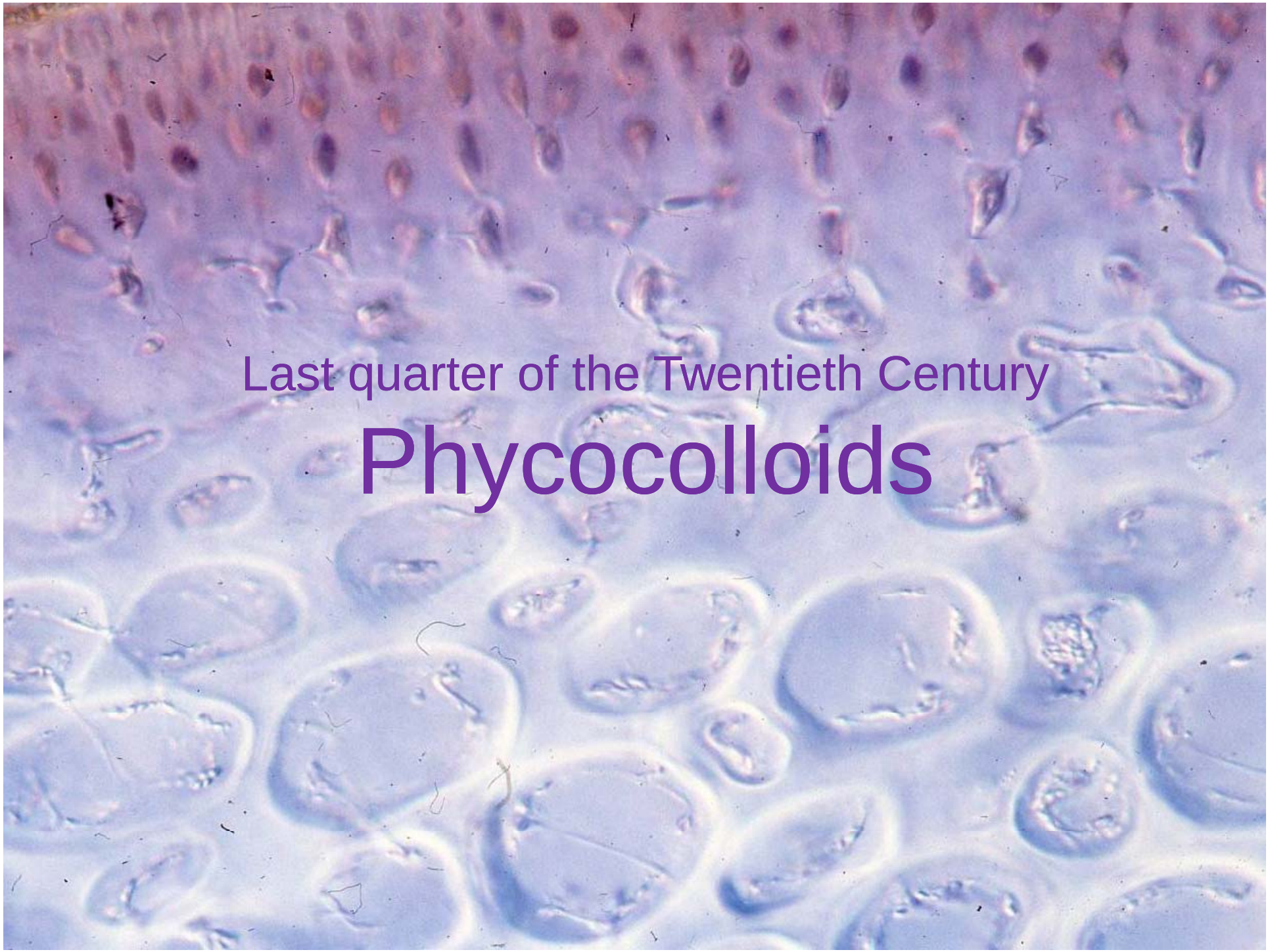
# Seaweed Farming in Spain

# The evolution of the uses of seaweeds in Spain

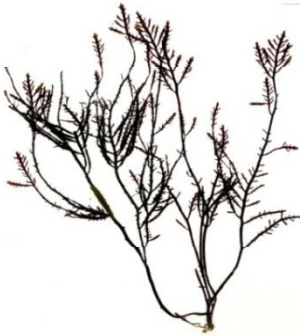
## Agricultural uses

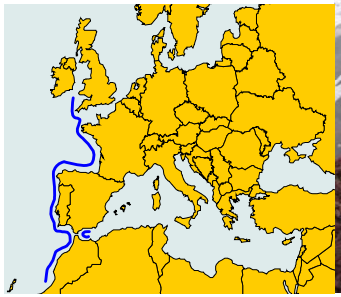
## Extraction of phycocolloids

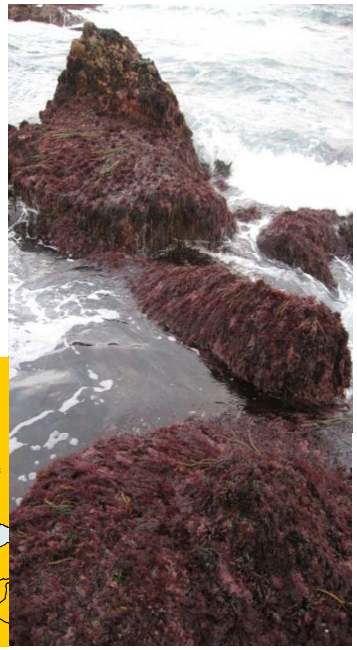
## Feed and Food


Last quarter of the Twentieth Century
Phycocolloids

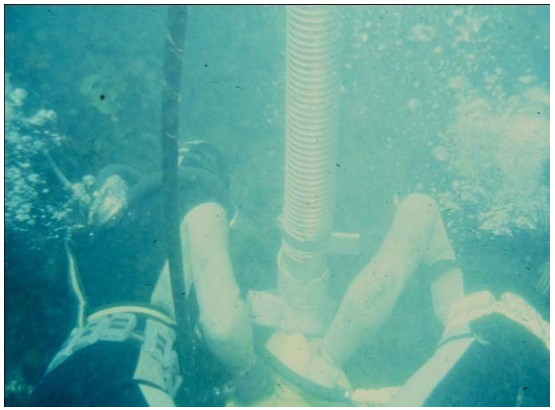
# *Gelidium corneum* (=*G. sesquipedale*) harvesting in Spain to extract agar







Galicia (northwest Atlantic coast), 1980s.



Beached biomass harvesting and mowing of sublittoral fields in the Cantrabian coast in the 1970s.

# Attemps for farming of *Gelidium corneum*

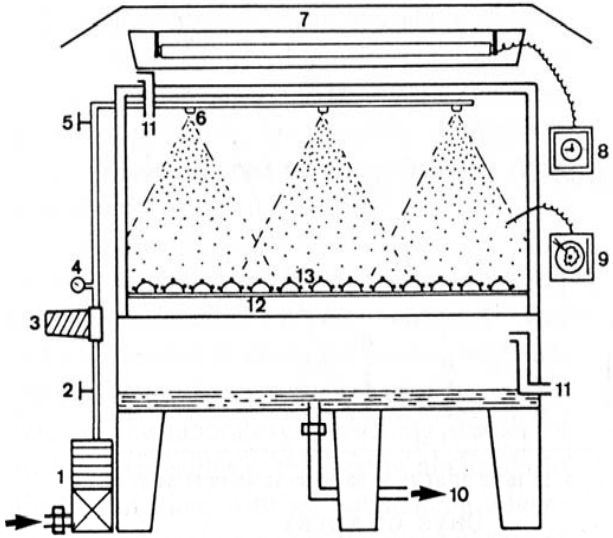



*Fig. 1.* Diagrammatic scheme of the spray chamber: 1 pump, 2 & 5 valves, 3 filter, 4 manometer, 6 nozzles, 7 lamps, 8 timer, 9 thermograph, 10 drain, 11 ventilation, 12 and 13 substrata & algae.

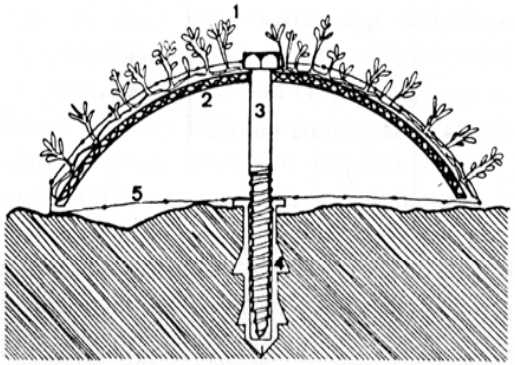
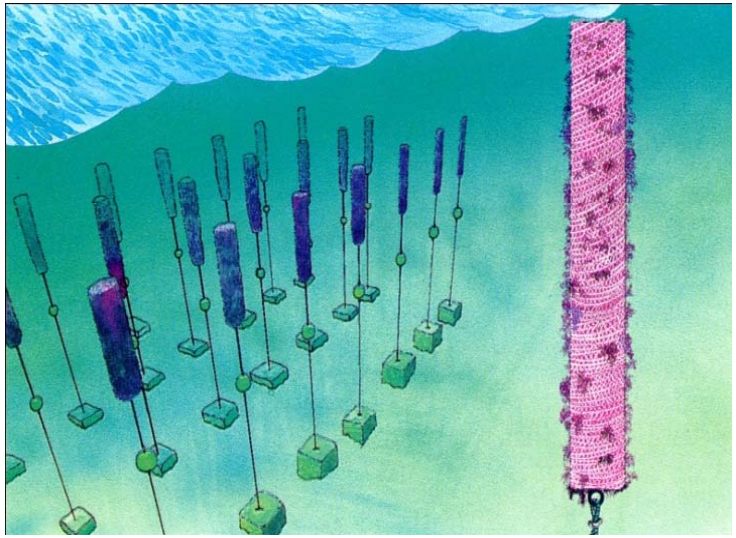



*Fig. 3.* Substratum positioned in the sea: 1 plant, 2 substratum, 3 & 4 bolt and washer, 5 protective netting.

Salinas, J.M. (1991). Spray system for re-attachment of *Gelidium sesquipedale* (Clem.) Born. et Thur. (Gelidiales, Rhodophyta). *Hydrobiologia*, **221**: 107-118.



The experimental cultivation of *Gelidium corneum* was tested in the 90's in the Ria de Vigo (Galicia). The experiment was unsuccessful due to its high cost and rapid colonization of the substrate by fouling species because of the low hydrodynamic conditions on the tested structures

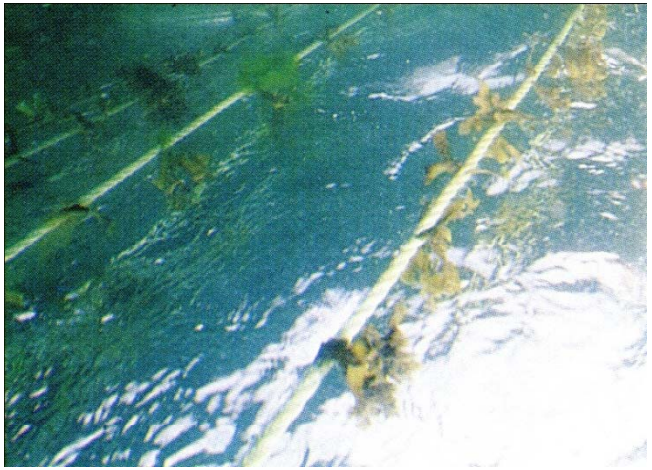
# *"Liquen"* harvesting and farming in northwest Spain (mainly Galicia) to extract carrageenans

***Chondrus crispus***

***Mastocarpus stellatus***

## Harvesting

## Farming



In the 1990s the company CEAMSA made in Baiona (Galicia) experimental trials of *Chondrus crispus* farming on ropes in long-lines in the open sea. These crops failed due to excessive light intensity, lack of the necessary hydrodynamic conditions and epiphytism processes.

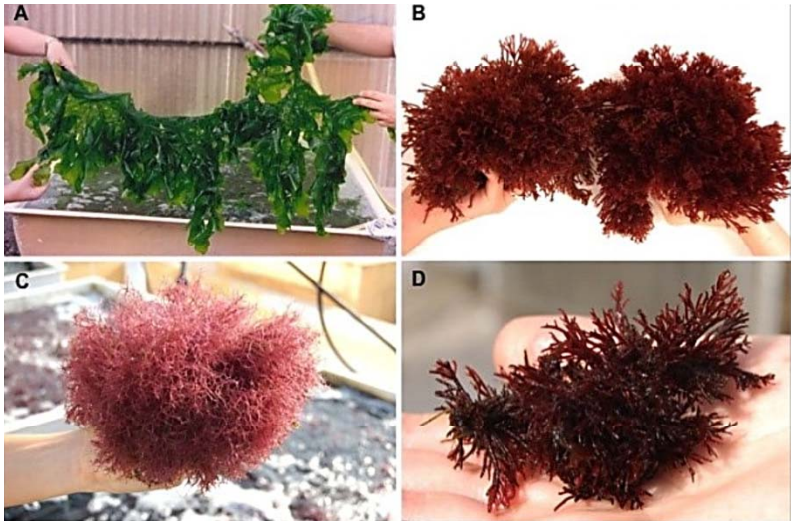
## Late 90s and early 2000s

### *Biotechnology of the biofiltration of effluents (fish) by means of algae*

Project: SEAPURA (Q5RS- 2000-31334)

**Marine Biotechnology Centre of the University of Las Palmas de Gran Canaria**

**Research Group of Photobiology and Biotechnology of Aquatic Organisms of the University of Málaga**




### *Open sea cultivation of* Palmaria palmata *(Dulse) on the northern Spanish coast.*

Project: PALMARIA (CT97-3828), Agriculture and Fisheries (FAIR)

**Department of Systems and Organisms, University of Oviedo**

Twenty-First Century
Sea Vegetables

# The raising of the Sea Vegetables

Apart from Asian products as "nori" or "dashi kombu" today can be found in Spain, even in department stores, many products made from native seaweed dried or canned alone or together with other marine products. It also made pasta, tartars, precooked products, rice with seaweed ... Every day these products are being incorporated into our diet.

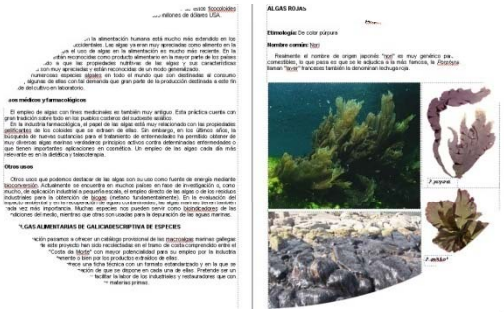
# The raising of the Sea Vegetables: Undiscovered treasures

PROJECTS

PGIDIT06TAL060E y PGIDIT08TAL004E

**"Algas marinas alimentarias de Galicia: prospección de especies, técnicas de procesado, aplicaciones culinarias y propiedades nutricionales"**

Inventory of sea vegetables usable in food and assessment of the feasibility of their exploitation
Development of processing techniques and culinary applications
Design and marketing of new products



PORTO-MUIÑOS
LAS VERDURAS DEL MAR

***But the future is the farming…***

# The farming of kelps (*Saccharina latissima*) as a spearhead of the spanish industry of edible seaweeds

INSTITUTO ESPAÑOL DE OCEANOGRAFÍA


**J.M. Salinas Morrondo**

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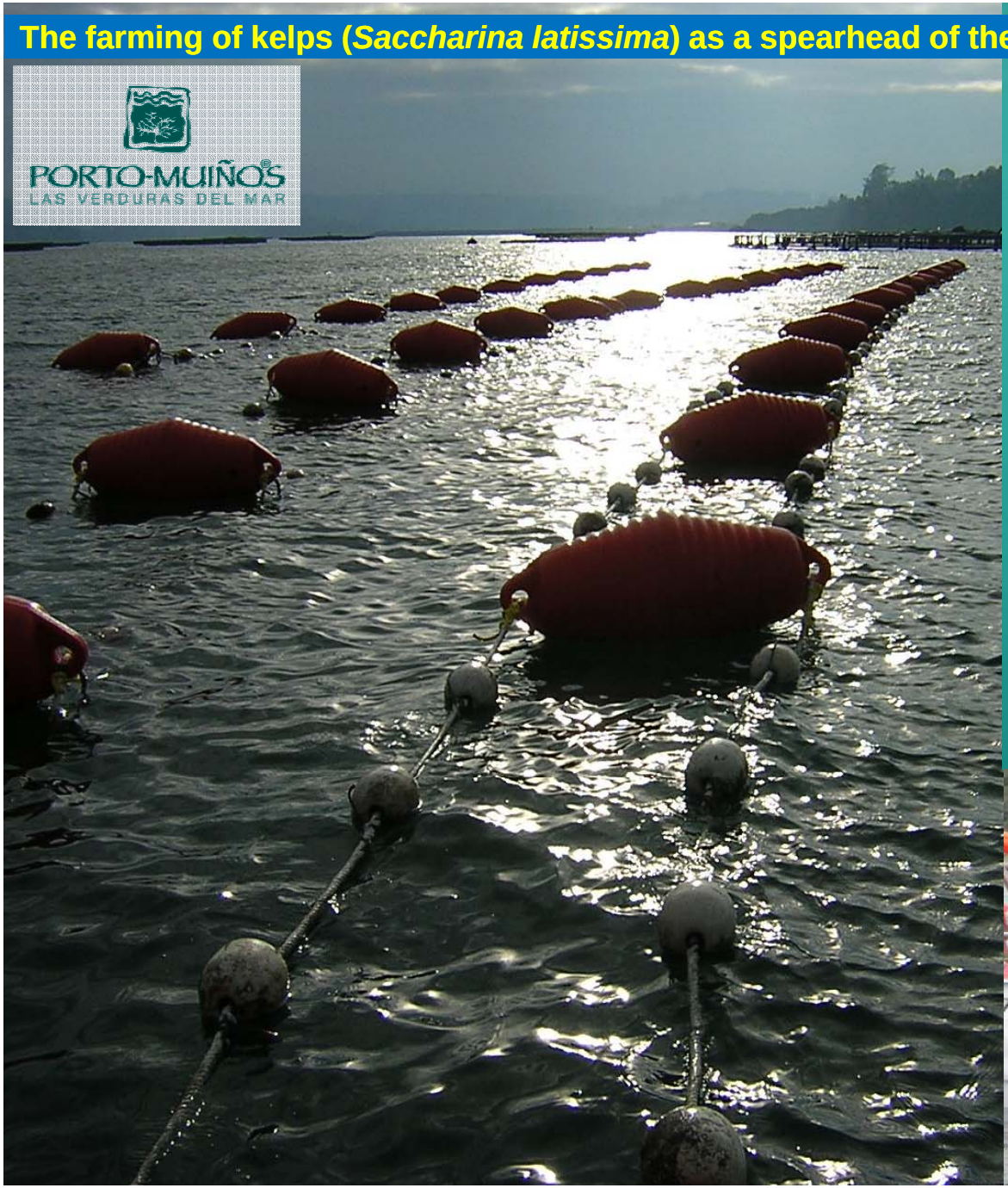
Centro Oceanográfico de Santander
**Instituto Español de Oceanografía (IEO)**


## Free-living method

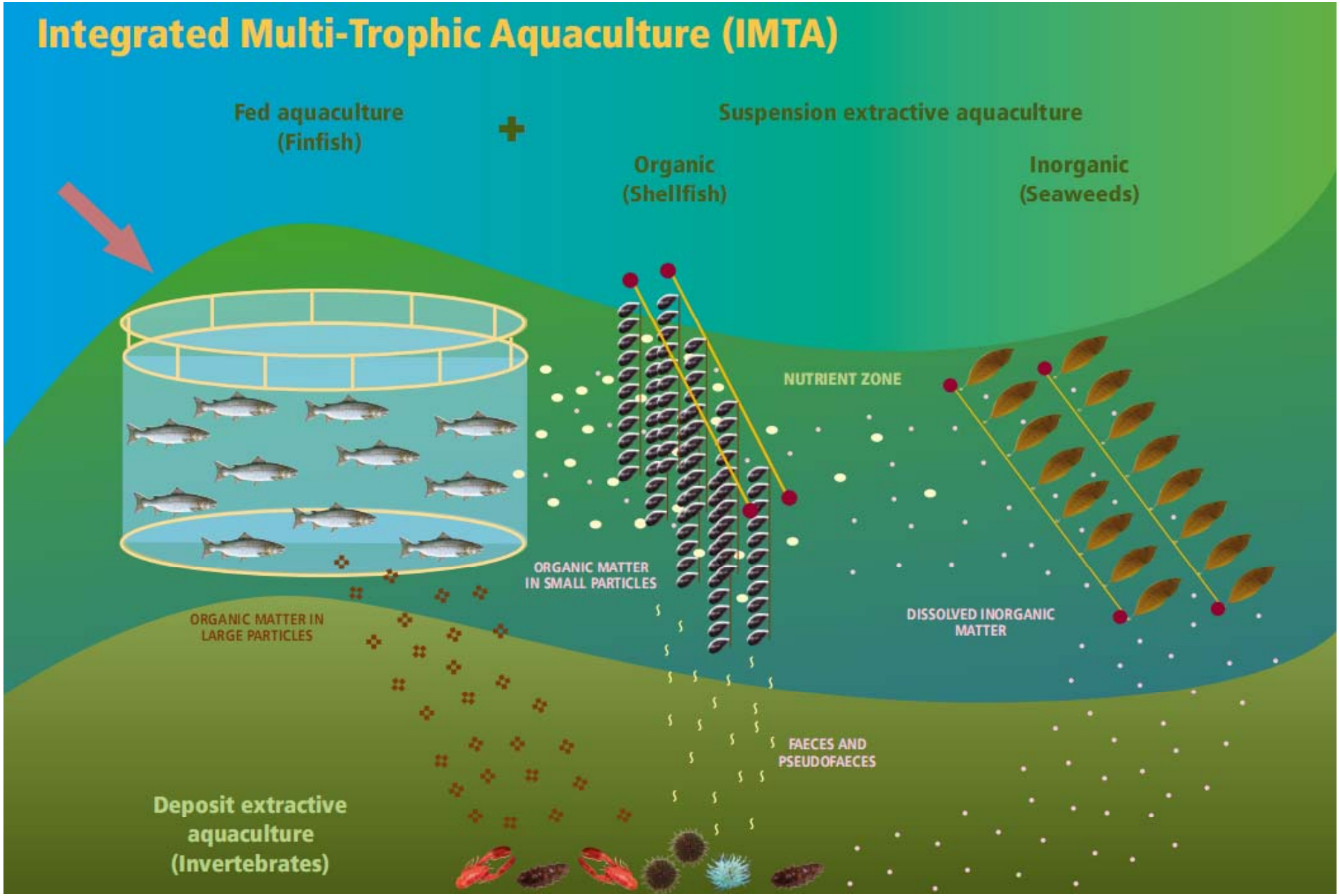
BioCost UNIVERSIDADE DA CORUÑA

# The farming of kelps (*Saccharina latissima*) as a spearhead of the spanish industry of edible seaweeds



BioCost UNIVERSIDADE DA CORUÑA

## The farming of kelps (*Saccharina latissima*) in IMTA systems

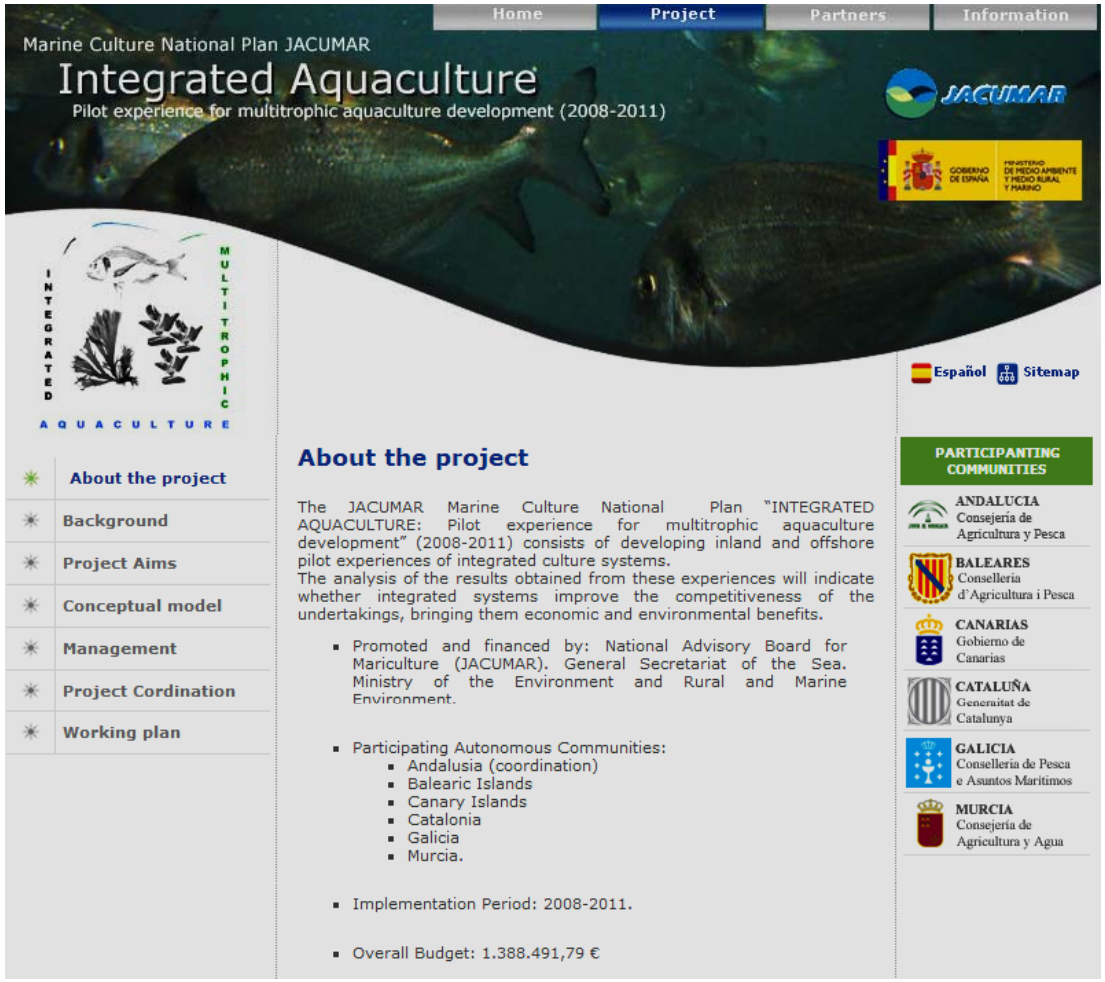


# AMTI experiences developed in Spain

Project:

***"Integrated aquaculture: Pilot experience for multitrophic aquaculture development (2008-2011)"***

National Advisory Board for Mariculture (JACUMAR). General Secretariat of the Sea. Ministry of Agriculture, Food and Environment




**http://www.acuiculturaintegrada.com**

CIMA CENTRO DE INVESTIGACIÓNS MARIÑAS

XUNTA DE GALICIA
CONSELLERÍA DO MAR

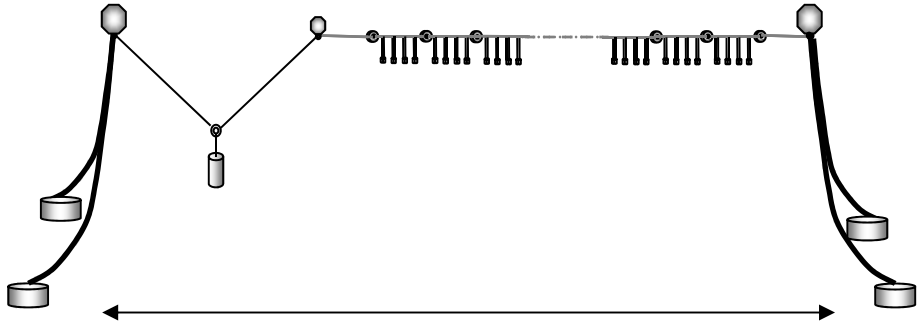
UNIVERSIDADE DA CORUÑA

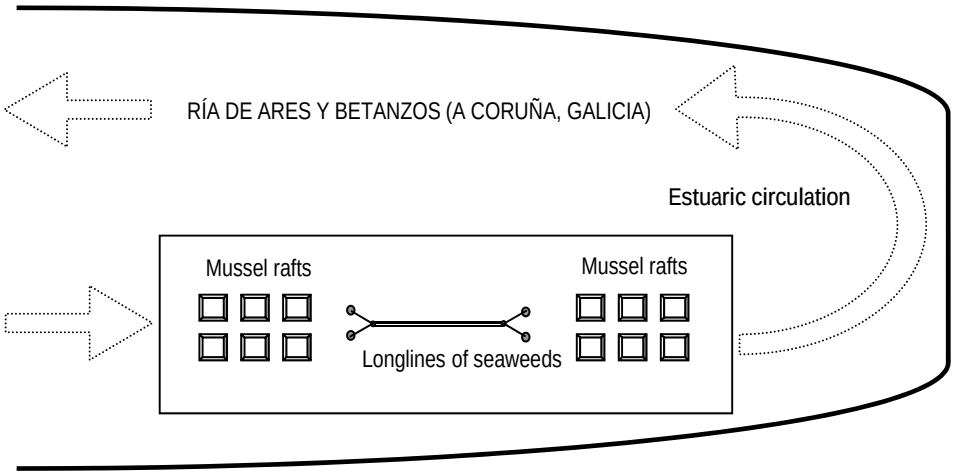
INSTITUTO ESPAÑOL DE OCEANOGRAFÍA

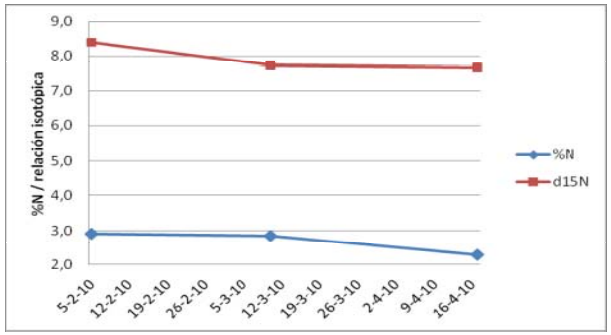
In the framework of this project, in Galicia are raised a series of experiments aimed at the development of different types of integrated multi-trophic aquaculture where **macroalgae have a key role**.

The aim of these experiments is to increase the profitability of marine aquaculture, minimize its potential environmental impact and thus make it more sustainable.

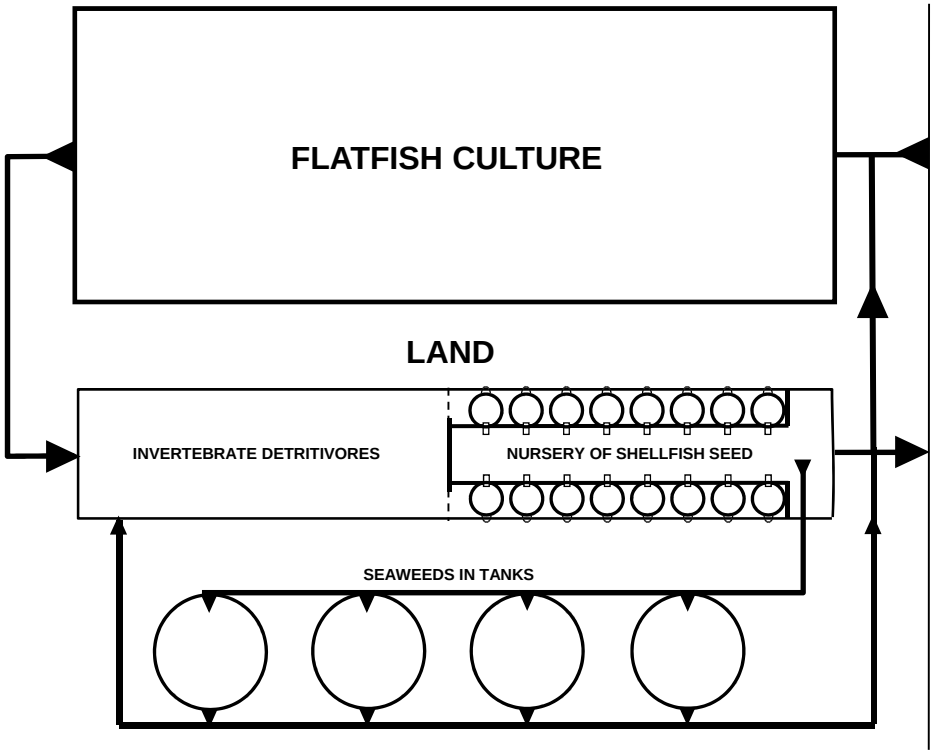
# Open sea farming of *Saccharina latissima* associated with mussel rafts



# Integrated culture systems of invertebrates and seaweeds in the effluent from an land-based fish farms



Proposed design for an IMTA system integrating several types of invertebrates and seaweeds using effluent from land-based flat fish farms working either in open or in recirculation system. If the effluent from the macroalgae tanks contains spores/gametes could be partially reused within the system.

## AMTI experiences developed in Spain and Galicia, a divulgation book

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http://hal.archives-ouvertes.fr/hal-00743395

# The future of seaweeds farming in AMTI systems in Spain and Galicia: The ESGA

The Galician Aquaculture Strategy (ESGA, www. Intecmar.org/esga) ) is a multi-year strategic plan that will be the Galician response to the impulse that European institutions want to give to the aquaculture activities until 2030.

In the ESGA the integrated multi-trophic aquaculture based on macroalgae is one of its main topics

Many thanks for your attention!