ciimar

ACTIVITY REPORT
2019

INDEX

DIRECTION BOARD MESSAGE	5
ABOUT CIIMAR	6
RESEARCH LINES	9
RESEARCH STRUCTURE	10
TECHNOLOGY PLATFORMS	11
FACTS & FIGURES	15
PROJECT HIGHLIGHTS	25
SCIENTIFIC OUTPUTS	69

MESSAGE FROM THE BOARD

In 2019, CIIMAR attained the rating of EXCELLENT amongst Portuguese research centers as the results of the international evaluation process that started early in 2018. Although the overall funding is not significantly different from the previous one, it will allow the hiring of three new researchers and the assignment of 15 PhD grants funded by FCT.

CIIMAR continued the implementation of two large Mobilizing Program projects led by industry – MARVALOR and MOBFOOD and, in 2019, a new one started ALGAVALOR - also led by industry. In 2019, we kept the trend of attracting national and international funds from the approval of new projects including 3 H2020 (AQUACOMBINE, TOXICROP, FutureMARES). In 2019, the sum of the projects in implementation in CIIMAR raised to 21.4 million euros.

CIIMAR members published 448 papers in internationally peer-reviewed journals and successfully contributed to the graduation of 19 PhD and 78 MSc students.

In 2019, four international patents were submitted, reflecting the increasing impact of our research and the success of the implementation of the measures to increase the technology transfer.

The Collaborative Laboratory for the Blue Economy (B2E) whose application was led by CIIMAR, was officially funded in 2019. CIIMAR outreach activities, both indoors and outdoors impacted more than 65 000 people.

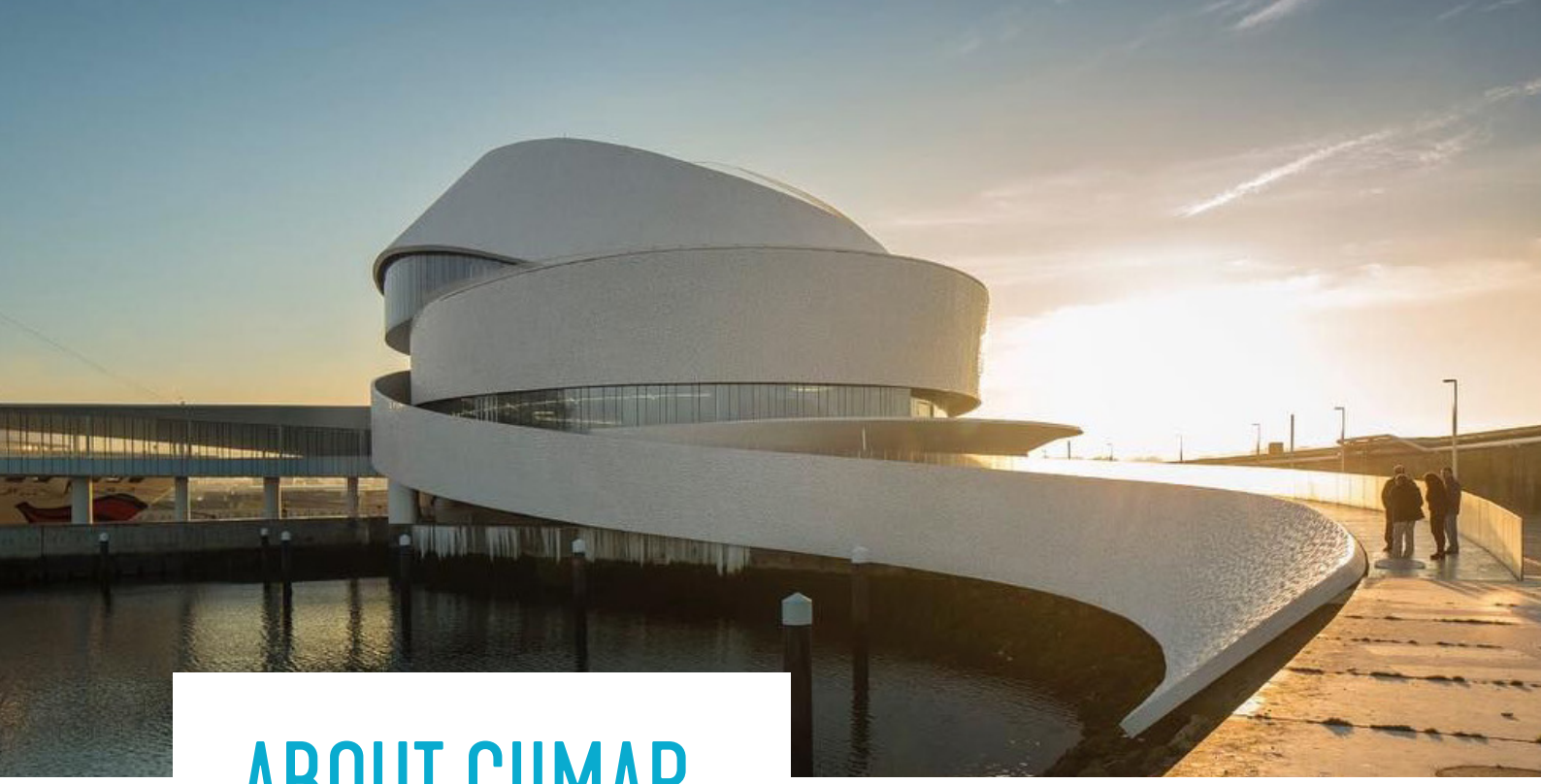
In September 2019 CIIMAR launched the BlueBioEconomy Roadmap for Portugal with the endorsement and presence of the minister of the Sea Ana Paula Vitorino. This was the end point of the H2020 Twinning action BLUEandGREEN but at the same time it became its legacy.

A new collective associate joined CIIMAR in 2019, the Porto Polytechnic through the High School of Health, which will allow an increased collaboration and allocation of resources (human and space) between both institutions.

CIIMAR aims in 2020 to strengthen the relationships with the University of Porto so as to establish a legal status that will allow an even better cooperation between both institutions taken into account all the challenges that are expected in the near future.

The director of the Board of CIIMAR

Vitor Vasconcelos



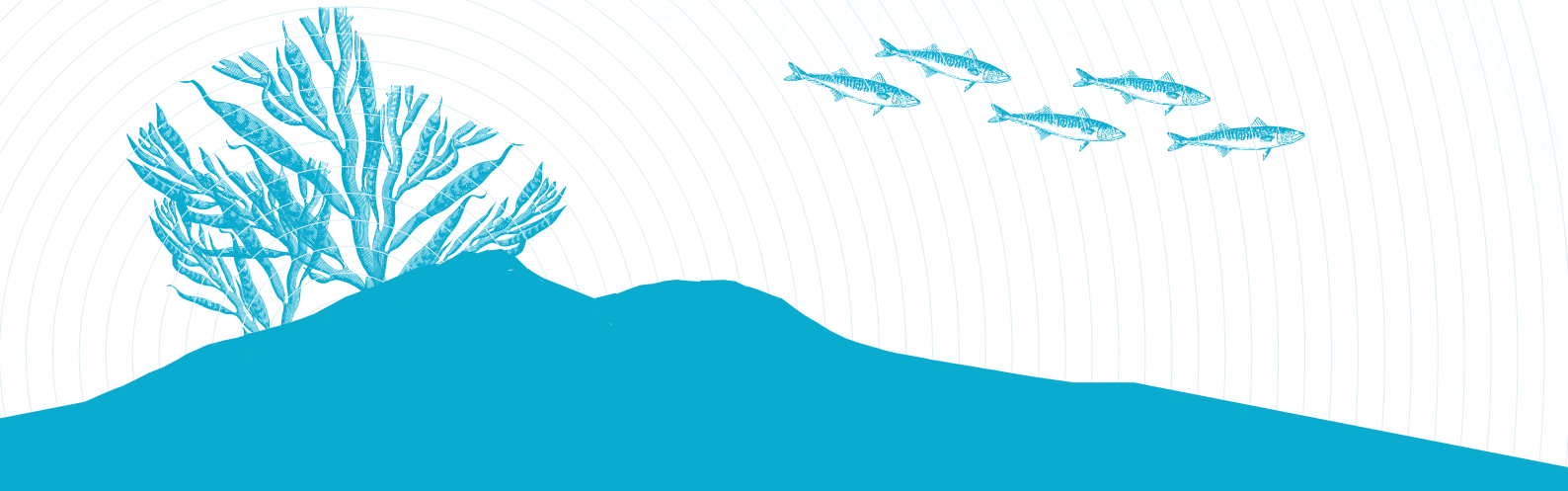
ABOUT CIIMAR

CIIMAR is a leading research and advanced training institution of the University of Porto, working at the frontiers of Ocean Knowledge and Innovation.

CIIMAR fosters an integrated approach to Ocean and coastal areas promoting the understanding and knowledge on physical, chemical and biological dynamics of these environments and the impact of natural and human disturbances, aiming to unravel links between these processes, grasp Ocean and ecosystems functioning and responses to global changes.

CIIMAR uses this knowledge-base to promote the natural capital and the sustained management of marine resources through monitoring of ecosystems health, optimization of aquaculture, and biotechnological exploitation of the resources for environmental and human health applications.

CIIMAR provides innovative solutions and products responding to actual economic and societal challenges. Among them are the demand for high-quality seafood, new drugs and marine products for industrial and medicinal needs, water quality, sustainable fisheries, preparedness for and mitigation of oil and HNS spills, environmental monitoring & risk assessment, preservation of ecosystems services, ocean & coastal management and Ocean Literacy.



Social Organs

The current social organs initiated their mandate in January 2019 and are composed as follows:

GENERAL ASSEMBLY	BOARD	FISCAL COUNCIL
President Eduardo Rocha	**President** Vitor Vasconcelos	**President** Luísa Bastos
Chairs › Aires Oliva Teles › Francisco Taveira Pinto › Carlos Vale › Susana Moreira	**Board members** › Ana Paula Mucha › Isabel Sousa Pinto › Luísa Valente › Rodrigo Ozorio	**Members** › José Fernando Gonçalves › Helena Peres

Headquarters

CIIMAR´ s new state-of-the-art facilities for research, training and services are located at the heart of the maritime industry and services in the Northern region of Portugal (Leixões harbour). The Centre features well-equipped laboratories for marine and maritime research, technological core platforms, high scale micro- and macroalgae cultivation and animal experimental facilities for freshwater and marine organisms approved by the Portuguese Veterinary Authority.

Besides its headquarters, CIIMAR comprises other partner facilities at five Units from U. Porto - Abel Salazar Biomedical Sciences Institute, and Faculties of Sciences, Engineering, Pharmacy and Law – and at Porto Polytechnic Institute, Regional Secretariat for Agriculture and Fisheries (RG Madeira) and Portuguese Institute of Sea and Atmosphere (IPMA).

CIIMAR is an integral research Centre of CIMAR - Associated Laboratory, together with CCMAR - University of Algarve.

Innovation and Technology Transfer

CIIMAR supports the development of a sustainable blue economy, while tackling important societal challenges. Through the implementation of Large Scale Mobilizing R&TD Programs,

R&D projects in co-promotion with companies and the CIIMAR's Blue Business Development Platform, the Centre promotes the transfer of knowledge, fostering the development of new technologies, products and services with a strong technology and innovation component.

Disruptive ideas and technologies are driven to business acceleration programmes, such as Blue Bio Value, enabling knowledge value creation through entrepreneurship.

CIIMAR is a founding member of the National Maritime Cluster – Forum Oceano, the BLUEBIO ALLIANCE, and more recently, the B2E CoLAB – Collaborative Laboratory for Blue Economy.

Science and Society

CIIMAR has an extensive Outreach Program addressed to all society sectors. In 2019 CIIMAR started "Clubes Ciência Viva" Protocols with 4 schools, received the visit of 31 school groups, and performed 29 indoor and 23 outdoor activities with schools. The Communication and Outreach Office coordinated several science dissemination campaigns, such as the Ocean Action and Ponds with Life, and traveling exhibitions ("Plastic Sea", "Marine Monsters", "Amphibians: a paw on land, another on earth"). CIIMAR also participated in numerous public events and science communication displays aimed to promote the dissemination of CIIMAR's research to society. CIIMAR Open Day, coinciding with Leixões Port Day at 21 September 2019, constituted a major dissemination event, with over 11.000 visitors.

CIIMAR is also responsible for the scientific management of two Environmental Monitoring and Interpretation Centres (CMIAs) through cooperation protocols with the City Councils of Vila do Conde and Matosinhos.

RESEARCH LINES

Marine Biotechnology

Top research is also focused on the exploration of a wealth of Ocean resources for the discovery and characterization of new bioactive compounds with ecological, pharmaceutical or other industrial applications. The study of emerging toxins, development of biosensors for early detection systems, and development of bioremediation and phytoremediation tools for ecosystem recovery are other main goals of this research line.

P.I. **Vitor Vasconcelos**

Global Changes and Ecosystems Services

CIIMAR provides basic knowledge and tools to support the protection and management of marine, estuarine and freshwater ecosystems. Sustainable exploitation of ocean resources with production of valuable goods and services is fostered. Work is done in close collaboration with SMEs, international and local authorities, and stakeholders.

P.I. **Lúcia Guilhermino**

Biology, Aquaculture and Seafood Quality

Development of new aquaculture species, products, and innovative culture methods are central approaches to tackle societal challenges related to human nutrition and seafood quality. High impact scientific knowledge and innovation in these areas are provided through basic and applied research and transferred to end-users and the industry.

P.I. **Luísa Valente**

RESEARCH STRUCTURE

RESEARCH LINES	RESEARCH GROUPS	RESEARCH TEAMS
MARINE BIOTECHNOLOGY	EVOLUTIONARY GENOMICS AND BLUE BIOTECHNOLOGY	EVOLUTIONARY GENOMICS
		BLUE BIOTECHNOLOGY AND ECOTOXICOLOGY
		EMERGENT BIOTECHNOLOGIES AND SEAFOOD PROCESSING
		CYANOBACTERIAL NATURAL PRODUCTS
	NATURAL PRODUCTS AND MEDICINAL CHEMISTRY	CHEMISTRY AND BIOLOGICAL ACTIVITY OF MARINE NATURAL PRODUCTS
		MEDICINAL CHEMISTRY: DRUG DISCOVERY AND DRUG DESIGN
	BIOREMEDIATION PROCESSES	BIOREMEDIATION AND ECOSYSTEMS FUNCTIONING
GLOBAL CHANGES & ECOSYSTEMS SERVICES	CONTAMINATION PATHWAYS AND MECHANISMS OF TOXICITY	CONTAMINANT PATHWAYS AND INTERACTIONS WITH MARINE ORGANISMS
		ENDOCRINE DISRUPTORS AND EMERGENT CONTAMINANTS
		SOIL/WATER INTERACTIONS
		MARINE AND COASTAL ENVIRONMENTAL TOXICOLOGY
		ECOTOXICOLOGY, STRESS ECOLOGY AND ENVIRONMENTAL HEALTH
	AQUATIC BIODIVERSITY AND CONSERVATION	HYDROBIOLOGY
		ESTUARINE ECOLOGY AND BIOLOGICAL INVASIONS
		AQUATIC ECOLOGY AND EVOLUTION
		COASTAL BIODIVERSITY
		BENTHIC ECOLOGY
	OCEAN DYNAMICS, COASTAL AND WATER SYSTEMS	COASTAL AND OCEAN DYNAMICS
		COASTAL MONITORING AND MANAGEMENT
		MARINE ENERGY
		WATER RESOURCES SYSTEMS
	LAW OF THE SEA	LAW OF THE SEA
BIOLOGY, AQUACULTURE & SEAFOOD QUALITY	AQUACULTURE AND SEAFOOD SAFETY	NUTRITION, GROWTH AND QUALITY OF FISH
		SAFE AND HEALTHY SEAFOOD AND SUSTAINABLE CONSUMPTION
	ANIMAL NUTRITION AND HEALTH	NUTRITION AND IMMUNOBIOLOGY
		ANIMAL PATHOLOGY
		ANIMAL HEALTH AND AQUACULTURE
	ANIMAL PHYSIOLOGY AND FUNCTIONAL GENOMICS	ANIMAL GENETICS AND EVOLUTION
		HISTOMORPHOLOGY, PHYSIOPATHOLOGY AND APPLIED TOXICOLOGY
		MOLECULAR PHYSIOLOGY
		ECOPHYSIOLOGY

TECHNOLOGY PLATFORMS

CIIMAR Platforms developed under various European Marine Sciences Infrastructure Networks (e.g. EMBRC and EMSO) represent a new strategic axis of the Centre to grant access from other institutions in the European Research Area and companies. These Platforms provide access and offer support and expertise to wide range of experimental services and equipment.

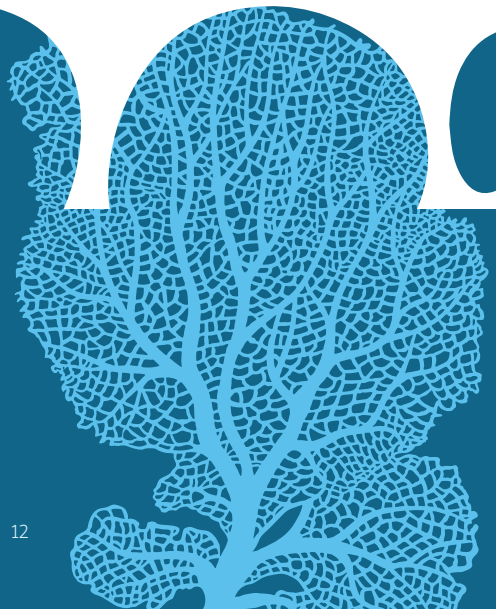
COLLABORATIVE
RATORY FOR BLUE
OMY

B2E

In pired by t an
Driven by arket
Powe d by nowl ge

rative Lab ory for the Bl my (B2E) w ose application
CIIMAR, was officially registered 2019 as non-profit priv
with CIIMAR as a board member. The main of the B2E Col
hly-skilled jobs and increase economic ar value through
elopment of kn dge-based activities suppor plementatio of
earch and innovation ag EAB is complementin d reinforci the
ent landscape of R&D units, part of the present consortiu by stin ting
tive participation of scientific, ademic, business and public com the
and solution of large scale a complex problems sustainably
ine bio-resources. Thi nge will be successfu
ry, inte ional appr the
fo goals and priorities:

- ation of highly-skilled jobs to ance the economic and soci value f
t of the Blue Growth sectors w the highest potential: Biot nnology nd
culture;
- nergies and multi isciplinary activities a g compleme ary
g f marine bio to improve t
logical intensity e dge of the services proc
- ntribute to policy maki e s egic managem vild marine s
harvest assuring marine e system healt
- Fostering marine biorefi ry frameworks se valorisa on of biol gical
resources.



BIO OURCES AND BIO CONOMY

SUSTAINABLE AQUACULTURE 4.0

TOOLS FOR SEAFOOD SAFETY AND CERTIFICATION

CIRCULAR ECONOMY AND BLUE GROWTH

HIGHLY-SKILLED JOBS IN BLUE BIOECONOMY

B2E CoLAB
Major Research Fields

NATURAL RESOURCES

New uses and valorisation;

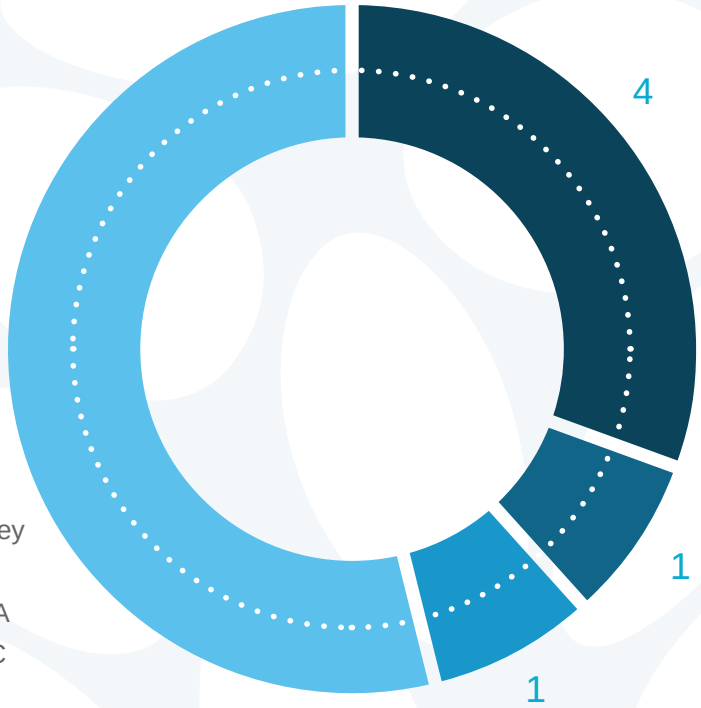
MARINE BIOTECHNOLOGY

Sustainability and new products;

SUSTAINABLE AQUACULTURE

Species diversification and enabling technologies.

B2E CoLAB
Participating Entities



Universities, R&D centres & Associate Laboratories

- CIIMAR
- University of Aveiro - CESAM
- University of Minho - ICVS/3B's
- University of Porto - UP

Technology Interface Centre

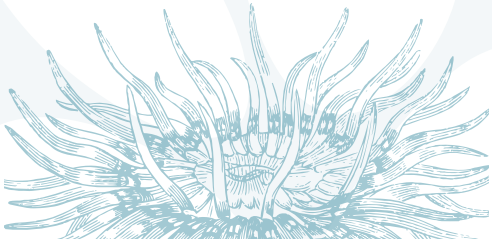
- INESC TEC

Sea Economy Cluster

- Fórum Oceano

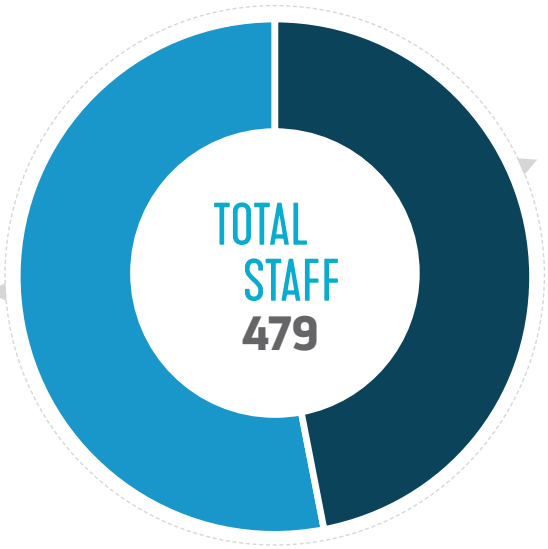
Private Companies

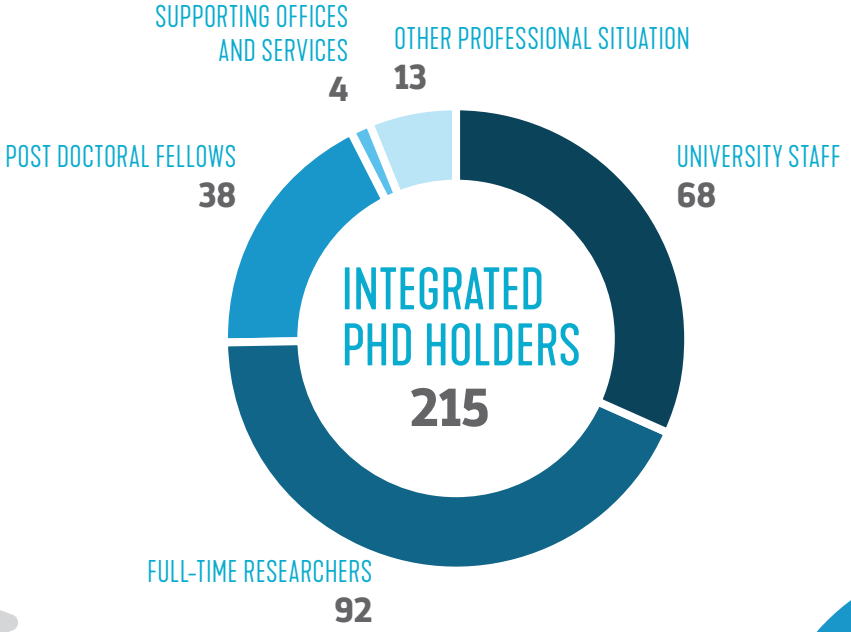
- A20
- Ingredient Odyssey
- SAVINOR
- SAFISTELA
- SONAE MC
- SORGAL
- SPAROS

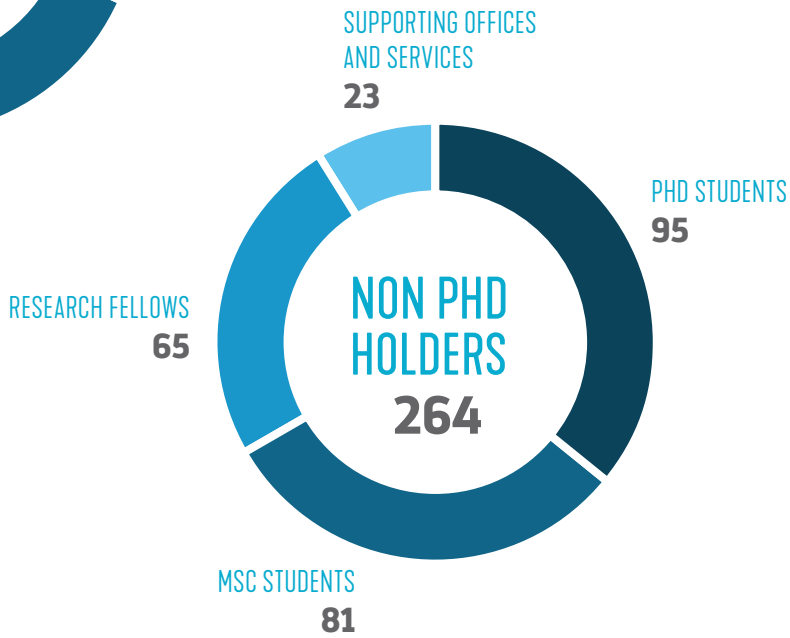


FACTS & FIGURES

TEAM







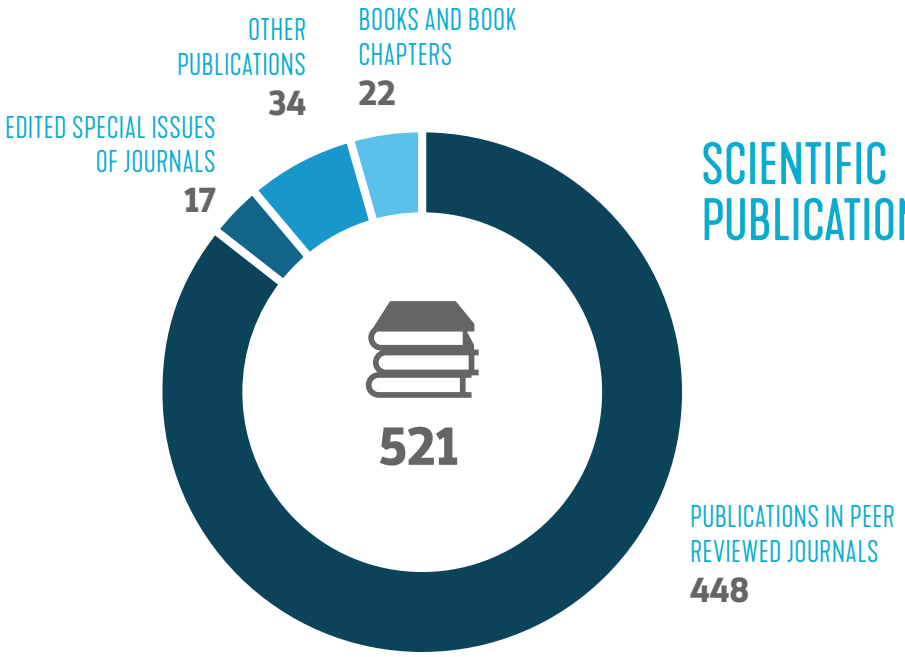
27
SUPPORTING OFFICES AND SERVICES

38
INTERNATIONAL VISITING RESEARCHERS

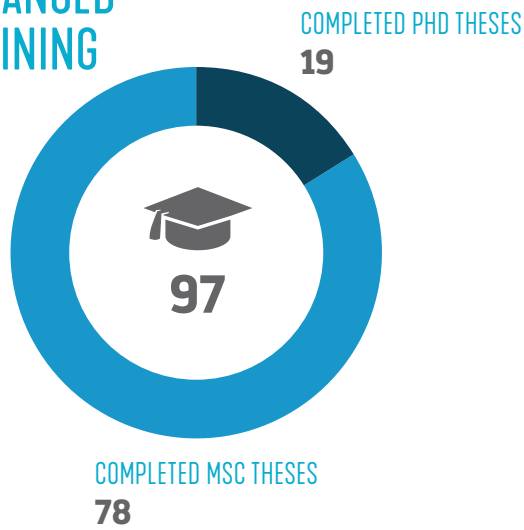
>30
NATIONALITIES

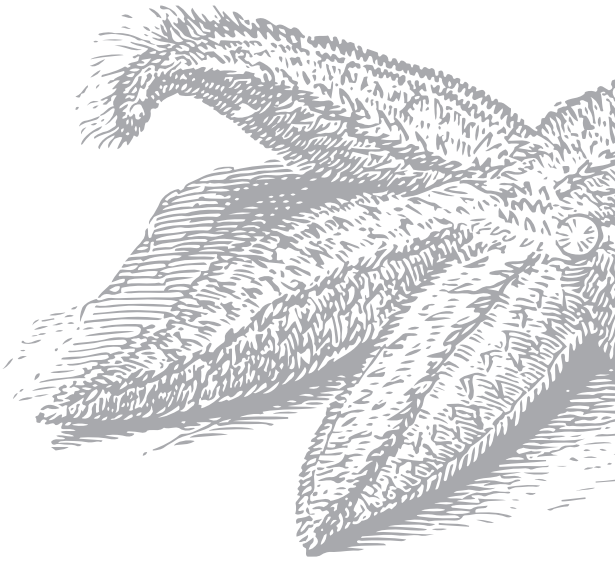
SCIENTIFIC PRODUCTIVITY

SCIENTIFIC PUBLICATIONS



ADVANCED TRAINING





3 SOFTWARE, MODELS, PROTOTYPES

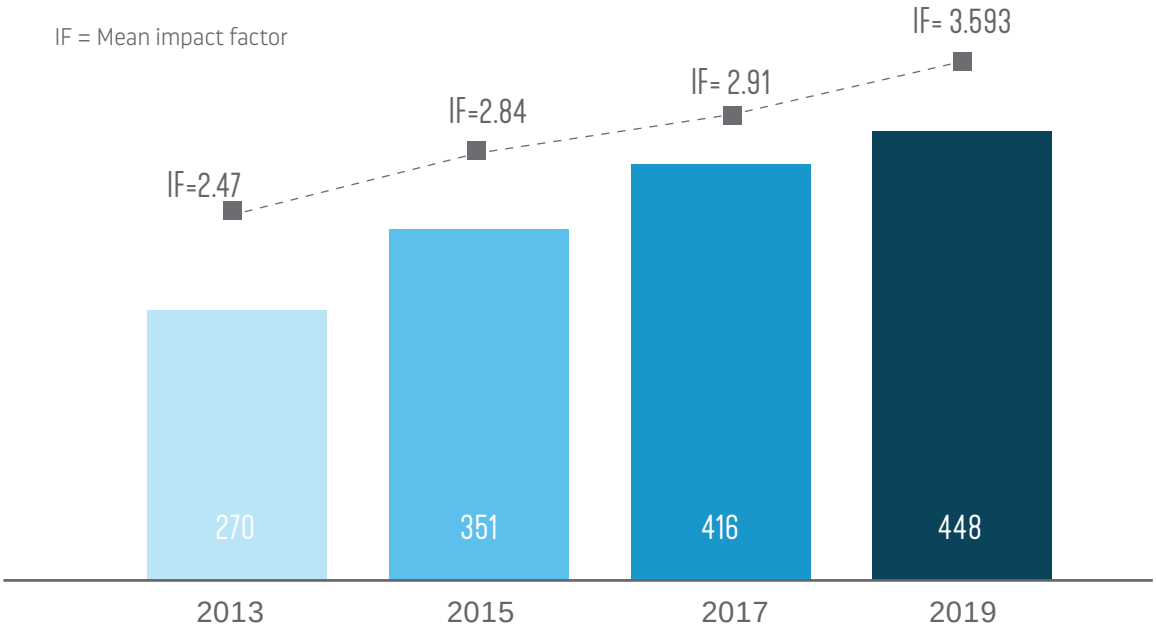
13 PATENTS

2019 MILESTONES

- **4** PROVISIONAL PATENT APPLICATIONS
- **4** INTERNATIONAL PATENT APPLICATIONS
- **1** GRANTED US PATENT
- **1** GRANTED EU PATENT

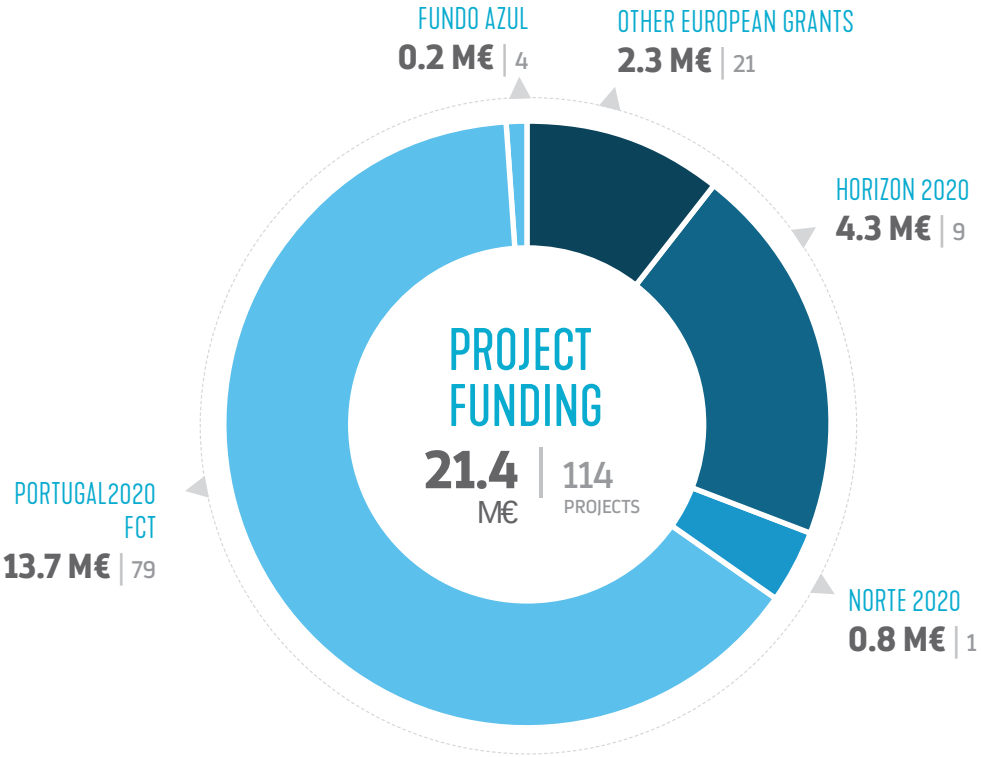
NR OF PUBLICATIONS IN PEER REVIEWED JOURNALS [2013-2019]

IF = Mean impact factor

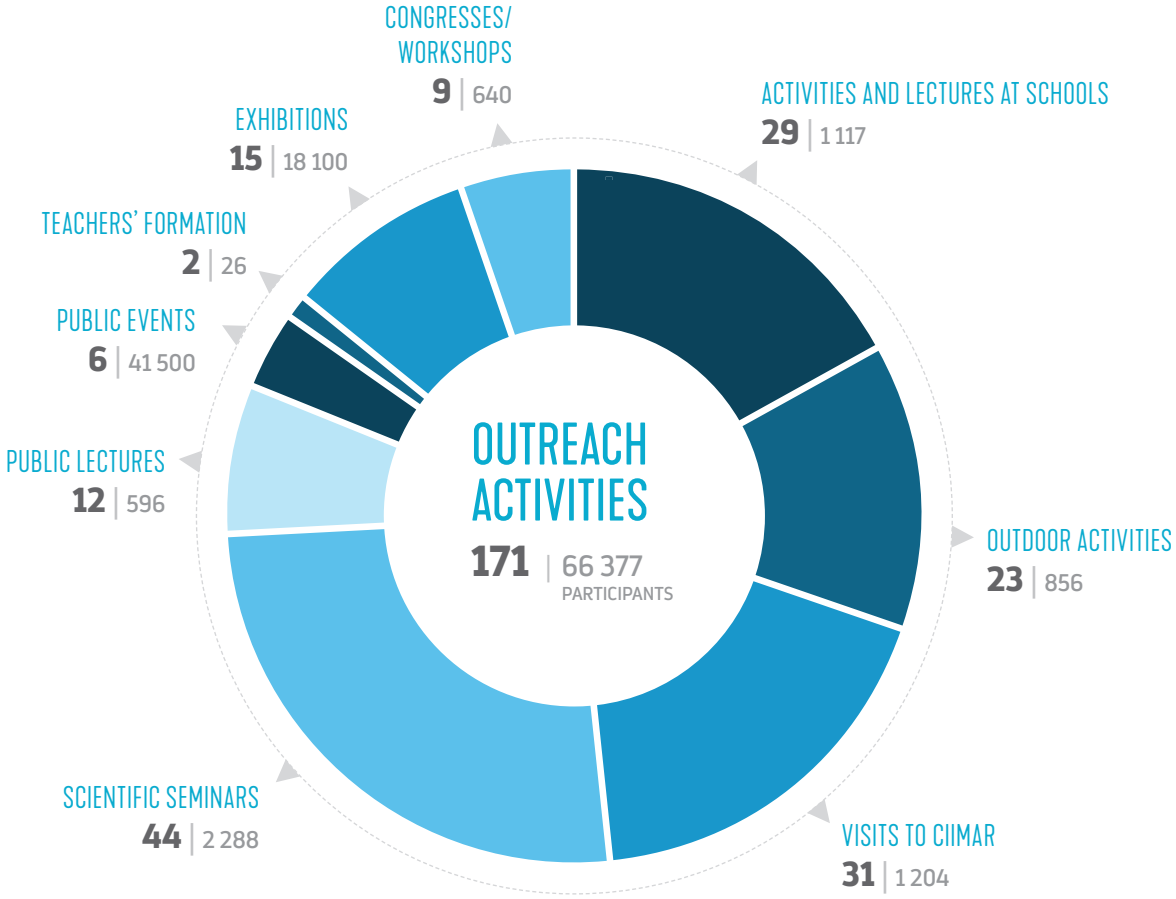


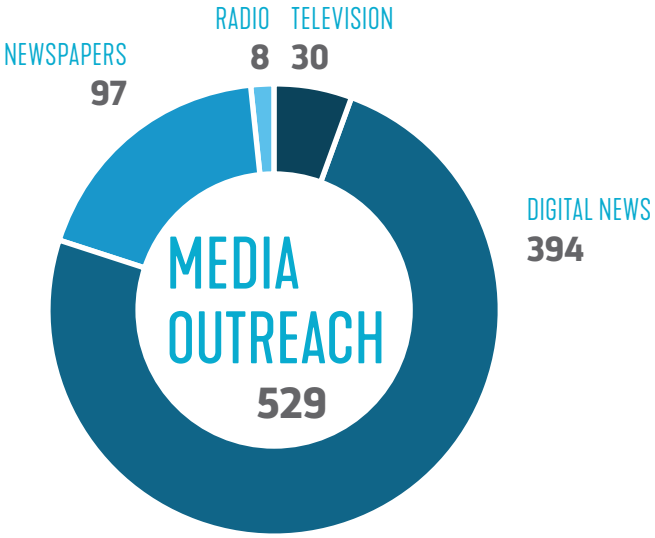
COMPETITIVE R&D PROJECT FUNDING

Competitive funding attributed to CIIMAR in R&D projects in execution during 2019



OUTREACH ACTIVITIES





2019 AT A GLANCE

JAN

New Board of Directors of CIIMAR for the 2019-2021 triennium

European Marine Biological Resource Centre Biobank meeting at CIIMAR

Workshop "Litoral Norte Natural Park: what futures?" co-organization

CIIMAR research on the genetic basis of cetaceans sleep published at Genes

FEB

Launch of the Blue Bioeconomy Collaborative Laboratory (B2E)

Eric Kandel (Nobel Prize in Medicine) visits CIIMAR

Workshop on Molecular Gastronomy Techniques applied to Mackerel

CIIMAR work on the white shark genome published at PNAS

MAR

Algavalor project approved

CIIMAR 19th Anniversary

Toxicrop and NetTag kickoff meetings

SpilLess project workshop

JUL

Launch of the 6th edition of Blue Young Talent (BYT) and 1st edition of BYTplus

GEO BON work meeting at CIIMAR

CIIMAR participates in Junior University (UPorto)

Stop the Plastic Tide campaign launched to reduce disposable plastics at CIIMAR

AUG

CIIMAR researchers Catarina Magalhães and Maria Paola Tomasino expedition to the Arctic for monitoring microbiological communities

BlueBioLab project Kick Off Meeting

SEP

CIIMAR Annual Meeting

CIIMAR Open Day

Programming With R For Biological Sciences Advanced Course

Plastic Sea exhibition at the CEI Leiria

APR

Blue Bioeconomy Roadmap Launch Event at CIIMAR

CIIMAR at Mostra UP 2019

Vitor Vasconcelos elected Executive Director of BLUEBIO ALLIANCE

International Symposium of the AtlantOS project

Plastic Sea exhibition at SeaLife Porto

MAY

Minister of Fisheries from Nova Scotia (Canada) visited CIIMAR

CAL-Aqua advanced course

Digital launch of the Blue Bioeconomy Roadmap for Portugal

New cyanobacteria anti-obesity metabolites discover published at Marine Drugs

JUN

CIIMAR obtained the FCT grade of "Excellent"

Vitor Vasconcelos on the scienti c board of the Natural History Museum of France

CIIMAR at the European Maritime Day Lisbon

Blue Bio Value Roadshow at CIIMAR

CIIMAR student wins the Idea Challenge Portugal 2019

OCT

APAA Conference 2019 at CIIMAR

CIIMAR at **Aquaporto 2019**

The Out-Of-The-Box Creative Price for CIIMAR project

CIIMAR at the Ocean Film Tour at Cinema Trindade

CIIMAR teams participates in Blue Bio Value 2019

NOV

DEEPbaseline project wins Ocean Conservation Fund

CIIMAR at Business2Sea and BioMarine 2019

Aquaimprove Workshop

Plastic Sea exhibition at Sea Museum, Cascais

DEC

Benthic Ecology and Animal Health & Aquaculture new Research Teams

Porto Polytechnic Health School joins CIIMAR

Launching of the "Ocean" multimedia educational Package with Lusoinfo

CalAqua advanced course

Sherpa do Mar Workshop at UPTEC

ROTEIRO DA BIOECONOMIA AZUL PARA PORTUGAL
CERIMÓNIA DE ABERTURA
ANA PAULA VITORINO

ciimar
Ocean Knowledge
& Sustainability
GLOBAL CHANGES AND
ECOSYSTEMS SERVICES
MARINE
BIOTECHNOLOGY
WWW.CIIMAR.UP.PT
BLUE
BIOLAB

HIGHLIGHTS

LAUNCH EVENT OF BLUE BIOECONOMY ROADMAP

The Blue Bioeconomics Roadmap for Portugal was launched at the Porto Cruise Terminal on March 2019, with the endorsement and presence of the minister of the Sea Ana Paula Vitorino. The Blue Bioeconomics Roadmap is an important result of three-year work by the BLUEandGREEN project, approved under the TWINNING projects of the Horizon 2020 program, and resulted from a joint work of CIIMAR, BlueBio Alliance and Fundação Oceano Azul.

Roadmap file available at: http://blueandgreen.ciimar.up.pt/

CIIMAR OPEN DAY

On September 21st CIIMAR opened its doors to the community, integrated with the 11th edition of the 'Leixões Port Day', with activities for all the age groups. More than 30 scientific and pedagogical activities, games, show cooking and storytelling moments aimed to help demonstrating CIIMAR's extensive research and the importance of marine ecosystems. Despite the adverse weather conditions of the day the Cruise Terminal received more than 11.000 visitors at this event.

TWO NEW RESEARCH TEAMS AT CIIMAR

Benthic Ecology (BET) and Animal Health and Aquaculture (A2S) Research Teams integrated CIIMAR during 2019. The BET team aims to explore the extensive sea bottom from the most accessible to the most remote areas, unravelling biodiversity patterns on marine benthic communities across space and time, while A2S team will explore innovative and sustainable solutions to improve the health condition of farmed animals, including nutritional approaches, host-pathogen and neuro-endocrine/immune interactions.

PROJECT HIGHLIGHTS

AQUACOMBINE - INTEGRATED ON-FARM AQUAPONICS SYSTEMS FOR CO-PRODUC OF FISH, HALOPHYTE VEGETABLES, BIOA COMPOUNDS, AND BIOENERGY

PRINCIPAL INVESTIGATOR AT CIIMAR
Benjamin Costas

LEADER INSTITUTION
Aalborg Universitet

WEBSITE
www.aquacombine.eu

One of the most important challenges of the 21st century is to meet the world's demand for sustainably produced biomass for both food and the growing bio-products sector. Increased use of fresh water for agriculture and loss of farmland due to salinity are related concerns. Salicornia europaea (S. europaea) is grown commercially in the EU for its edible fresh tips. It is a halophyte plant and can grow on saline lands without requiring freshwater for irrigation. When grown as a vegetable only the fresh tips are used while the woody part of the plant is considered a residue.

Today, European farmers are using part of the fibrous residue for soil amendment and drying the fibers to produce herbal salt. However, the amount of food product residue is large (approximately 80%) and the salt content of the residue is a problem when used for soil amendment, as it returns the salt to the soil. There is a great wish from Salicornia farmers to increase the value of this fraction in line with the principles of circular economy. The woody residue part of Salicornia has been investigated as a source of pharma- and nutraceutical products due to its high content of phytochemicals e.g. hydroxycinnamic acids (e.g. HCA). To help increase Salicornia farming there is a wish to valorize these residues via biochemicals and bioenergy production.

The project will also examine the combination of aquaculture and Salicornia farming creating synergies such as formulation and test of phyto-chemicals rich functional fish feed and formulation and test of protein and lipids rich fish feed. The outcomes of this study will enable Salicornia farmers and aquaponics farms to utilize all fractions of the produced biomass and produce value added HCAs, functional fish feed, and bioenergy. This will create new circular industries with co-production of food, pharma, and bioenergy from this new sustainable type of crop with very little or no production of waste streams.

ASSEMBLE PLUS - ASSOCIATION OF EUROPEAN MARINE BIOLOGICAL LABORATORIES EXPANDE

ASSEMBLE Plus will provide scientists from academia, industry and policy with a quality-assured programme of access to the marine biological station facilities and resources. These stations offer a wide variety of services, including access to marine ecosystems, unique marine biological resources, state-of-the-art experimental and analytical facilities with integrated workflows, historical observation data, and advanced training opportunities. The goal i of the project s to stimulate European fundamental and applied research excellence n marine biology and ecology, thereby improving our knowledge and technology-base for the European bioeconomy, policy shaping and education.

ASSEMBLE Plus brings together 32 marine stations and institutes with modern research infrastructures and track-records of unique service provision, from 14 European and two associated countries, under the leadership of the European Marine Biological Resource Centre (EMBRC), an ESFRI consortium developed from the previous ASSEMBLE (FP7) partnership.

The sum of the actions envisaged in ASSEMBLE Plus, including Access, Networking and Research will ultimately increase the number of users of marine biological stations and shape novel strategic development perspectives of the partners, to be based on effective integration and efficient complementarities, resulting in a key contribution to their long-term sustainability.

PRINCIPAL INVESTIGATOR AT CIIMAR
Vitor Vasconcelos

LEADER INSTITUTION
UPMC

WEBSITE
www.assembleplus.eu

ATLANTOS - OPTIMISING AND ENHANCING THE INTEGRATED ATLANTIC OCEAN OBS SYSTEMS

PRINCIPAL INVESTIGATOR AT CIIMAR
Isabel Sousa Pinto

LEADER INSTITUTION
GEOMAR - Helmholtz Centre for Ocean Research Kiel

WEBSITE
www.atlantos-h2020.eu

FACEBOOK
/AtlantOSH2020

The overarching objective of AtlantOS is to achieve a transition from a loosely-coordinated set of existing ocean observing activities producing fragmented, often monodisciplinary data, to a sustainable, efficient, and fitfor-purpose Integrated Atlantic Ocean Observing System (IAOOS). This will be achieved through research and innovation activities focused on: defining requirements and systems design, improving the readiness of observing networks and data systems, engaging stakeholders around the Atlantic, as well as strengthening Europe's contribution to the Global Ocean Observing System (GOOS), a major component of the Group on Earth Observations (GEO), its Global Earth Observation System of Systems (GEOSS), and specifically on its emerging "Oceans and Society: Blue Planet" initiative.

AtlantOS contributes to blue growth by merging new information needs relevant to key sectors such as transport, tourism, fisheries, marine biotech, resource extraction and energy with existing requirements. AtlantOS significantly contributes to trans-Atlantic cooperation by integrating existing observing activities established by European, North and South American, and African countries and by filling existing gaps to reach an agile, flexible IAOOS and associated ocean information systems around the Atlantic.

EMERTOX - EMERGENT MARINE TOXINS IN THE NO ATLANTIC AND MEDITERRANEAN: NEW APPRO ASSESS THEIR OCCURRENCE AND FUTURE SC IN THE FRAMEWORK OF GLOBAL ENVIRONMEN CHANGES

EMERTOX aims at mapping the actual situation in emergent marine toxins and the producing organisms, developing new approaches to assess their occurrence and predicting the possible future scenarios in the framework of global warming. The partnership, formed by a multidisciplinary team, will produce a joint research and innovation project that will exploit the complementary expertise of the participants and will create synergies among them. The main objectives are:

- to assess the current situation on potentially harmful algae and bacteria and the relevant emerging toxins in 8 countries belonging to different but geographically connected areas (Mediterranean Sea and North Atlantic);
- to develop innovative approaches to sample, and analyze the producing organisms and their toxins by chemical and biological methods including immunoassays and sensors;
- to estimate different future scenarios based on molecular data (routes of dispersion) and modelling.

PRINCIPAL INVESTIGATOR AT CIIMAR
Vitor Vasconcelos

LEADER INSTITUTION
CIIMAR-UP

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Fatty Cyanos

FATTYCYANOS - FATTY ACID INCORPORATION AND MODIFICATION IN CYANOBACTERIAL NATURAL PRODUCTS

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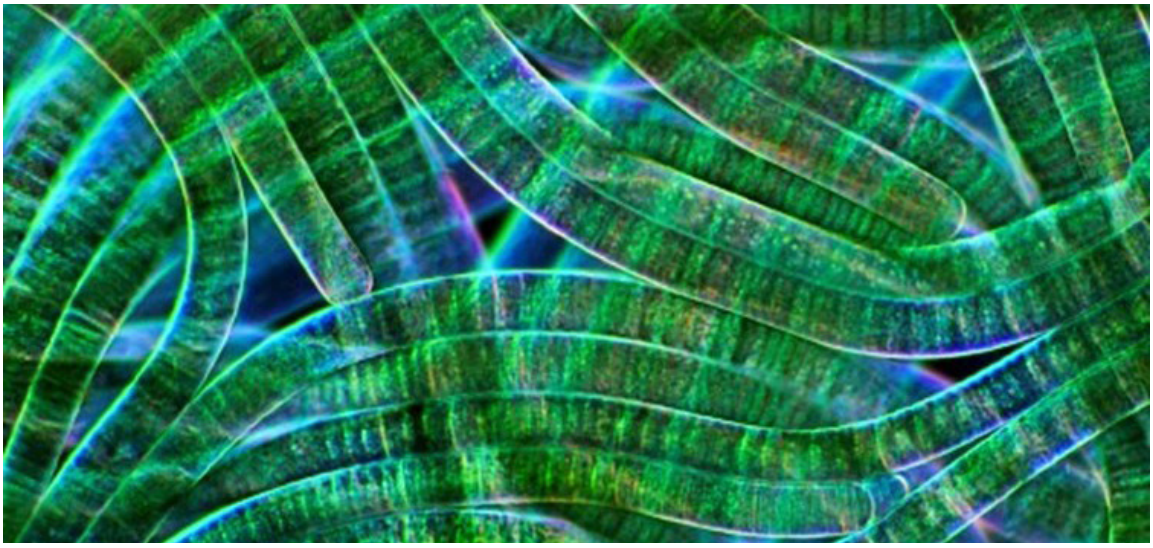
erc
European Research Council
Established by the European Commission

Known, but mostly novel natural products (NPs) are in high demand – these are used in drugs, cosmetics and agrochemicals and serve also as research tools to probe biological systems. NP structures inspire chemists to develop new syntheses, and NP biosynthetic enzymes add to the metabolic engineer's toolbox. The advent of next generation DNA-sequencing has revealed a vastly rich pool of NP biosynthetic gene clusters (BGCs) among bacterial genomes, most of which with no corresponding NP.

Hence, opportunities abound for the discovery of new chemistry and enzymology that has the potential to push the boundaries of chemical space and enzymatic reactivity. Still, we cannot reliably predict chemistry from BGCs with unusual organization or encoding unknown functionalities, and, for molecules of unorthodox architecture, it is difficult to anticipate how their BGCs are organized. It is the valuable, truly novel chemistry and biochemistry that lies on these unexplored connections, that we aim to reveal with this proposal.

To achieve it, we will work with a chemically-talented group of organisms – cyanobacteria, and with a specific structural class – fatty acids (FAs) – that is metabolized in a quite peculiar fashion by these organisms, paving the way for NP and enzyme discovery. On one hand, we will exploit the unique FA metabolism of cyanobacteria to develop a feeding strategy that will quickly reveal unprecedented FA-incorporating NPs. On the other, we will scrutinize the intriguing biosynthesis of three unique classes of metabolites that we have isolated recently and that incorporate and modify FA-moieties. We will find the BGCs for these compounds and dissect the functionality involved in such puzzling modifications to uncover important underlying enzymatic chemistry. This proposal is a blend of discovery- and hypothesis-driven research at the NP chemistry/biosynthesis interface that draws on the experience of the PI's work on different aspects of cyanobacterial NPs.



GENIALG - GENETIC DIVERSITY EXPLOITATION FOR INNOVATIVE MACRO-ALGAL BIOREFINERY

Seaweed, or "macro-algae", has long been recognised as a valuable source of diverse bioactive compounds and has great potential to be used in pharmaceuticals, nutraceuticals and functional foods. However, until now, seaweed has been underexploited in Europe due to the challenges of expanding seaweed biomass production: costs need to be reduced, scales of production need to be increased, quality improved, and seaweed biomass needs to be successfully refined into multiple useful products. If these issues can be addressed, seaweed biomass production could become more economically and environmentally sustainable.

The overall objective of the GENIALG project is to boost the European Blue Economy by designing high-yielding seaweed cultivation systems. GENIALG aims to increase the production and sustainable exploitation of two high biomass yielding species of European seaweed: the brown algae (or sugar kelp) Saccharina latissima and the green seaweed (or sea lettuce) Ulva rigida. GENIALG is the first industry-driven project bringing together pioneering companies in large-scale integrated European biorefineries and experts in seaweed cultivation, genetics and metabolomics to boost the seaweed industry. GENIALG will combine available knowledge in seaweed biotechnology with reliable eco-friendly tools and methods to scale up current small cultivation seaweed operations.

Two pilot pre-industrial seaweed biorefinery plants will provide vital seaweed compounds for a wide range of products such as cosmetics, pharmaceuticals, food and feed ingredients, fine and specialty chemicals, additives and blends such as gels, as well as precursors for biodegradable plastics. GENIALG will help lead the way in the Blue Biotechnology sector in Europe, while addressing social acceptability and competition for maritime space.

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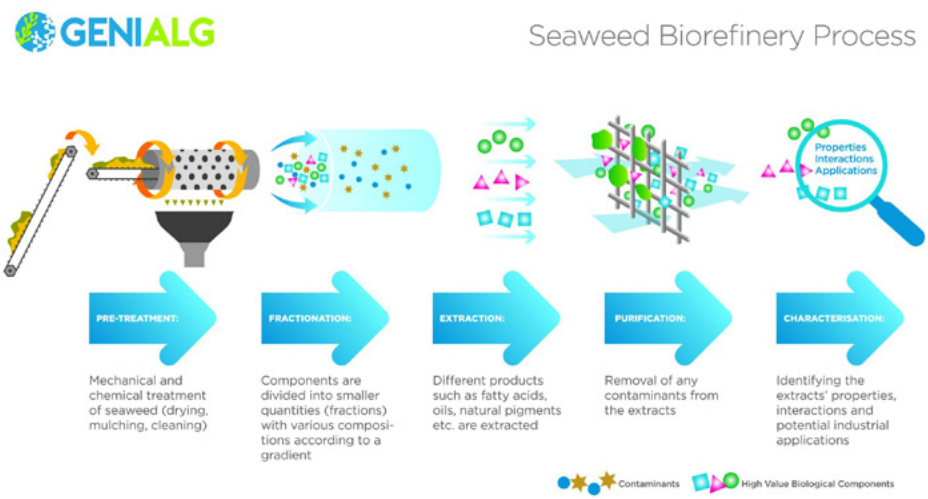

IGNITE - COMPARATIVE GENOMICS OF NON-MODEL INVERTEBRATES

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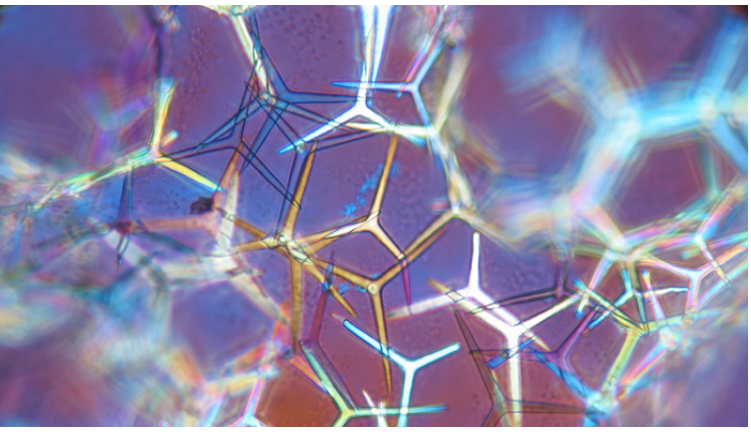
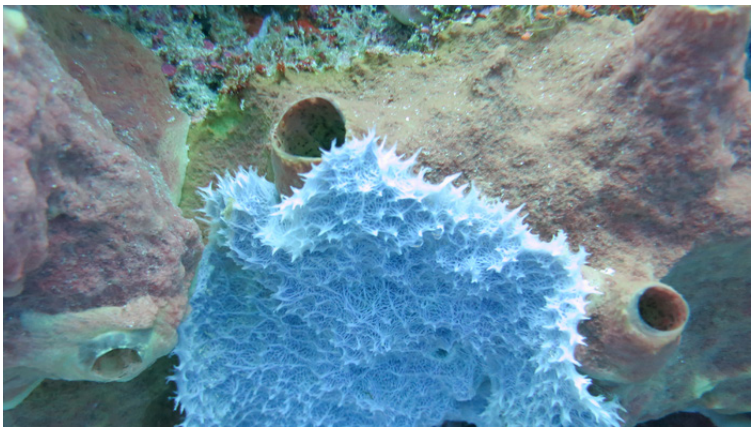
Invertebrates, i.e., animals without a backbone, represent 95% of animal diversity on earth but are a surprisingly underexplored reservoir of genetic resources. The content and architecture of their genomes remains poorly characterised, but such knowledge is needed to fully appreciate their evolutionary, ecological and socio-economic importance, as well as to leverage the benefits they can provide to human well-being, for example as a source for novel drugs and biomimetic materials.

Europe is home to world-leading expertise in invertebrate genomics and IGNITE will gather together this European excellence to train a new generation of scientists skilled in all aspects of invertebrate genomics. We will considerably enhance our knowledge and understanding of animal genome knowledge by generating and analysing novel data from undersampled invertebrate lineages and by developing innovative new tools for high-quality genome assembly and analysis.

The well-trained genomicists emerging from IGNITE will be in great demand in universities, research institutions, as well as in software, biomedical, agrofood and pharmaceutical companies. Through their excellent interdisciplinary and intersectoral training spanning from biology and geobiology to bioinformatics and computer science, our graduates will be in a prime position to take up leadership roles in both academia and industry in order to drive the complex changes needed to advance sustainability of our knowledge-based society and economy.





NOMORFILM - NOVEL MARINE MOLECULES AGAINST BIOFILM: APPLICATION TO MEDICAL DEVICES

In the last decades, an increasing number of antibiotic resistant bacterial pathogens have become an important problem worldwide. This includes also biofilm-associated pathogens, causing prosthetic devices infections, and requiring costly implant replacement. Biofilm formation is especially important in infections related to implants and catheters, once they can promote an immune reaction giving rise to inflammation at underlying tissue. This finally causes a release of the implant, requiring surgical interventions, which entail an increase in antibiotic consumption, together with healthy cost of about 50,000-90,000 per episode.

Taking both problems in account, the search of new antimicrobial agents that will be effective against bacteria in their two stages of life (planktonic and biofilm), is a priority need in the clinical practice. Overall objective of this project is to search for such bioactive compounds from EU microalgae collections, which will be useful in the treatment of these kinds of infections and will be incorporated in the manufacturing of medical prosthetic devices.

The NOMORFILM project combines the two major antibiofilm strategies in use: high throughput screening and coating. NOMORFILM makes use of microalgae as the source of compound libraries. 6,800 Microalgae species coming from different ecosystems and continents will be screened and cultured in order to maximize their potential for production of antibiofilm molecules. Thus, each microalgae species will act as a natural multireactor producing a large number of compounds, and the high microalgae biodiversity will increase significantly the degree of structural diversity of the different families of compounds.

The new lead compounds discovered will be incorporated into functionalized nanoparticles and applied for coating prosthetic devices. These novel bionanomaterials will certainly make a breakthrough to the infection control and thus will make a great impact in the growing field of nanomedicine.

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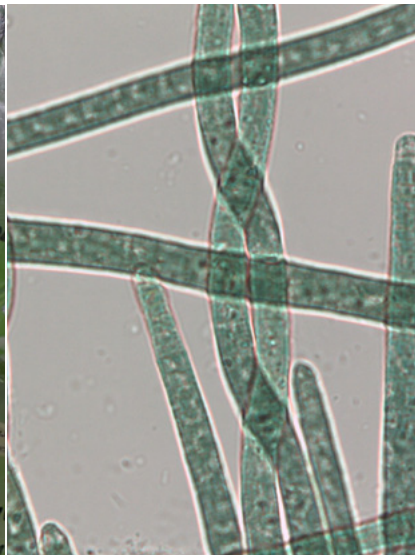

SEAFOODTOMORROW - NUTRITIOUS, SAFE AND SUSTAINABLE SEAFOOD FOR CONSUMER TOMORROW

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SEAFOODTOMORROW aims to strengthen the European seafood production and processing industry by providing validated, commercially viable, and eco-innovative solutions that will improve seafood quality and safety, minimise environmental impacts, and drive socioeconomic development within the seafood industry.

Meeting the growing market need for safe, sustainable seafood is a formidable challenge for the European seafood industry. With European seafood imports presently reaching almost 70%, and global food demands projected to increase by 80-100% by 2050, it is vital to source and validate environmentally friendly and innovative seafood production and processing methods that will reduce European dependency on imports. Such solutions need to underpin seafood security in-line with market demand, whilst maintaining quality and traceability throughout the value chain to support consumer confidence.

Expected Results:

- Validation of nutritional and safety aspects of eco-innovative seafood solutions through certified methodologies carried out by independent partners.
- Easily-accessible database with seafood innovative products validation data for the implementation of a digital traceability tool linked to quality labels.
- Improved understanding of market acceptance of eco-innovative seafood solutions in different European regions and demographics.
- Validation of sustainable solutions from economic and environmental perspectives.
- Benchmark for certification schemes of seafood quality and traceability for industry to strengthen consumer confidence and trust in European seafood.
- Reduction of public health risks and promotion seafood consumption through transparent and responsible communication, dissemination, knowledge transfer and exploitation of the outcomes to the different stakeholders.

SponGES - DEEP-SEA SPONGE GROUNDS ECOSYSTEMS OF THE NORTH ATLANTIC: AN INTEGRATED APPROACH TOWARDS THEIR PRESERVATION AND SUSTAINABLE EXPLOITAT

The objective of SponGES is to develop an integrated ecosystem-based approach to preserve and sustainably use vulnerable sponge ecosystems of the North Atlantic. The SponGES consortium, an international and interdisciplinary collaboration of research institutions, environmental non-governmental and intergovernmental organizations, will focus on one of the most diverse, ecologically and biologically important and vulnerable marine ecosystems of the deep-sea - sponge grounds – that to date have received very little research and conservation attention. Our approach will address the scope and challenges of EC's Blue Growth Call by strengthening the knowledge base, improving innovation, predicting changes, and providing decision support tools for management and sustainable use of marine resources.

SponGES will fill knowledge gaps on vulnerable sponge ecosystems and provide guidelines for their preservation and sustainable exploitation. North Atlantic deep-sea sponge grounds will be mapped and characterized, and a geographical information system on sponge grounds will be developed to determine drivers of past and present distribution. Diversity, biogeographic and connectivity patterns will be investigated through a genomic approach. Function of sponge ecosystems and the goods and services they provide, e.g. in habitat provision, bentho-pelagic coupling and biogeochemical cycling will be identified and quantified. This project will further unlock the potential of sponge grounds for innovative blue biotechnology namely towards drug discovery and tissue engineering. It will improve predictive capacities by quantifying threats related to fishing, climate change, and local disturbances.

SponGES outputs will form the basis for modeling and predicting future ecosystem dynamics under environmental changes. SponGES will develop an adaptive ecosystem-based management plan that enables conservation and good governance of these marine resources on regional and international levels.

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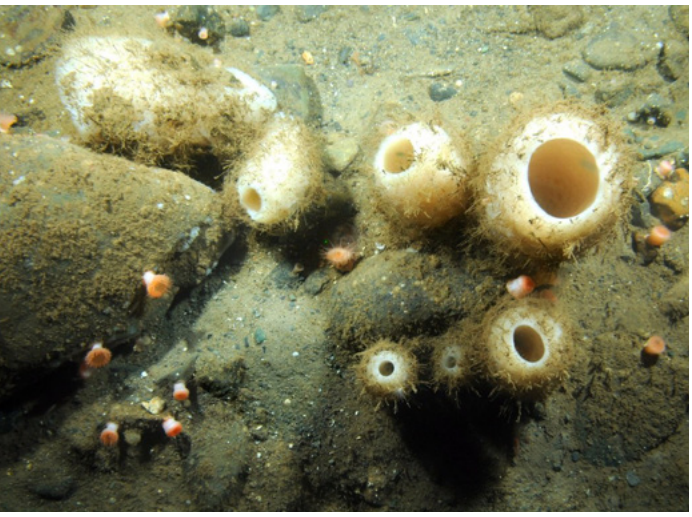

TOXICROP - CYANOTOXINS IN IRRIGATION WATERS: SURVEILLANCE, RISK ASSESSM AND INNOVATIVE REMEDIATION PROPOS

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CIIMAR-UP

Water scarcity and food production are some of the greatest challenges of our times. Fresh water resources in many countries are vulnerable due to their biogeographical and climatic characteristics. Moreover, higher water consumption and higher human impacts in the downstream water bodies is leading to a higher eutrophication with increased incidence and intensity of cyanobacteria blooms and their toxins. The scarcity of clean water resources leads to the compulsory use of water containing cyanobacteria and their toxins in agriculture.

This project aims through Research and Innovation Staff Exchange to map agricultural risk areas of cyanotoxin occurrence in consortium member countries, to access the fate of cyanotoxins in crops as also bioaccumulation in crops and food contamination related to the use of eutrophic waters in irrigation. Environment-friendly, low-cost techniques of water treatment will also be developed, and methods to detect and assess toxicity of cyanotoxins improved. This project seeks to integrate the activities already developed by the partners, and develop new multidisciplinary activities which could lead to the maximization of the research and foster the creation of knowledge in the domains of water toxicology, food safety and eco-technologies of water treatment. The main innovation aspect of this project rely on the multidisciplinary approach to the subject under study, which is expected to contribute to the elucidation of the minimum quality requirements applied to the irrigation waters. The integration of countries with different weather regimes and agricultural practices in one single project will constitute a unique approach to this subject and to consolidate the transnational collaborations. The expected results will be delivered as guidelines for water management and treatment and will contribute to the implementation of a more sustainable and safe agriculture in Europe and worldwide.

ACCESS2SEA - NEW OPPORTUNITIES FO COMPETITIVE AND SUSTAINABLE OWT ATLANTIC AREA

Marine aquaculture (fish, shellfish, algaculture) is a leading sector of the Atlantic Area blue economy that relies on an important tradition in many EU countries and that is economically relevant in many of its coastal areas. As only 10% of Atlantic shore seafood is aquaculture-sourced there is a great opportunity to increase its production in a sustainable way. Access2Sea aims to improve the attractiveness of the Atlantic shore for aquaculture SMEs by enabling and providing an easier access to new business opportunities. Its main objective is to enhance the exploitation and preservation of the Atlantic Area's natural assets:

- By unlocking the existing barriers (legal/regulatory, technological, existence of suitable areas in costal zones, social acceptance) to provide the industry with technical solutions to give aquaculture businesses access to shore.
- By enabling onshore production.
- By disseminating existing and new solutions and providing support to the aquaculture SMEs, to fix them or attract them to the Atlantic Area This way it is expected to enable SMEs to assess spatial opportunities to settle in the Atlantic shore new aquaculture business, supporting them in exploiting the natural assets in a sustainable way as well as in improving its performance through the improvement of their business model and be better accepted by local communities It is also expected that Access2Sea improves the co-operation between stakeholders, business support organisations, research institutes, national and regional administrations and local councils facilitating the innovation and knowledge transfer in Aquaculture sector.

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BLUEBIOLAB - TRANSBOUNDARY MARINE BIOTECHNOLOGY LABORATORY

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The general objective of the BLUEBIOLAB project is the creation of a cross-border laboratory of scientific excellence in the area of marine biotechnology that boosts the capacity to develop excellence in R&D, reinforces and internationalizes the R+D+i capabilities of the territory, optimize the use of research infrastructures and contribute to achieving the expected results in the RIS3, RIS3T and in the blue growth strategy.

In order to achieve this global BlueBioLab aims to:

- Support the consolidation of biotechnology as a fundamental tool for the study and valorization of marine biological resources, and the sustainable exploitation of marine biological resources.
- To pool the existing infrastructures, integrated in the Transboundary Marine Biotechnology Laboratory, in line with the common strategic objectives of the Regions.
- Develop actions to support talent and promote the mobility of researchers, including
- The programming of training activities.
- Create networks of knowledge and joint work, with actors of the scientific system linked to marine biotechnology on both sides of the border, in order to increase critical mass and scientific excellence.
- Promote the internationalization and integration of scientific infrastructures linked to marine biotechnology in international R+D+i networks.

Therefore, BLUEBIOLAB aims to establish the resources and mechanisms to strengthen and stimulate internationally strategic research lines for the territory and for the marine productive sector, promoting innovative capacity and territorial competitiveness.

CVMAR+I - INDUSTRIAL INNOVATION UNDER THE CONTEXT OF BIOTECHNOLOGICAL VALORIZAT MARINE RESOURCES AND BY-PRODUCTS

Industrial innovation through specific collaborations between enterprises and research centers in the context of marine biotechnological valorization - CVMar+i aims to promote industrial innovation around marine biotechnology by the proposal of new products based in marine compounds. This will be done by a synergic effort of enterprises and research enters in the transboundary area, benefiting from the complementarity of the partners.

The project will benefit from former POCTEP projects implemented by partners of this Consortium that can now be potentiated and without who's the innovation proposed would not be possible. We will develop tools that allow the enterprises of the region to increase their investment in innovation, reinforcing the role of the region in the Blue Economy. This is in alignment with RIS3T Galicia-North Portugal, developing products based on marine resources and sub-products in the areas of health (tissue regeneration and pharmacology), food and industrial applications.

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CYANOBESITY - CYANOBACTERIA AS A SOURCE BIOACTIVE COMPOUNDS WITH EFFECTS ASSOCIATED MORBIDITIES - SCREENING MOLECULAR MECHANISM

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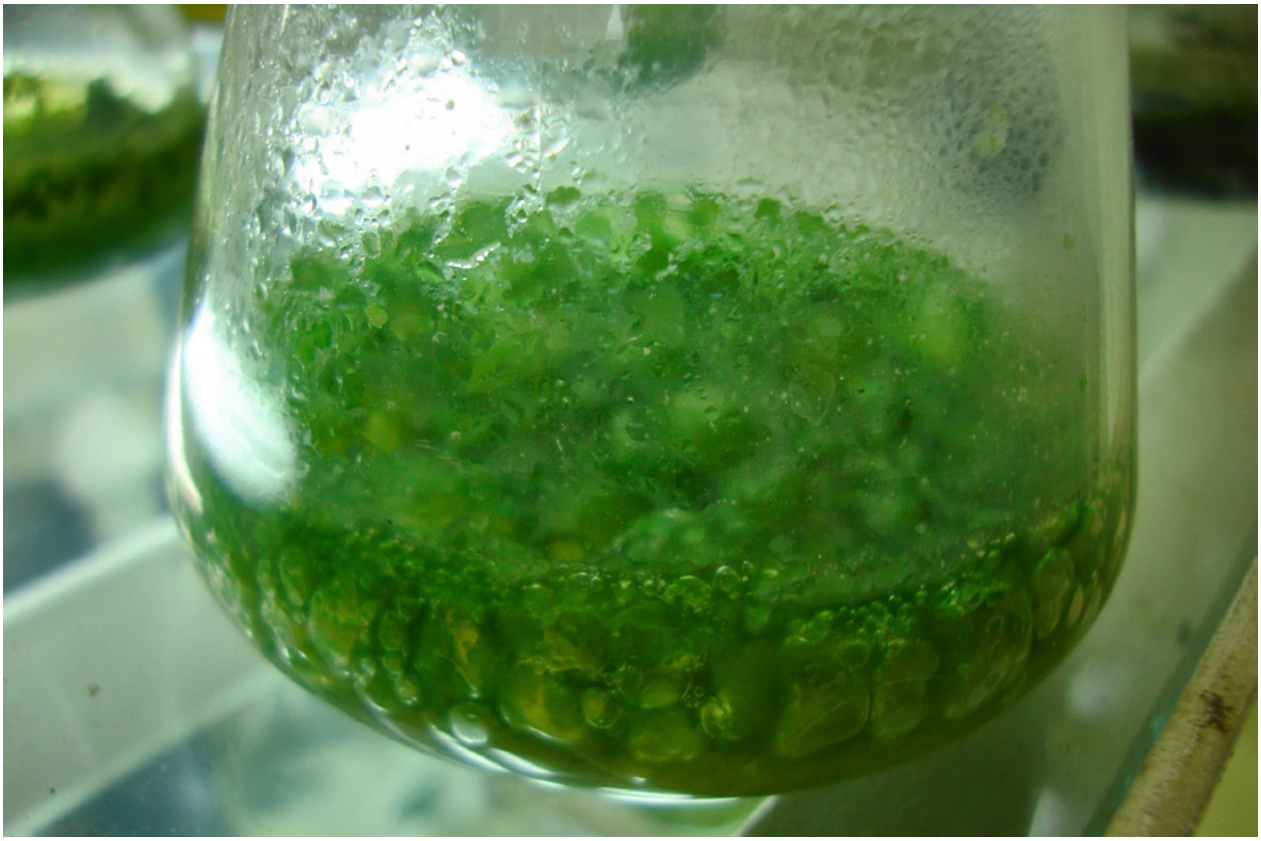
An urgent demand for new anti-obesogenic compounds is present, and marine cyanobacteria promise to be an excellent source for natural-derived molecules and novel nutraceuticals. Some strains of cyanobacteria are commercially available for consumption due to their beneficial properties to human health. Preclinical studies have been performed in various animal models and demonstrated hypolipidemic activities in rats and mice, lowering hepatic cholesterol and triglyceride levels.

In the proposed project, marine cyanobacterial strains of a culture collection will be screened for beneficial properties towards obesity and obesity-related comorbidities (obesity, fatty liver disease, diabetes, appetite and hyperlipidaemia) and the chemical structure will be elucidated. By applying an innovative biotechnological platform, the interactions from oral administration to the blood stream will be analyzed, and with different target tissues in vitro. A proof of concept regarding the improvement of metabolism will be performed in a relevant physiological model.

The general aim of the project is to develop novel nutraceuticals that have the potential to improve the quality of life for millions of people worldwide.



EBB - EUROPEAN MARINE BIOLOGICAL RESOURC CENTRE BANK

The coastal regions in Europe through their S3s acknowledge the potential of Marine Biological Resources (MBRs) and especially blue biotechnologies (technological applications that use marine biological systems, living organisms or derivates to make or modify products or processes for specific uses, as defined by the Convention on Biological Diversity) to generate and promote employment, economic and regional development, contributing to growth and cohesion.

MBRs are one of the main services provided by marine ecosystems. Culture collections of MBRs are key to the systematic research of interesting and unique genes, bioactives and biomaterials from the marine environment with potential for commercial development and job creation in coastal regions.

The EMBRC BioBank (EBB) will set the basis for the common operation of the distributed marine biobanking facilities of the European Marine Biological Resource Centre (EMBRC) by:

- Setting up technological tools and common procedures for the ex-situ maintenance of MBRs along the whole phylogenetic tree of life; and:
- The application of best practice guidelines throughout the EBB collections to ensure compliance with regulatory framework that sets the rules on access and benefit sharing (ABS) on the use of marine bioresources for commercial and academic research.
- The development of innovation use cases involving industrial end users and administrations at the national and European level with competence in regulating ABS for the production of a set of best practice guidelines for ABS compliance when using MBRs for innovation purposes.

The EBB will ultimately facilitate sustainable access to Atlantic marine biodiversity, its associated data, and extractable products for local and international academia and industry users.

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MARINAQUA4ALGAE - IMPROVING BIO-UTILISATIO MARINE ALGAE AS SUSTAINABLE FEED IN TO INCREASE EFFICIENCY AND QUALITY AQUACULTURE PRODUCTION

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Global population growth and increase in living standards will push up the demand for fish-derived protein in the future. However, resource scarcity (feed, water and energy), environmental impacts, and changes in climate and growing conditions can seriously hamper aquaculture that supplies a significant proportion of human food. New sustainable protein and lipid sources and improved technologies to increase bio-availability of existing sources will be needed to ensure adequate supply of aquafeeds to ensure growth of aquaculture. On the other hand, the growth of the industry has caused environmental concerns. Interestingly, aquaculture effluents can be an excellent medium for algal growth, although they are not usually reused since they contain residual organic compounds, minerals and other micro-pollutants. MARINALGAE4aqua is an innovative research project that targets the development of strategies to increase efficiency of important European farmed fish species (Atlantic salmon and European sea bass) and reduce the environmental impact using micro- and macro-algal biomass as feed ingredients by:

- Culturing marine algae under optimized technological processes to remove organic compounds and minerals from fish farm effluents, and producing high value products for aquafeeds while recycling nutrients, thus improving the water body quality and reducing the environmental impact.
- Identifying novel feed additives to improve fish digestive capacity and nutrient metabolism upon using the selected algae.
- Improving fish growth and end product quality, reducing time to slaughter and providing a safe and healthy food item with wide consumer acceptance.

MARINALGAE4aqua aims to tackle the sustainability challenges of the aquafeed industry by developing cost-effective and resource-efficient alternatives to FM and FO. MARINALGAE4aqua is innovative and cutting edge - it adopts a multidisciplinary approach, integrating molecular (genomics, proteomics) and traditional tools to address physiological, nutritional and environmental challenges in modern aquaculture – providing state-of the-art knowledge to identify strategies to increase efficiency of farming important European fish species.

MarRISK - COASTAL ADAPTATION TO : CHA KNOWING THE RISKS AND INCRE ESILI

MarRISK aims to ensure an intelligent and sustainable growth of the Galician and Portuguese coastal zones through evaluation of the coastal risks that are most important in terms of climate change scenarios.

Floods, intensification of extreme events, toxic algae blooms and coastal erosion are examples of the risks that shall be analysed in order to improve the resilience of traditional economic sectors and of other, emerging sectors, like marine renewable energies.

This way, the adaptation of the cooperation region to potential disasters will be improved, and applications and services to guarantee a coordinated response will be developed, given that environmental risks require a cross-border approach.

MarRISK shall evaluate coastal climate evolution, at a better resolution than is presently done, and will enable monitoring and warning systems. MarRISK will deliver decision support tools to public authorities, the productive sector and the general public, to improve coastal management.

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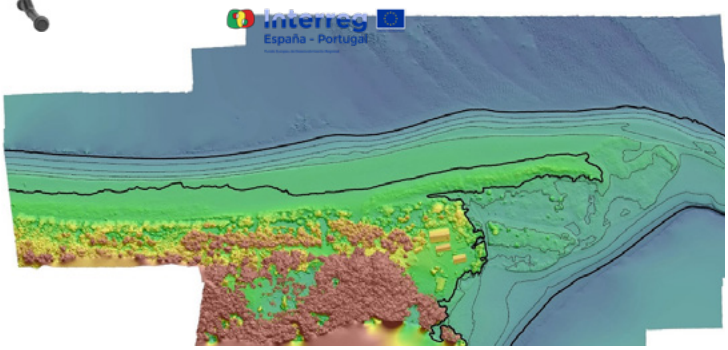

MIGRAMIÑO-MINHO - PROTECTION AND CONSERVATION OF MIGRATORY FISH IN INTERNATIONAL SECTION OF MINHO RIVE TRIBUTARIES

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The MIGRA MIÑO - MINHO project proposes as main challenge to improve the protection and sustainable management of the natural boundary area that forms the sub-basin of the international section of the Minho River

MIGRA MIÑO - MINHO aims to improve the protection and conservation of river habitat of the sub-basin of the river Minho, from the Frieira Dam (province of Ourense) until its mouth, with actions to improve the conservation status of river beds and migratory fish species present in the Minho River and its tributaries.

In addition to the environmental component, this project aims to solve the socio-political aspects of protecting and improving the natural state of the international river Minho, through the conservation of one of the most threatened key elements - the migratory fish species. This will contribute to the preservation and exploitation of traditional fishing activities, as well as the improvement of sustainable socio-economic development of cross-border territory, by of commercial activities such as fishing, tourism or energy sector.

MiningImpact2 - ENVIRONMENTAL IMPA RISKS OF DEEP-SEA MINING

The MiningImpact project gathers 32 partners from 10 different countries and will set up a comprehensive monitoring programme of the impact of an industrial test to harvest manganese nodules in the Clarion Clipperton Zone, by the Belgian contractor DEME-GSR. Polymetallic nodules are mainly composed of manganese and iron oxides, but also contain economically valuable metals, such as nickel, copper, cobalt, lithium, and rare earth elements.

The DEME-GSR collector test intends to harvest nodules in approx. 0.1 km^2 large areas of the seabed in the Belgian and the German contract areas of the Clarion Clipperton Zone in the Eastern Equatorial Pacific Ocean. Within the lifetime of MiningImpact researchers are planning two cruises to the test areas in order to constrain the spatial and temporal dynamics of the sediment plume created by the mining test and impact on the abyssal environment.

The project will further study regional connectivity of species in the deep-sea and their resilience to impacts, and the integrated effects on ecosystem functions, such as the benthic food-web and biogeochemical processes.

In this context, key objectives of the project are:

- To develop and test monitoring concepts and strategies for deep-sea mining operations
- To develop standardization procedures for monitoring and definitions for indicators of a good environmental status
- To investigate potential mitigation measures, such as spatial management plans of mining operations and means to facilitate ecosystem recovery
- To develop sound methodologies to assess the environmental risks and estimate benefits, costs and risks
- To explore how uncertainties in the knowledge of impacts can be implemented into appropriate regulatory frameworks

MiningImpact will be able to further close existing knowledge gaps and reduce uncertainties on the environmental impacts of deep-sea mining of polymetallic nodules. The project will specifically work towards policy recommendations and has reached out to the International Seabed Authority to become a partner in the project. It will further contribute to the preparation of environmental impact assessments (EIAs) for future European deep-sea pilot mining tests that are requested by the ISA, and to the Horizon2020 technology development projects Blue Atlantis and Blue Nodules.

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MOSES - MARITIME, OCEAN SECTOR AND ECOSYSTEM SUSTAINABILITY: FOSTERIN GROWTH IN ATLANTIC INDUSTRIES

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The MOSES objectives of the MOSES project is to examine the 'blue' growth path for the sustainable development of the major sectors operating in the Atlantic space as envisaged in the Atlantic Action Plan. MOSES will quantify blue growth for key marine sectors and develop a common methodology for the quantitative assessment of sectoral pressures on the marine environment and the vulnerability of marine and coastal areas. The methodology will contribute to the joint implementation of integrated marine industry sustainability assessment toolkits across the Atlantic region.

To achieve these aims the consortium will work on four major blocks:

- Evaluate the evolution of the Atlantic marine sectors using the previous Atlantic Area project MARNET framework;
- Examine the sectoral pressures on the Atlantic marine environment in order to identify best management practices;
- Assess the vulnerability of coastal marine areas/features to marine sector to the identified sectoral pressures;
- Using case studies, develop sustainable transition plans to blue growth for a number of key marine sectors and test policies for how well they manage activities to meet Marine Spatial Planning and Maritime Strategy Framework Directive goals.

NANOCULTURE - RISK ASSESSMENT AND MITIGATION OF THE PRESENCE OF ENGINEERED NANOMAT IN ATLANTIC AQUACULTURE

The objective of NANOCULTURE is to advance in knowledge, risk assessment and mitigation of environmental presence of the most-used engineered nanoparticles (ENPs) in market products: titanium dioxide (TiO2) and silver (Ag).

As metallic NPs present important improvements in diverse industrial applications, the frequency of their application is growing exponentially. However, the studies of risks and mitigation of their presence in the environment are lagging far behind the rate of utilization, which represents a critical environmental and safety challenge in the Atlantic Area.

The focus of the project are the aquatic ecosystems related to aquaculture, a sector of high economic relevance in the Atlantic Area, and specifically organisms used for human consumption (cultured fish, mollusks, seaweed, sea urchins, etc.). NANOCULTURE will investigate the effects of ENPs on aquaculture products, their bioaccumulation, and assess its impact on human intake.

In order to carry out this project, collaboration of all the participating centres is essential to ensure a wide range of industrial (aquaculture professionals) and scientific profiles (analytical chemists, physical chemists, molecular biologists), as well as providing infrastructure to run the analysis and deliver real samples from aquaculture plants.

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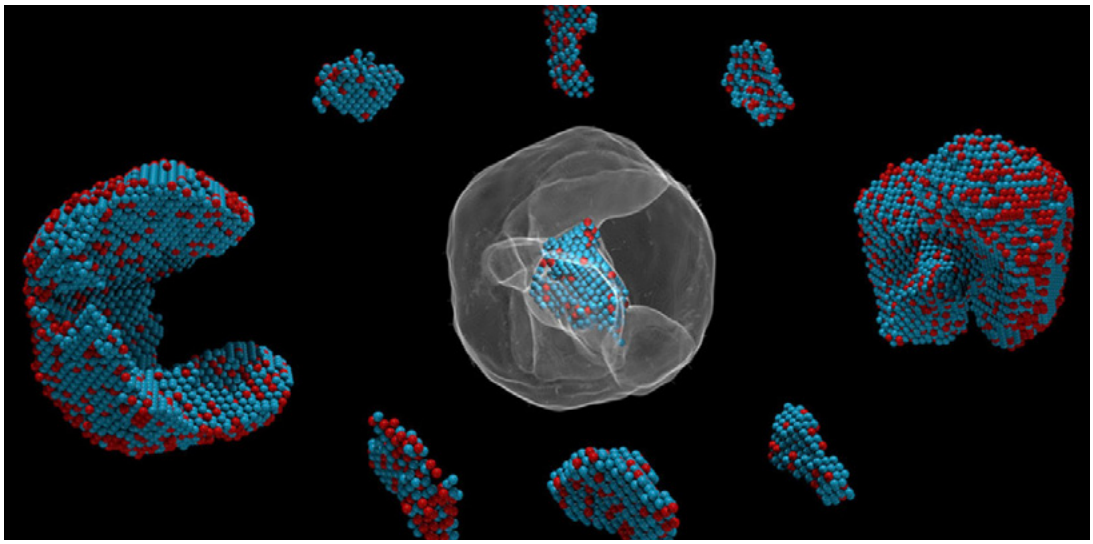

NETTAG - TAGGING FISHING GEARS AND ENHANCING ON BOARD BEST-PRECTICES PROMOTE WASTE FREE FISHERIES

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NetTag project aims to reduce and prevent marine litter derived from fisheries, bringing together scientists, engineers and the fisheries industry.

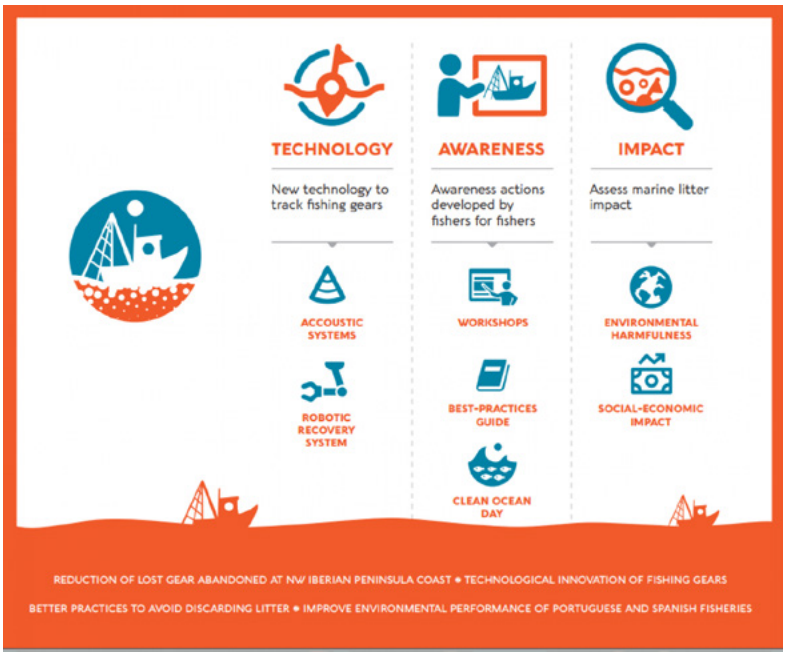
NetTag approach combines two different types of preventive measures:

- new technology to prevent lost gears;
- awareness actions to promote best-practices for on-board waste management

NetTag will develop new technologies to track fishing gears in case gears got lost, fostering a reduction of lost gears. The technology will include low cost, miniature and environmental-friendly acoustic tags and acoustic transceivers for uniquely localization (with fisher's personal ID) of lost gear and an automated-short-range robotic recovery system. Participant fishers will, then, evaluate the new technology in a dedicated demonstrative field action.

Awareness actions, developed by fishers for fishers, will be an innovative strategy to engage the fishing industry, increasing fishers' willingness to act and adopt better practices on-board to reduce marine litter from fishing vessels. In parallel, we will assess the reduction of environmental impact of lost gears as a new pollutant. We will also evaluate the cost-efficiency of the proposed solutions, estimating the economic viability of their implementation for reduction of marine litter derived from fisheries.

The project is based on synergistic activities between fishers and scientists to pilot innovative solutions to tackle the urgent need of reduction and prevention of marine litter.



NOR-WATER - EMERGING POLLUTANTS IN THE WATE OF GALICIA-NORTHERN PORTUGAL: NEW TOO RISK MANAGEMENT

This project is aimed at identifying the main emerging pollutants (EPs) and their sources in the hydrographic basins of northern Portugal and Galicia. In addition, it is focused on developing, implementing and harmonizing a set of innovative multidisciplinary tools to minimize the impact of EPs on these water bodies. The project will also contribute to the improvement of water quality and will enhance the implementation of the Water Framework Directive (WFD) in this cross-border area.

The four main aims of NOR-WATER are:

- Identifying the main emerging pollutants (EPs), including fire-related runoff compounds in rivers, as well as their sources and transformation products (TPs), in the hydrographic basins of northern Portugal and Galicia.
- Developing new analytical methods and ecotoxicological tools, as well as prediction and modeling tools, for those EPs which pose the highest potential risk to ecosystems.
- Assessing the efficiency of wastewater treatment plants (WWTPs) in removing EPs, as well as developing tools to improve treatment systems and increase their efficiency in EPs removal.
- Transferring the results to the entities that are responsible for the implementation of the WFD in the management of inland and coastal water bodies, as well as to the technology companies in charge of water treatment. In parallel, cross-border activities focused on environmental education are intended to be carried out, thus contributing to a behavioral change in civil society.

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RASORGMAT

RASORGMAT - DEVELOPING WATER TREATMEN TECHNOLOGY FOR LAND-BASED CLOSED CONTAINMENT SYSTEMS (LBCC-RAS) TO EFFICIENCY BY REDUCING THE NEGATIV ORGANIC MATTER

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This project aims to develop strategies and water treatment technology for removal of particulate organic matter (POM) in land-based closed containment recirculation systems for aquaculture (LBCC-RAS). This will increase efficiency by reducing waste products, off-flavour compounds and carrying capacity of bacteria. Removal of POM is the key to improve the production and product quality of fish produced in LBCC-RAS. Organic matter is the determining factor of the amount of heterotrophic bacteria that can be sustained in the LBCC-RAS. Nitrification efficiency of the bio-filter is affected by the competition for space and oxygen with heterotrophic bacteria.

In addition, high amounts of organic matter reduces the efficiency of both UV and ozone disinfection. Heterotrophic bacterial degradation affect the consumption of O_2, the production of CO_2 and ammonia, contribute to water colour and bacteria producing off-flavour compounds, eventually reducing the value of fish and caviar.

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The effects of high and low removal efficiency of organic matter on the effects on dissolved CO_2, bacteria and off-flavour prevalence will be investigated. Both tank dynamics and water treatment in the RAS loop will be used to obtain high removal efficiency. Multiple drains with optimized geometry and hydraulics will be designed for early particles collection and to be used as a strategy in combination with techniques such as advanced membrane filtration.The effectiveness of a membrane is dependent on several ambient conditions and fouling is a challenge for membrane performance. We will aim to adapt the membrane technology, optimize the operation and maintenance in a LBCC-RAS. A close collaboration with fish-producing companies safeguard that the project is applicable for commercial aquaculture.

REWATER - SUSTAINABLE AND SAFE WATER MANAGEMENT IN AGRICULTURE: INCREASING EFFICIENCY OF WATER REUSE FOR CROP GRO WHILE PROTECTING ECOSYSTEMS, SERVICES CITIZENS' WELFARE

Water is a natural resource vital for social wellbeing and agriculture economy. Yet, during the past decades, geographic and climatic features, as well as active release of man-made chemicals, have been driving to water depletion and a loss of quality. This creates a major need for water reuse in increasingly situations, such as in agriculture. Wastewater treatment plants (WWTP) are crucial sources for water reuse, since they promote the removal of unwanted substances. However, one of the major challenges restricting wastewater (WW) reuse is the presence of emerging contaminants (ECs), as they are usually not properly managed by conventional treatment technologies. These technologies still need urgent innovative development and integrated solutions, in order to promote sustainable water reuse and safety.

REWATER proposes to develop an innovative joint research and application of technologies producing a final integrated solution for reuse of WW for agricultural purposes, and their economic and environmental evaluation with a Life Cycle Assessment. This systematic approach, inspired in technological, organizational and bio-based economy, will minimize negative impacts of WW reuse in the environment, decreasing the undesirable introduction of ECs in agriculture and aquatic systems and reducing their spread within the food chain.

REWATER provides a unique interdisciplinary expertise of consortium scientific partners and SMEs specialized in WW treatment. Work programme will include tuned improvement or development of: 1) biosensors for in-field rapid and selective detection of micropollutants and their corresponding metabolites and/or degradation products (MMDs), 2) treatment processes for MMDs removal through integration of electrochemical and biological technologies, 3) ecotoxicological tools to evaluate treated water for reuse and develop expeditious surveillance, and 4) analytical monitoring, scaling-up and environmental/economic assessment. REWATER will provide tools and solutions contributing to WW reuse, environmental health, and economic and social welfare. Interaction among consortium partners, allied to stakeholders of water industry, will enhance collaborative research and innovation, as well as international cooperation in the water sector, during and beyond REWATER lifespan.

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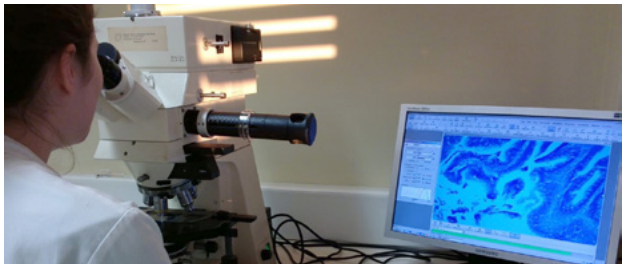

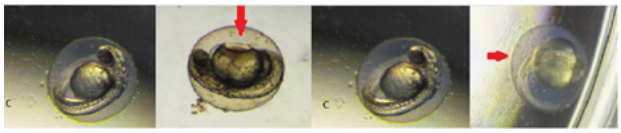

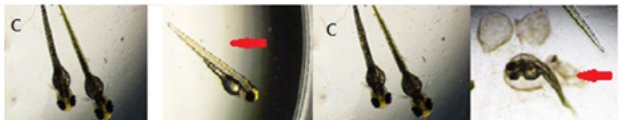

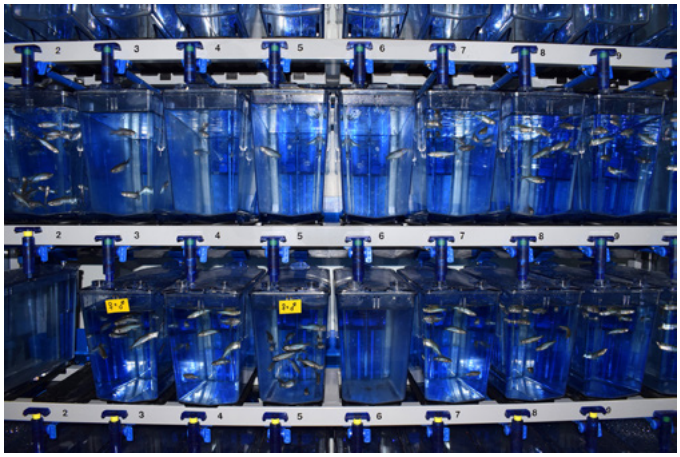

SHERPA DO MAR - EUROREGIONAL PLATFORM T PROMOTE COMPETITIVENESS IN THE MA MARITIME FIELD THROUGH THE PROMOT TECHNOLOGY-BASED COMPANIES

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Sherpa do Mar intends to boost the creation and consolidation of new knowledge-intensive business activities in the marine-maritime environment, favoring job creation and increasing business competitiveness through:

- Creation of a transboundary ecosystem of innovative entrepreneurship in the marine-maritime context.
- Creation of companies in the marine-maritime sector with high added value through the enhancement of technological-scientific synergies.
- Improving the competitiveness of pre-existing companies through the drive for innovation.
- Sherpa do Mar will implement the following activities:
- Sectoral diagnosis and identification of the actors that will form the Euro-regional Sherpa do Mar platform.
- Design of a new methodology for monitoring and boosting innovative technology-based companies: Sherpa Journeys.
- Scientific-technical monitoring and knowledge transfer promotion program.
- Implementation of the Sherpa Journeys methodology for valuing innovative technology-based business projects.
- Selection and enhancement of 12 innovative technology-based business projects in the marine-maritime sector.
- Itinerary for the improvement of the capacities of 20 companies in the sector, stimulating the link with transfer entities, boosting R+D+i and sustainable growth.

SPILLESS - FIRST LINE RESPONSE TO OIL SPILLS BASED ON NATIVE MICROORGANISMS COOPERATION

SpilLess aims to implement an innovative 'laboratory' (Blue Lab) to pilot new and viable solutions to tackle with one of the most damaging sources of maritime pollution: oil spills. These solutions will be based on the production of native microbial consortia with bioremediation capacity, and the adaptation of unmanned and autonomous vehicles for in-situ release of autochthonous microorganisms (bioaugmentation) and nutrients (biostimulation).

This Blue Lab will have a multidisciplinary profile. It will be established by a team of young scientists, and supported by senior researchers from three institutions (CIIMAR, INESC TEC and the University of Vigo) and experienced business tutors from three private companies (ACSM, Biotrend and MARLO). Besides, the R&D team will be advised and mentored by a stakeholder's platform that includes several public and private entities. SpilLess will be implemented in the region of the Atlantic Ocean, with potential for transferability to other regions facing similar challenges.

This solution will be environmental-friendly, will be able to act as fast first line response with low time to reaction and mission costs, will set-up holistic pollution combat and will provide environmental monitoring.

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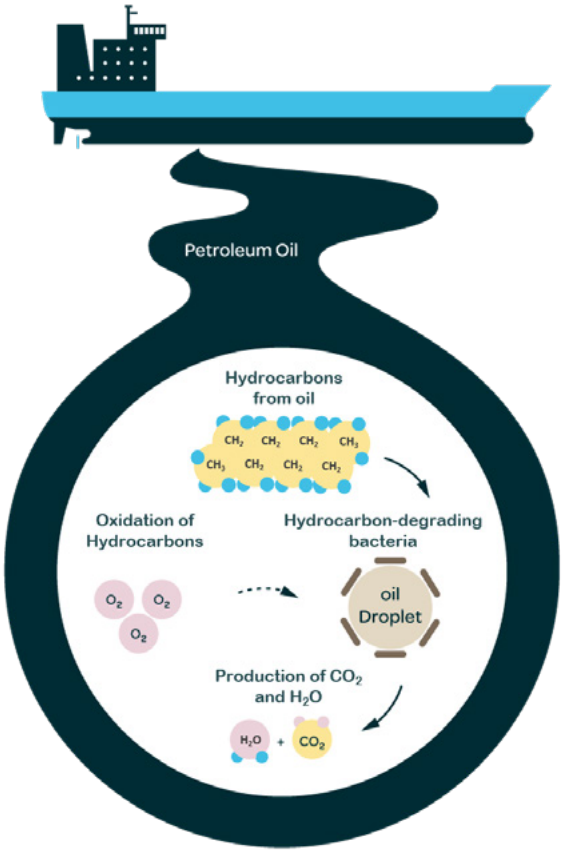

SUDOANG - PROMOVER A GESTÃO CONCERTADA E SUSTENTÁVEL DA ENGU ÁREA SUDOE

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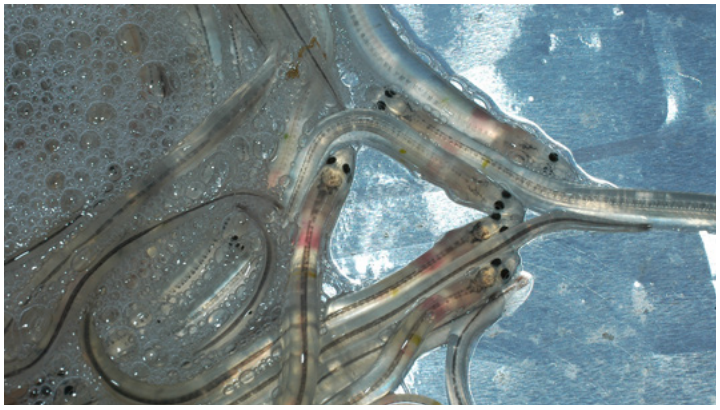
The abundance of the European eel (Anguilla anguilla) has been declining in the last 50 years and is outside safe limits. For this reason, the European eel has been included in the IUCN Red List of threatened species.

The SUDOANG project arises to try revert several conditions that restrain the recovery of the eel stock, namely:

- The lack of data and the variability of assessment methods limit the scope and effectiveness of the population monitoring.
- Although the European eel is a single fish stock, it is assessed and managed as separate units.
- There is a lack of dialogue and common strategies between the stakeholders (scientists, managers, fishermen, NGOs) and at different levels local / regional / national).

In order to carry out the project, a partnership has been built that includes the entire value chain related to the management of the eel in the SUDOE area: 10 research centers and 27 associated partners including local, regional and national managers, NGOs and associations of fishermen.



MobFood - MOBILIZING SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE IN RESPONSE T CHALLENGES OF THE AGRI-FOOD MARKET

MobFood project is the result of an open debate carried out by several agents from the agribusiness that aims to find the right path to promote the competitiveness of the national food industry in an organized and integrated manner. It will be strategically undertaken with a close collaboration between scientific institutions and private companies grounded on economic growth measures based on R&D, innovation and technologies for new products, services and processes achievement with direct effects in all value chain. The principal aim is to make the sector totally sustainable, resilient, open, safer and with an effective utilization of resources being consumer-driven.

The main goals will be attained through the implementation of the solution in three fundamental principles: "Food Safety and Sustainability", "Food for Health and Well-being" and "Safe Food and Quality", embodied in the research and development for several processes, products or services.

The join-venture is composed by 47 entities that represent all Portuguese agribusiness, with participant companies from different agroindustry subsectors. R&D entities participants will bring the ability for a complete approach of the different areas of key knowledge for an acute development of the Portuguese food industry.

The MobFood project is organized in 9 areas of intervention: Emerging Technologies, Resources Valorization, Sustainable Packaging, Nutrition, Health and Well-being, Quality and Food Safety, Authenticity and Traceability of products, Logistics, Consumer and "Coordination, implementation, dissemination and exploitation of results".

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