers - they are at the bottom of the food chain of the aquatic ecosystems.
- At the seashore marine macroalgae provide refugee, nourishment and substractum forming ecosystems which are the nesting basis for a great variety of living organisms.
- They are terrific signs of pollution levels – excess of *Ulva latuca.*

The Portuguese Coast – Atlantic Ocean

West Coast:

- Rough Sea
- Cold Water
- The Temperature of the water increases as we go down south

South Coast:

- Quieter Sea
- Milder Seawater

Ordinary Algae found in Portugal

Brown Algae

***Laminaria hyperborea* – perene species (as far as 18 years old).**

Found – up to a depth of 20 metres, in regions with water corrents from River Minho

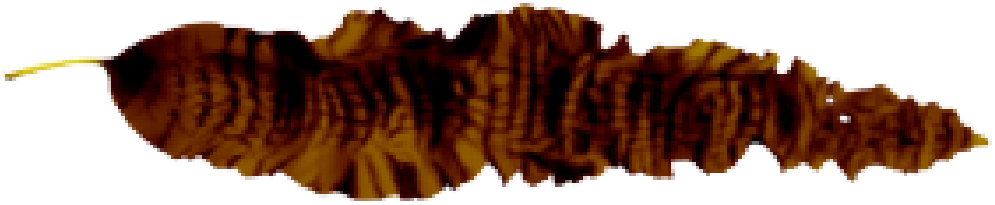
mouth to Vila do Conde.

Ordinary Algae found in Portugal

Brown Algae

Saccharina latissima – *perene species* (2 to 4 years old).

Found - Viana do Castelo area.



Ordinary Algae found in Portugal

Brown Algae

Undaria pinnatifida – annual.

Original from Japan it has invaded many of the seas and oceans and is spreading across Portugal.

Found around Porto and

Cabo Mondego.

Ordinary Algae found in Portugal

Brown Algae

Phyllariopsis brevipes – annual.

Found – Porto and between Peniche and Faro.

Ordinary Algae found in Portugal

Brown Algae

Phyllariopsis purpurascens – annual

Found – from Peniche to Vila do Bispo.

The use of Algae

- In Portugal there are various types of Algae which are economically viable:
  - *Gelidium sp* was used for many years to produce great quality agar-agar.

The use of Algae

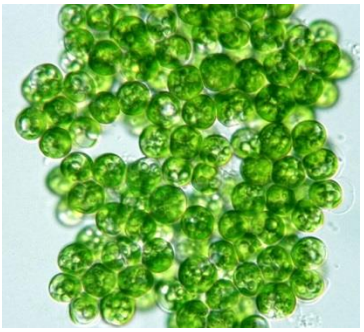
- **Science/Research** – identifying species;
- **Agriculture** – natural fertilizers;
- **Fish nourishment** - aquaculture;
- **Gastronomy** – jellies, agar-agar, icecream, food thickener,…;
- **Medicine and Pharmaceutycal Industry** – antioxidants, immunologic and anticarcinogenic;
- **Cosmetics** – soaps, lotions, shampoos,…;
- **Industry** - biodiesel, bioethanol, methane,…;

The use of algae

- **Food pygments** - Photosynthetic pygments
- **Energy Production**
- **Food Additives**
- **Thickeners**
- **Agar-agar** (***Gelidium sesquipedale)***
- **Algenato** – used in prosthetic teeth molds
- **Carragena** - chocolate used in milk

The use of algae

- **Spirulina** (*Spirulina sp*):
  - Worldwide most cultivated Microalgae;
  - Healthy eating;
  - Helps fighting obesity;
  - Regenerates and helps the soil get unpolluted.



- **Botryococcus *(Botryococcus braunii)*:**
  - Biodiesel production.

- **Wakame** *(Undaria pinnatifida):*
  - Healthy eating.

- **Chlorella** *(Chlorella vulgaris):*
  - Aquaculture;
  - Healthy eating.

The use of Algae

Detox Juice

The use of Algae

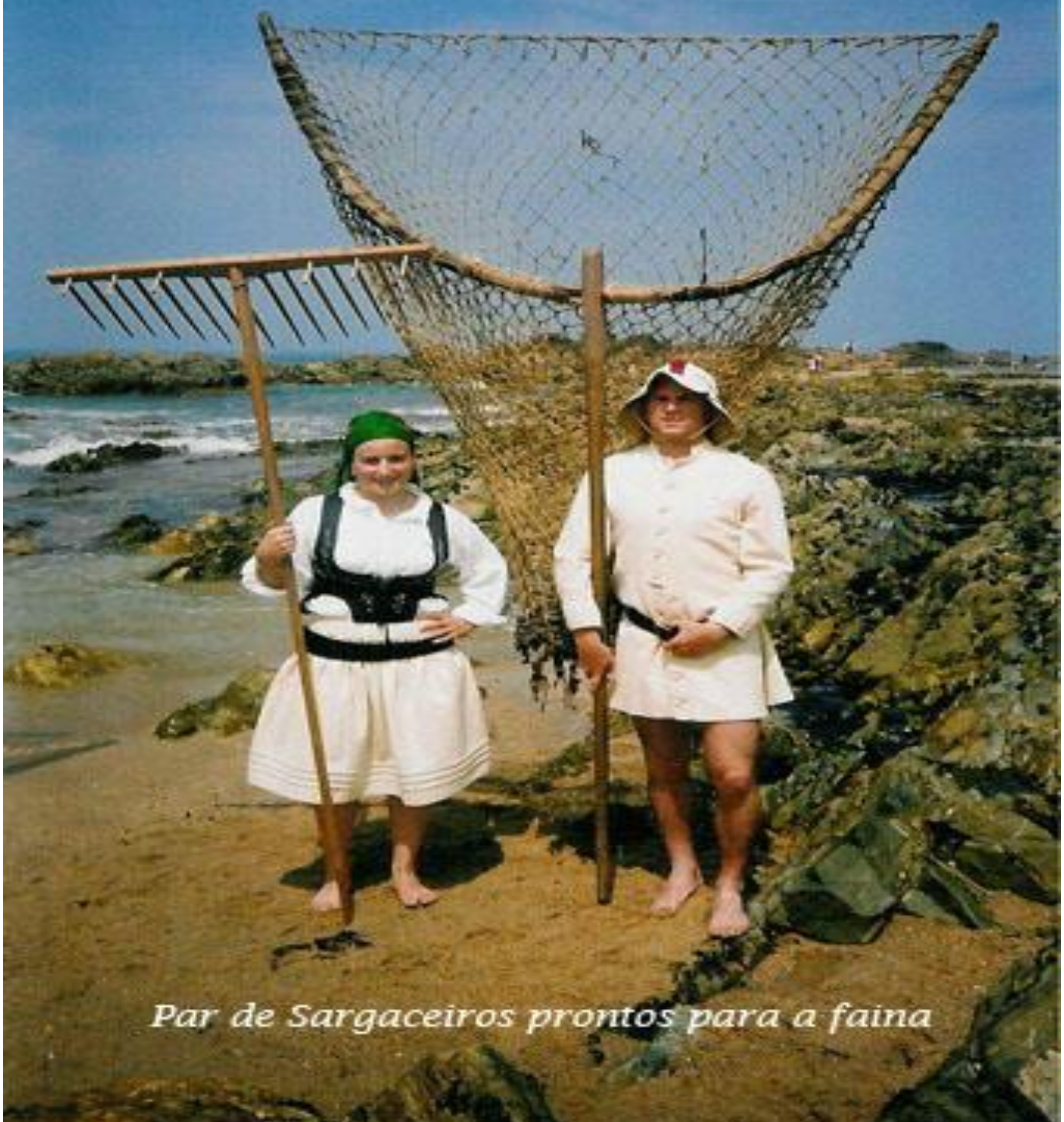
- In agriculture:
  - Algae are very important in Agriculture once they are used in the production of fertilizers and in the North of Portugal they also produce manure.
  - Moliço – *Mollis sp*.
  - Sargaço – *Sargassum sp*.

The use of Algae

Picking Algae - Agriculture

Picking Algae

Sargaço



Par de Sargaceiros prontos para a faina

Transporting Sargaço


Transporting
and drying
Sargaço

Sargaço Meads

Sargaço Meads

Sargaço Meads

Sargaço meads

Picking *moliço* – Ria de Aveiro

- The economic interest in the picking of *moliço* has decreased due to the utilization of natural fertilizers.

- However, the councils want to maintain tradition, which can be seen in local popular events and in keeping in shape the traditional boats that fulfill countless tasks.

Ria de Aveiro – Typical *Moliceiro* Boats

Picking *Moliço* – Ria de Aveiro

Unloading *Moliço*

Unloading *Moliço*


Using *Moliço* as green fertilizer

Using *Moliço* as green fertilizer

Aquaculture

Aquaculture

- Producing different types of aquatic organisms in an artificial environment, such as: fish, molluscs, crustaceans, amphibians, reptiles.
- Producing algae (Algaeculture) to feed the fish born in captivity (Aquaculture).
- Producing algae for human use.

Aquaculture – Olhão - Algarve

Aquaculture – Tanks of the Fish Research and Sea Institute, Lisbon

Aquaculture – Olhão - Algarve

- Advantages:
  - Economical;
  - Avoids overfishing;
  - Offers social advantages to the inhabitants of various countries where fish don´t arrive in good sanitary conditions and at reasonable prices;
  - Keeps the fishing quality without altering the environmental balance;
  - Increases the amount of fish;
  - Allows the species to be fed in accordance to their needs, thus making sure they achieve a healthy development without altering their nutritional value.

Aquaculture – Olhão - Algarve

- Disadvantages:
  - The number of wild fish, such as salmon, and its quality has been suffering alterations;
  - Animal rations and the products used can harm the ecosystem if thrown in the environment without the correct treatment;
  - Environmentalists say that aquaculture is used by great multinational groups and doesn´t benefit the local populations directly.;
  - Breeders use great quantities of low-cost protein producing products of high cost (eg. Shrimp) instead of betting in other less expensive fish population to obtain a quick profit;
  - Rapid illness propagation, and therefore a shorter reaction time in face of any problem;
  - The amount of workers decreases, once the crop is much simpler than that of fishing;
  - Increases the spreading of invasive species.

New Companies of Algae Production

ALGAplus – founded in 2011 is the fusion of the academic, scientific and commercial knowledge.

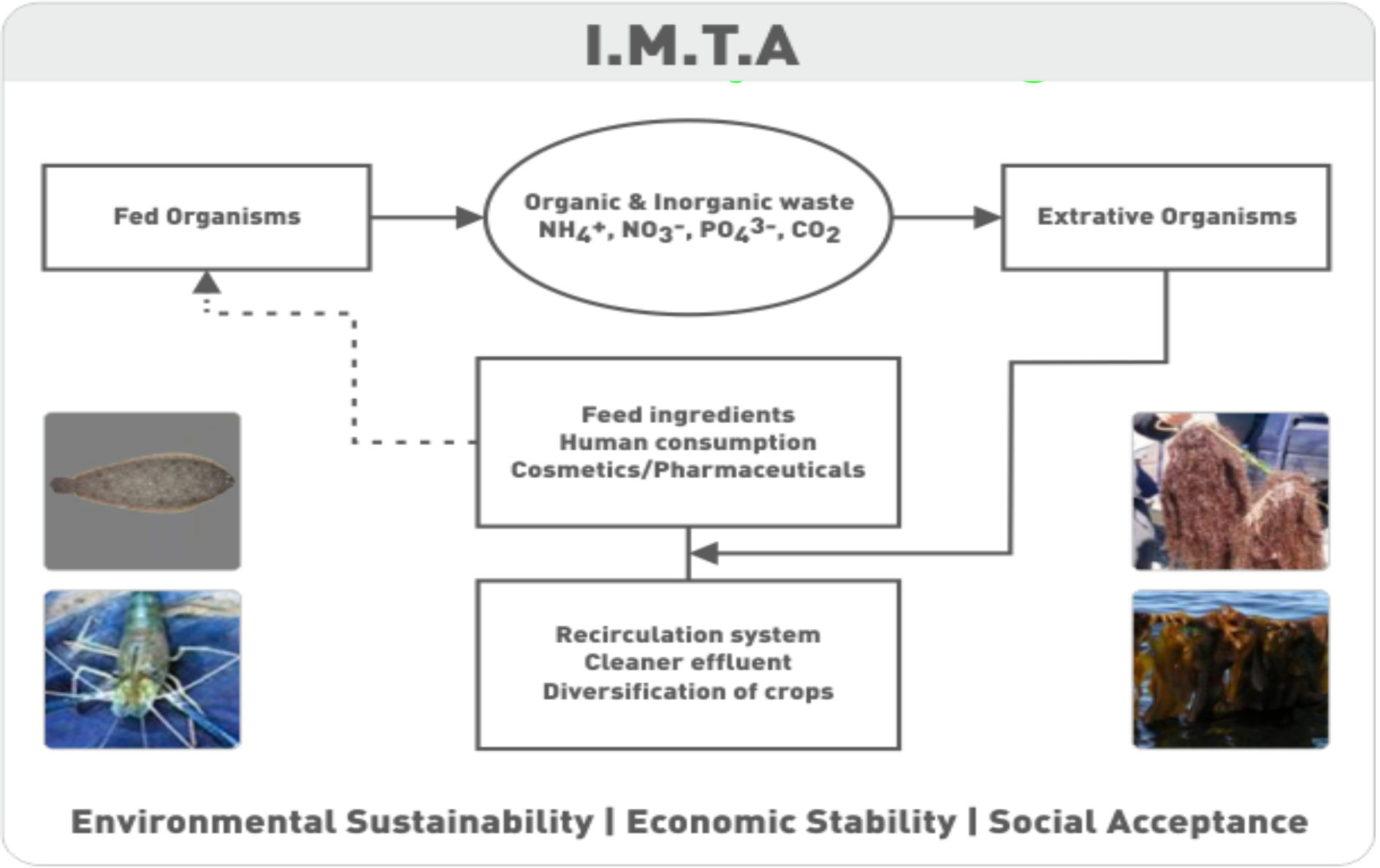
Goods – dried whole and grinted seaweed
- fresh seaweed

Commercialized Species:
- *Chondrus crispus;*
- *Codium tomentosum;*
- *Gracilaria verrucosa;*
- *Palmaria palmata;*
- *Porphyra dioica;*
- *Porphyra umbilicalis;*
- *Ulva lactuca.*





New Companies of Algae Production



New Portuguese Firms of Algae Production

ALGAplus produces and commercializes macroalgae and their derivatives in a sustainable way in multitrophyc integrated aquaculture systems on land.

IMTA systems are a type of technology that can help solve this problem (European Innovation and Technology in Aquaculture, 2011). These systems combine fish or crustacean production with extractive organisms (bivalves and /or seaweed) mocking the natural functioning of the natural ecosysytems.

New Firms of Algae Production

Tok de Mar **is the first Portuguese national brand of seaweed and its derivatives for nourishing purpose.**

Recipe – (Sea) Lettuce Cake

6 eggs
3 cups of self-raising flour
2 cups of sugar
1 cup milk
1/2 cup oil
15g of dehidrated Sea lettuce (brand suggestion: Tok de Mar)

PREPARATION

Soak the sea lettuce in water for a period of 5 minutes. Drain thoroughly squeezing the seaweed with your hands. Add the milk, the oil and the sea lettuce in a bowl and beat until liquified.

In another bowl get the yolk and keep the whites in a separate bowl. Mix the yolk with the sugar until you get a whitish cream and add the green batter mixing well. Beat the egg whites to a stiff peak and incorporate them as well as the flour eventually. When you get a homogeneous batter put it in the oven until it is cooked.

http://tokdemar.wordpress.com/

ALGAplus – Tok de Mar

Salt with algae


Algas secas inteiras
Whole dried seaweed
Tok de Mar
100% natural
Algas secas inteiras
Whole dried seaweed
Tok de Mar
100% natural
Ria de Aveiro
um mar de experiências
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t and Seaweed Bath
ATURAL
100% natural
Sabores com toque de mar
Flavours with a sea touch
Musgo-irlandês
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ALGA+
Chondrus crispus
Alga Inteira || 20g
Embalagem de amostra
www.algaplus.pt


ALGA+
Ulva spp.
Alga Inteira || 10g
Embalagem de amostra
www.algaplus.pt


ALGA+
Porphyra dioica
Alga Inteira || 10g
Embalagem de amostra
www.algaplus.pt

Human Impact on Coastal Ecosystems

SUSTAINABLE TOURISM

- Sinking frigates of the Portuguese Navy – **Ocean Revival Project** – Portimão, Algarve.
- **Dolphin Watching** – Sado River, Tróia, Setúbal.
- **Snorkelling/Diving** to watch other species in the Portuguese coast or other ships sank (Wilhelm Krag) – Luz Beach, Algarve.
- ***LIFE Biomares Project*** – Replanting the marine species – Portinho da Arrábida, Setúbal

Ocean Revival Project

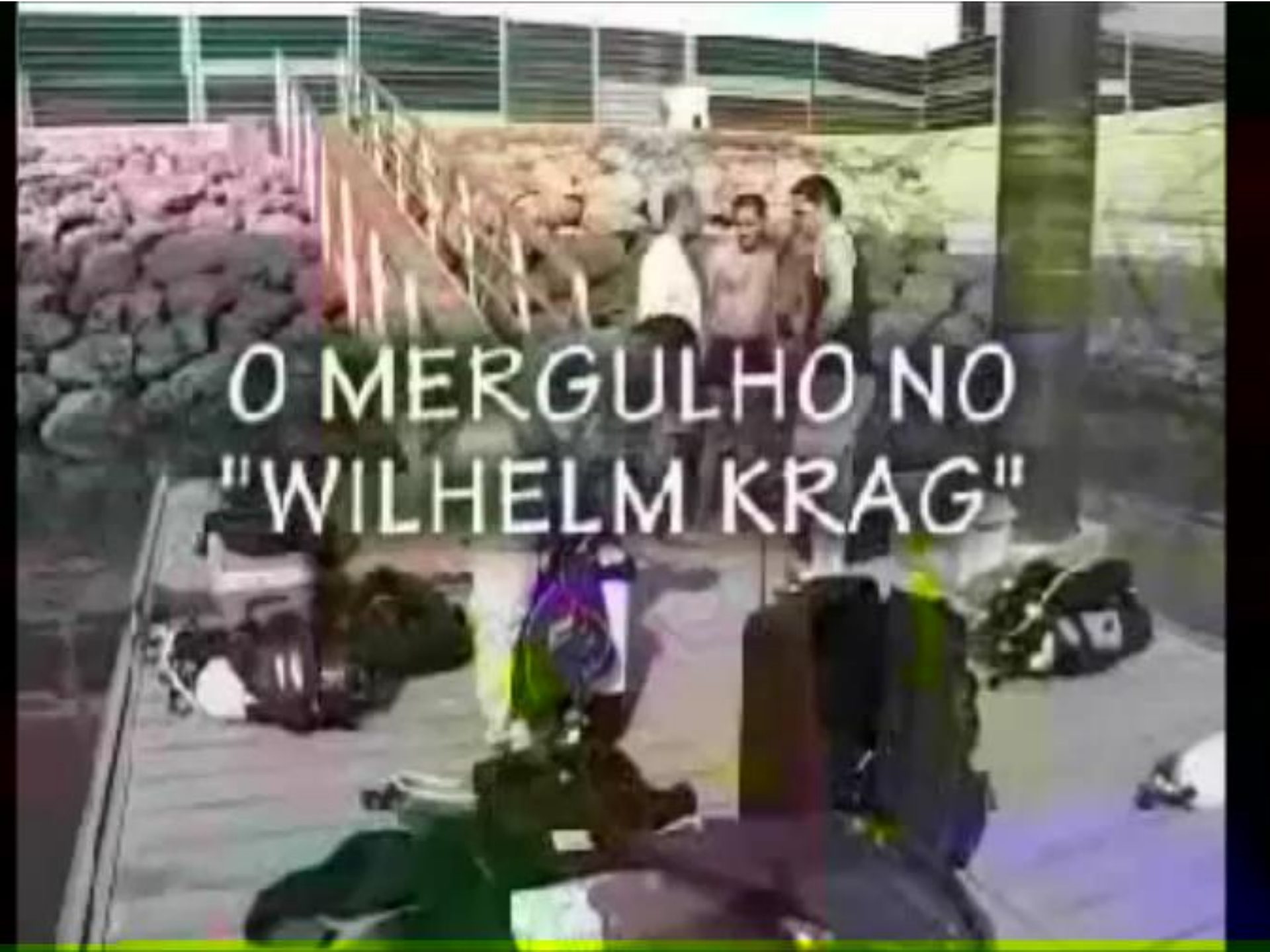
- This project aims at creating the first Underwater Portuguese Museum to promote underwater tourism, thus developing marine ecosystems through an artificial substractum.
- 2 out of 4 ships from the Portuguese Navy have already been sank in a reef area 300 m off the coast in Portimão / Algarve.
- Costing 3 million euros the project aims at attracting part of the 8 million divers spread around the world.

Film - Frigate
Hermenegildo Capelo
sunk off the coast
of Portimão

Film – Life Biomares Project – Portinho da Arrábida

Film - Atlantic spotted dolphins underwater

Film – Promoting diving in the Algarve, Luz Beach, *Wilhem Krag* war vessel sunk at 35 metres deep

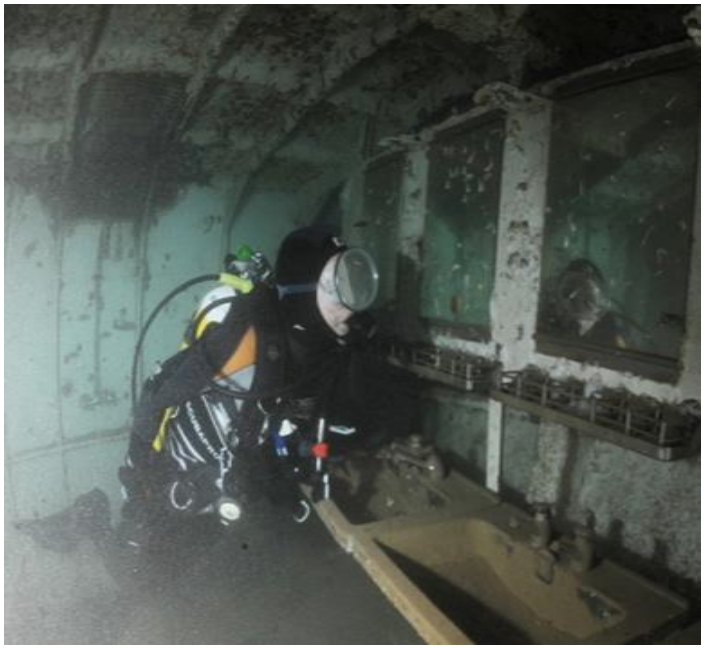

O MERGULHO NO
"WILHELM KRAG"

Ocean Revival Project

- Since November 2012 it has been possible to dive around and into the sunk ships. One can watch cephalopods, sea slugs, congers, rooster fish, seabreams, seabasses, among many other species.

Ocean Revival Project

- As far as diving is concerned they made openings in the internal walls of the boats in a way there is always light inside, so a diver who enters the boat never loses sight of a way out.



Ocean Revival Project

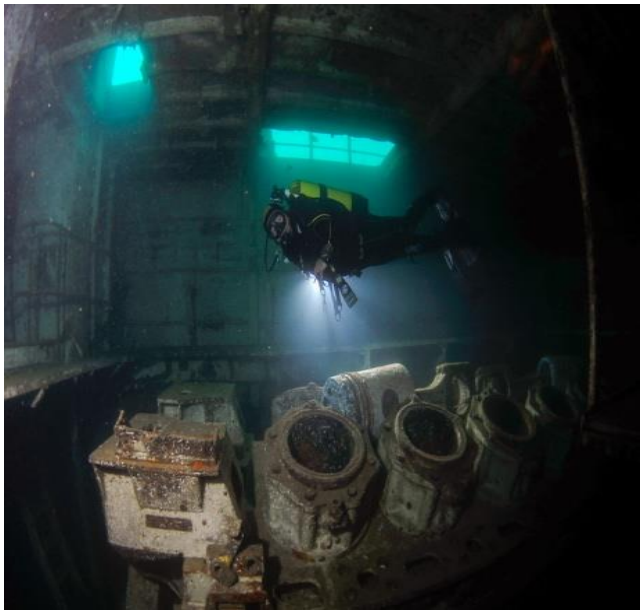
- The ships must be freed from harmful materials and prepared to the diving practice. They have to strip them from dangerous materials such as asbestos, hydrocarbon, all types of electric and electronic materials, electric wires, zinc, lead, hydraulic machines, bombs, etc.

Ocean Revival Project

- Besides improving some of the local infrastructures, *Ocean Revival* expects that the history of the four sunk ships will be told and exhibited at the Portimão Museum.

Ocean Revival Project

- Aimed at worldwide sea lovers, *Ocean Revival* is based on the belief that sustainable tourism is a way to protect biodiversity and preserve the environment.



Biomares Project

Biomares Project

- This project was created to get a larger diversityon the Arrábida marine park and also to allow the implementation of different environmental actions.
- The objective of the project is to replant 10 hectares of marine seaweed in the Portinho da Arrábida and Galapagos Bay. In 1983 the area was almost dicimated. It was so harsh that in 2006 there were only 0,006. That was mainly due to the use of the harpoon and other types of destructive fishing.
- One of the ways of controlling the environment is to implement environment-friendly floating markers which protect the marine bottom and also provide a recreational use of the marine park.

Squid Project

Squid Project

- Algarve University (UAlg) want to launch in the market aquaculture bred squid, according to a pioneering European project coordinated by the researcher José Pedro Andrade.
- Unlike other species traditionally bred in aquaculture such as the sea brass or the sea bream, the smaller the squid is the biggest commercial value it has, once “Choquinhos” (little squid) are a very enjoyable product, typical of the gastronomy of the Algarve.
- According to researcher José Pedro Andrade, Ramalhete Station, in Faro, the site of the actual rehearsals, is currently the only lab at European level betting on the squid as a new species to breed in an intensive way, without causing any damage to the species.


RTP
CHOCOS EM AQUACULTURA
Cientistas da Universidade do Algarve criam choco em cativeiro
JORNAL DA TARDE
13:47

Thanks for your attention!

WE ARE WAITING FOR YOU!!!!!

MARE NOSTRUM

COMENIUS MULTILATERAL PROJECT

LISBOA - PORTUGAL

Escola EB 2,3 Piscinas-Lisboa
Lisboa, Portugal