Annual Report 2023

CEAB
Centre d'Estudis Avançats de Blanes

CEAB 2023

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CEAB
Centre d'Estudis Avançats de Blanes

ANNUAL REPORT 2023

"We are a scientific research center focused on aquatic biology and ecology"

"We work both in the Mediterranean region and in other geographical areas at the national and international levels"

"Our research employs a wide range of methodological approaches, from data collection and experimentation in situ and in the laboratory to mathematical modeling"

"We conduct rigorous, creative, cross-cutting, and multidisciplinary research."

Posidonia oceánica. Author: Laura Carrau

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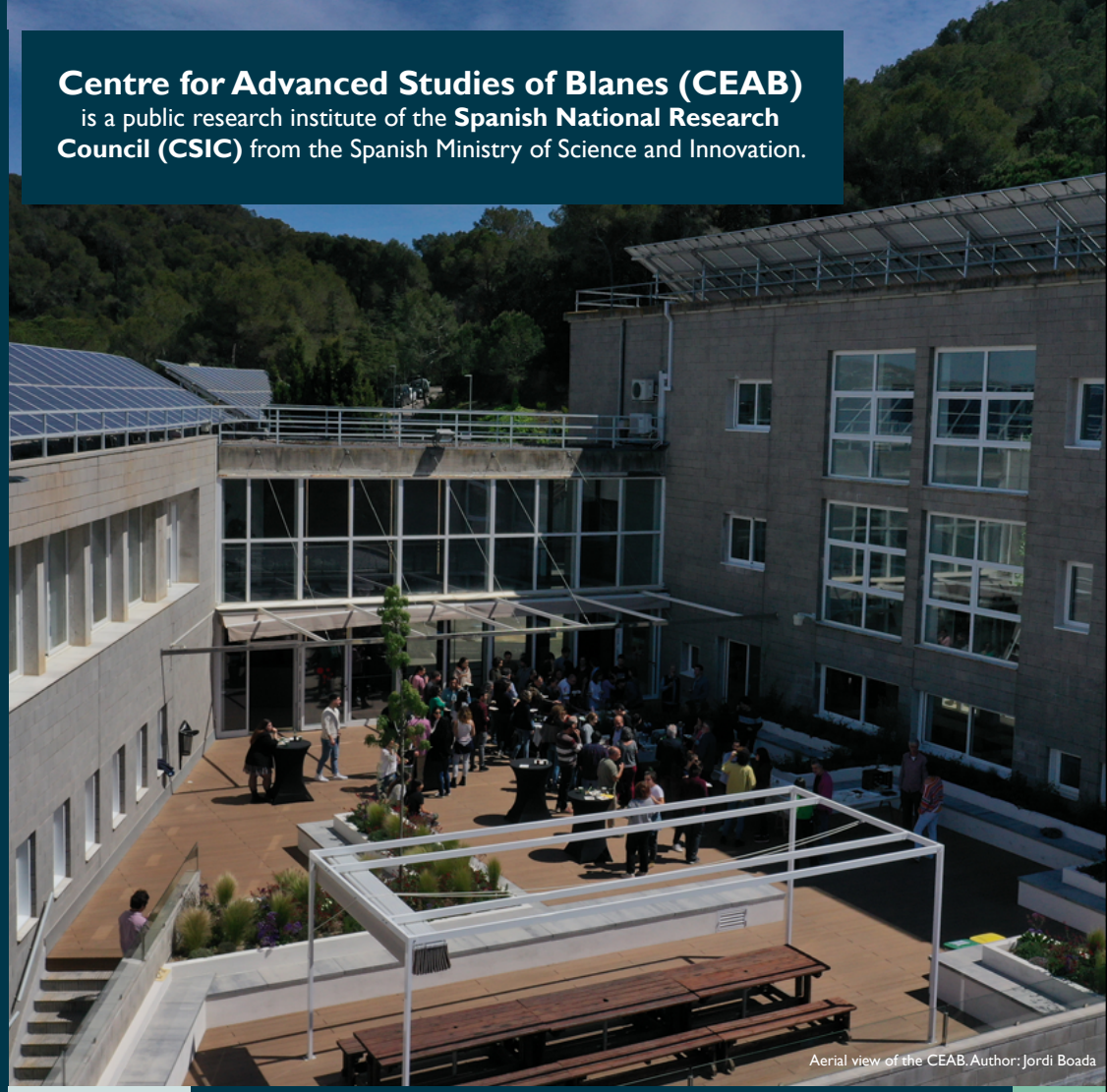
Centre for Advanced Studies of Blanes (CEAB)
is a public research institute of the **Spanish National Research Council (CSIC)** from the Spanish Ministry of Science and Innovation.



Aerial view of the CEAB. Author: Jordi Boada

Launched in October 1985 as a multidisciplinary research center, the current research mainly focuses on the Ecology and Biodiversity of marine and freshwater ecosystems.

The CEAB is formed by **two research departments** dedicated to marine biology, limnology and ecology:

- Department of Continental Ecology
- Department of Marine Ecology

The research staff is divided in **seven research groups.**

The CEAB is an internationally recognised research institute on aquatic sciences and integrative ecology.

The **CEAB aims** are:

- Generate new knowledge in the field of **biodiversity, functioning, health and conservation of aquatic ecosystems.**
- Application of this knowledge to the rational use and management of **natural resources** and the prediction of ecosystem responses to environmental changes.
- Work with a wide range of environmental studies and approaches, from **biochemical and genetic composition to dynamics of populations and ecosystems.**
- Development of a creative and technically sound research with **solid conceptual backgrounds** on marine and freshwater biology and ecology.

DIRECTION

Marc Rius
Director
Scientific Researcher

VICEDIRECTIONS

Eugènia Martí
Deputy Director
Scientific Researcher

Marc Ventura
Deputy technical director
Scientist

DEPARTMENT HEADS

Helena Guasch
Head of Continental Ecology Department
Scientist

Emma Cebrian
Head of Marine Ecology Department
Scientist

MANAGEMENT

Olga Gallardo
Head of Administration
Manager

Marine benthic community, Lloret de Mar (Costa Brava). Author: Marc Rius

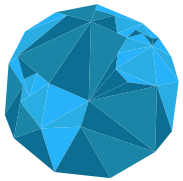
Marc Rius
Director

2023 has been a great year for CEAB, with several success stories that are detailed in this annual report. I would like to start by highlighting the international taxonomic courses that CEAB staff offered and that attracted experts from France, Portugal, Spain and Sweden. Another notable achievement this year is the awarding of European Union research grants led and / or coordinated by CEAB members. In addition, CEAB researchers have been awarded international prizes in recognition of their research in aquatic ecology and importantly, for the social implications of their research, such as the Academic Research Award from The Financial Times, the Blue Wave Awards-Science or the First European Union Prize for Citizen Science (honorary mention). In terms of actions that benefit the centre as a whole, in December CEAB was awarded internal CSIC funding (Redinter programme) to open an internationalisation office. This office will be in charge of promoting and managing the participation of CEAB at international calls and programmes, especially competitive European Union grants and will provide support with both the pre- and post-award stages.

The research conducted at CEAB is highly relevant to societal challenges, most notably in relation to local, regional and global environmental issues. CEAB works in continuous collaboration with public sector entities (e.g. conservation and restoration managers, stakeholders and policy makers) and private companies. During 2023, we have around 20 on-going collaboration agreements and 40 technological support and/or service contracts. These contracts have a total economic value of more than three and a half million euros, of which around 20% have been initiated and completed in 2023. The external communication / popular science teams at CEAB have continued doing excellent work. They have ensured a timely and broad dissemination of CEAB's activities to civil society and relevant policy-makers, with >350 impacts in the press, and involving CEAB in local and international popular science events, such as Pint of Science, the European Researchers Nights or the International Day of Women and Girls in Science.

CEAB has this year attracted an impressive amount of research funding from highly competitive calls. While this has resulted in a very exciting time to be conducting research at CEAB, it also means facing some new systemic challenges due to the large number of new hires, purchases, fieldtrips, etc., and the obvious need for more office and laboratory space on our premises. For example, we have documented more than 1500 individual outings (many of those being fieldtrips) across the year. CEAB is tackling these challenges with a very ambitious plan to strengthen our administration and purchasing team. This plan is enhancing our capacity to deal with different administrative and human resources issues, but also to manage more effectively both national and international research grants. Securing such a large number of research grants has translated into the largest amount of overheads ever collected by CEAB in a single year, which will aid the implementation of the above-mentioned plan.

Well done CEAB team!



Global and Climate Change:

Diagnosis and prognosis of global change effects on aquatic ecosystems, species invasions and the distribution and abundance of species.

Conservation and Management of Aquatic Ecosystems:

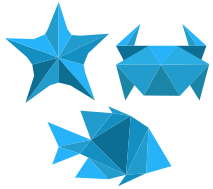
Applied knowledge for the rational management of natural resources and the improvement and conservation of aquatic ecosystems.

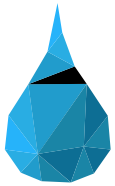
Theory and Computation in Ecology and Evolution:

Use of mathematical and computational techniques as essential tools to provide conceptual advances in ecology and biodiversity conservation.

Functional and Integrative Aquatic Ecology:

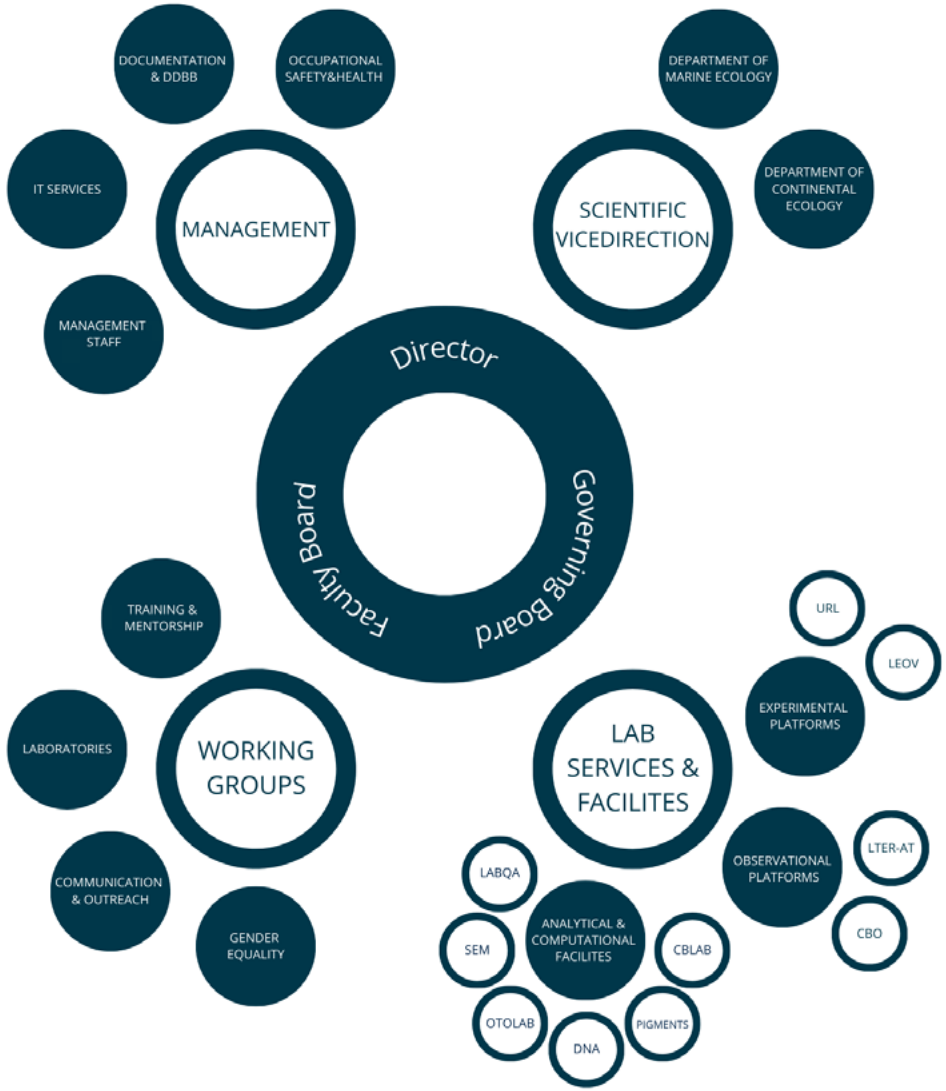
Understand how organisms relate to each other and understand their functions and interactions in nature, from genes to communities combining fieldwork, empirical studies, and meta-analysis.





Aquatic Biodiversity:

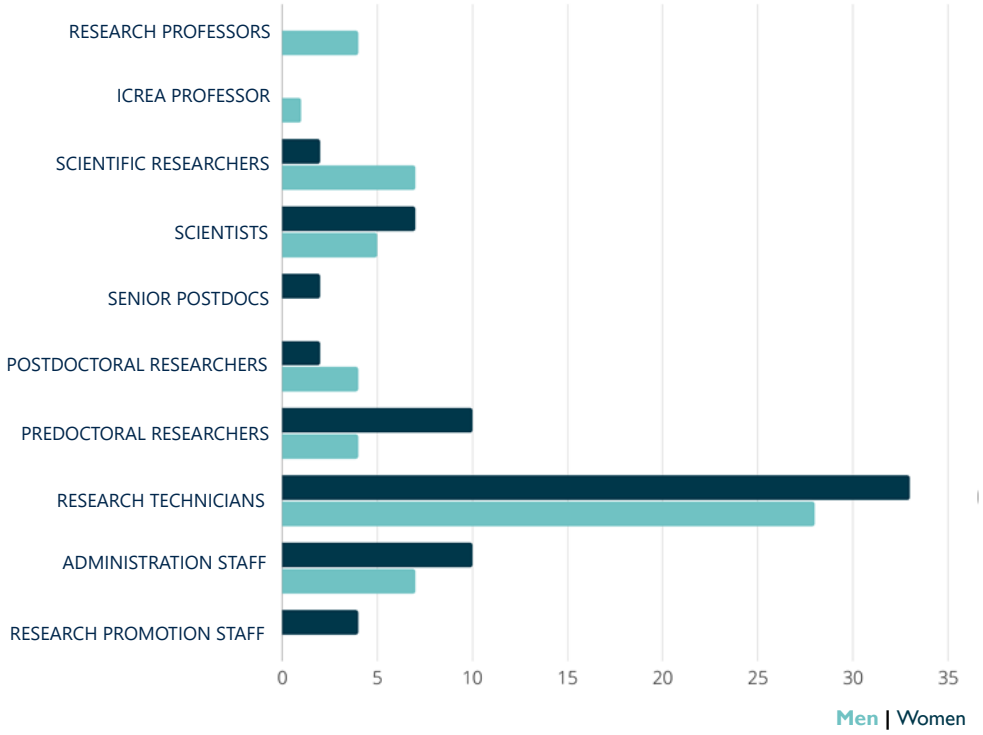
Identify the diversity of organisms, taxonomic characteristics and phylogenetic relationships, as well as describing new biological species using environmental surveys and naturalistic observations worldwide.



SEM: Scanning Electronic Microscopy
LEOV: Laboratory for Experimentation with Live Organisms
URL: Urban River Lab
CBLAB: Computational Biology Lab
LTER-AT: Long Term Ecological Research-Aigüestortes
CBO: Coastal Benthic Observatory
OTOLAB: Otolith Research Lab
Clean DNA Lab: DNA Laboratory

CEAB IN NUMBERS

PEOPLE

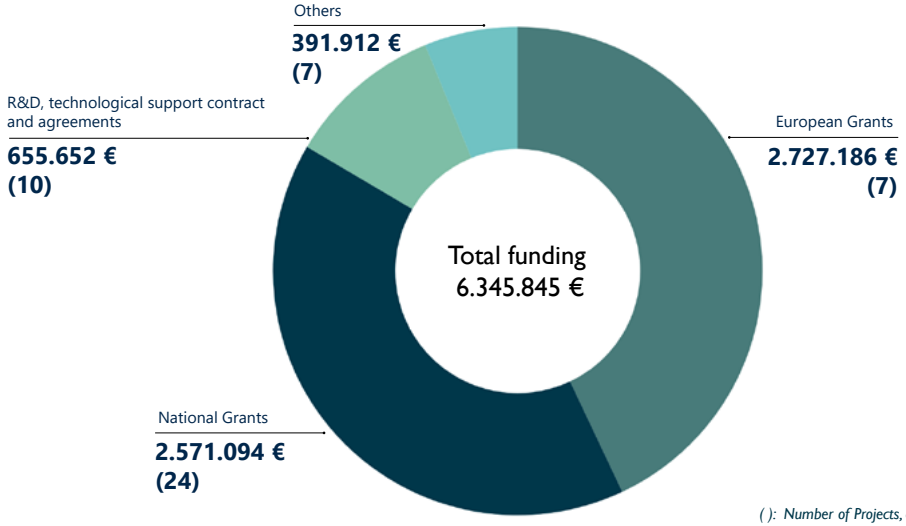


PROJECTS AND FUNDING OVERVIEW

TOTAL FUNDING OBTAINED FROM ONGOING PROJECTS IN 2023

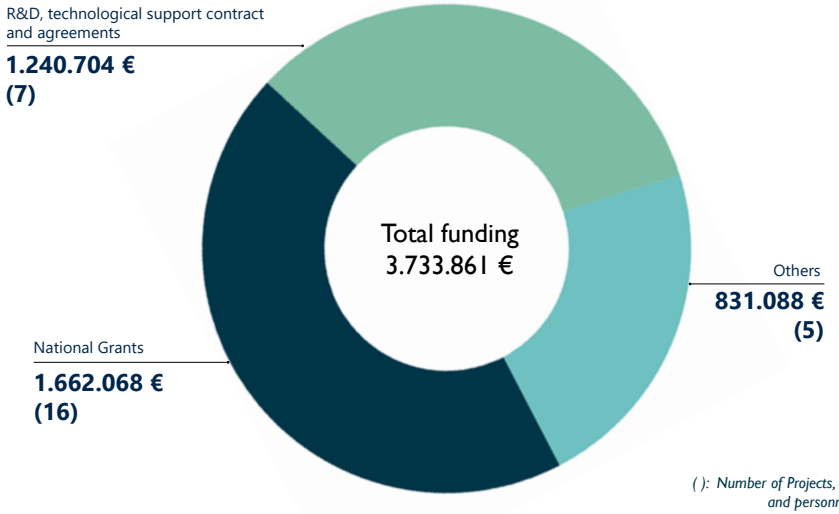
19.502.771 €
96
Ongoing Research Projects,
Contracts, Agreements and Personnel Grants

TOTAL FUNDING OBTAINED FROM PROJECTS INITIATED IN 2023



( ): Number of Projects, contracts, agreements and personnel grants

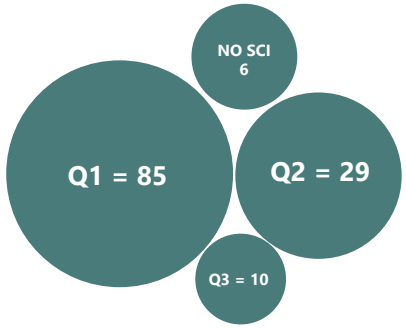
TOTAL FUNDING OBTAINED FROM PROJECT FINISHED IN 2023

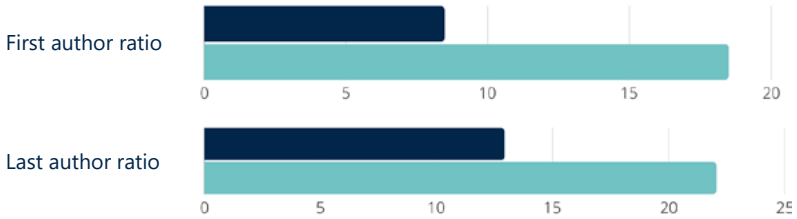


( ): Number of Projects, contracts, agreements and personnel grants

PUBLICATIONS

130
SCIENTIFIC ARTICLES





Men | Women

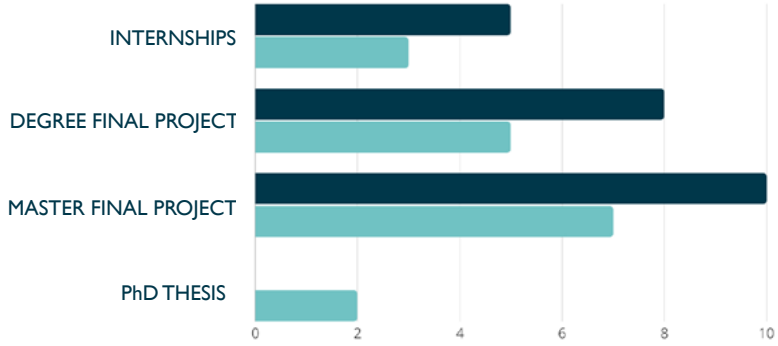
TRAINING

We place special emphasis on training scientists to develop critical and independent thinking.

38 UNDERGRADUATE AND MASTER STUDENTS TRAINED

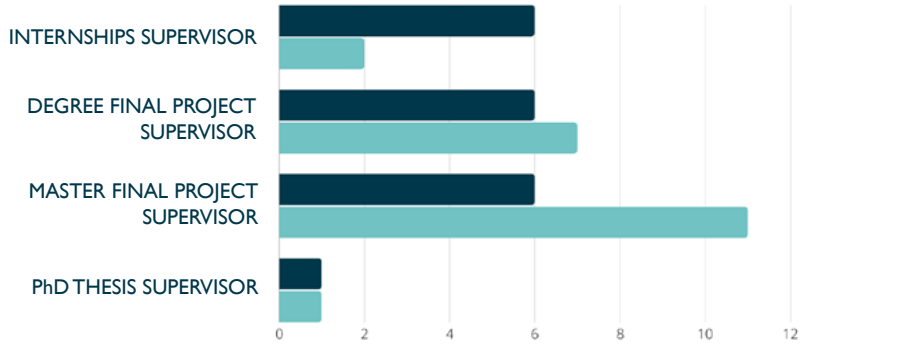
\+

2 PhD THESES DEFENDED



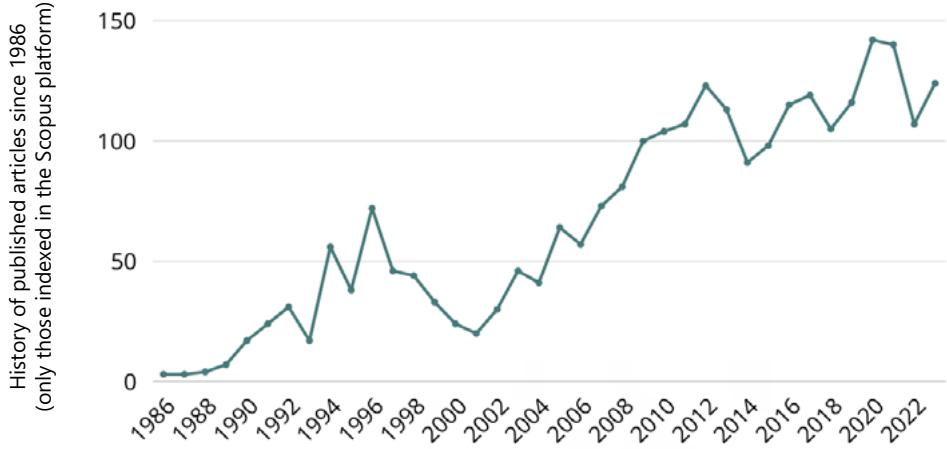
Men | Women

We can carry out all this training thanks to the scientists who lead the different research projects.



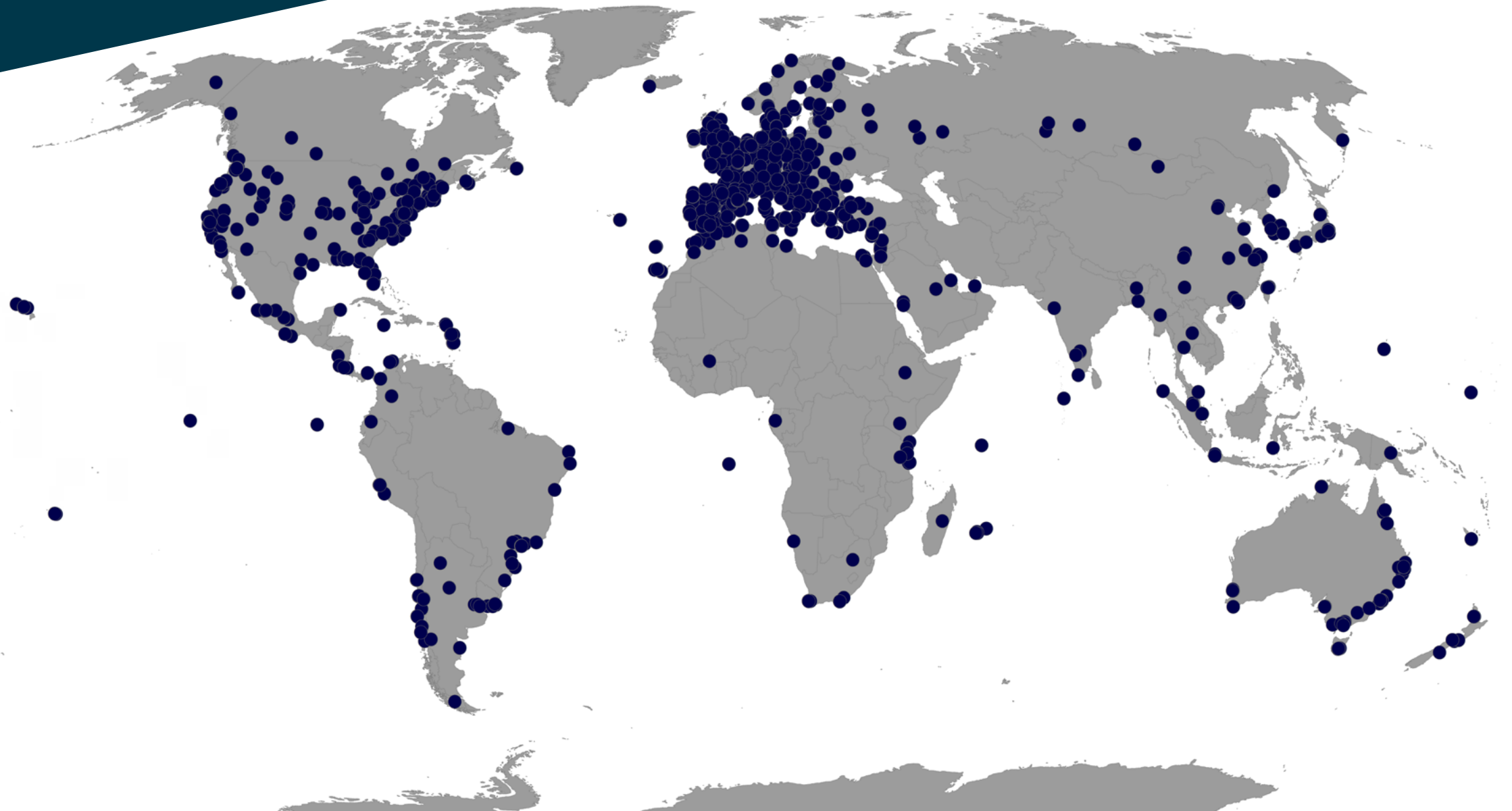
Men | Women

SCIENTIFIC PRODUCTION



	BOOKS	BOOK CHAPTER	PhD THESIS	MASTER THESIS
2023	0	1	2	17
2022	1	3	2	10
2021	3	9	12	9
2020	10	33	8	7
2019	3	18	3	6
2018	1	8	6	8

CEAB co-authorsip network of scientific collaborations from papers published in 2023



RELEVANT ACTIVITIES

KICK-OFF OF THE EUROPEAN PROJECT E4WARNING

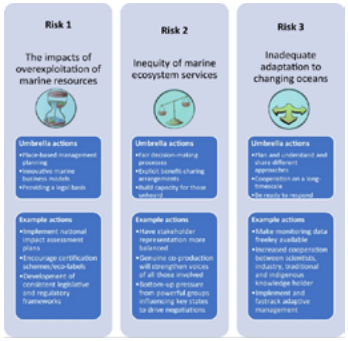
E4Warning is an holistic approach to improve our understanding of the interplay between humans, mosquitoes, reservoir species and the environment for a better disease intelligence capable of anticipating and identifying mosquito-borne diseases epidemic risk and outbreaks.

The E4Warning consortium involves 12 organisations from Spain, Greece, Belgium, Germany, Switzerland and UK. E4Warning has received funding from the European Union's Horizon Europe programme (HORIZON Research and Innovation Actions). More.

THE FINANCIAL TIMES AWARDS A PROJECT LED BY CEAB-CSIC

The study, 'Business for Ocean Sustainability' , led by Rafael Sardá, a researcher at the Advanced Studies Center of Blanes (CEAB) of the Spanish National Research Council (CSIC), has been awarded in the Academic Research category of the Financial Times' Responsible Business Education awards, recognizing outstanding work with a real impact on improving companies and entities.

Among the results, it highlights that nearly 90% of the pressure on the oceans comes from activities carried out not directly in the ocean but inland, such as agriculture, food, chemicals, energy, and fashion. More.



TRAINING COURSES IN AQUATIC TAXONOMY

We have launched the Training Courses in Marine Benthic Taxonomy. Training Courses aim to provide high quality knowledge and technical tools to increase the skills and confidence of researchers in marine taxonomy. The courses are open to a restricted number of participants.

During the year 2023, the polytechnic course took place. More.

THE PROJECT EFFECTIVE: SHAPING A SUSTAINABLE MEDITERRANEAN BLUE FUTURE IS BEING LAUNCHED

The main objective of the EFFECTIVE research project is to develop a comprehensive scientific knowledge base and practical guidance, combining science, nature-based technological solutions, digitalization and social implications for the application of Ecosystem-Based Management in the protection and management of the restoration of the EU's Blue Natural Capital of the Mediterranean.

This project has received funding from the European Union's Horizon Europe innovation programme. More.

MOSQUITO ALERT RECEIVES AN HONORABLE MENTION AT THE EU CITIZEN SCIENCE AWARDS

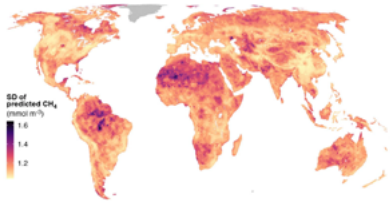
Mosquito Alert was awarded an honorable mention in the first edition of the European Union Citizen Science Prize, which took place on May 22nd at the Ars Electronica headquarters in Linz, Austria. This new prize is part of the European Union's IMPETUS project, which aims to strengthen and support citizen science in the European Research Area.

With this award, the European Union aims to recognize outstanding achievements in advancing knowledge through empowering citizens. More.

THE PAPER "GLOBAL METHANE EMISSIONS FROM RIVERS AND STREAMS" PUBLISHED IN NATURE

The results of the study published by the CEAB highlight the importance of land-water connections in regulating the supply of CH4 to running waters. This supply is vulnerable not only to human-induced modifications but also to various responses to climate change on Earth.

The researcher Gerard Rocher-Ros, from CEAB, is the lead author of the article. The study collected and analyzed over 20,000 data points on methane concentrations in rivers and streams worldwide, using machine learning models to predict global methane emissions in these ecosystems. More.



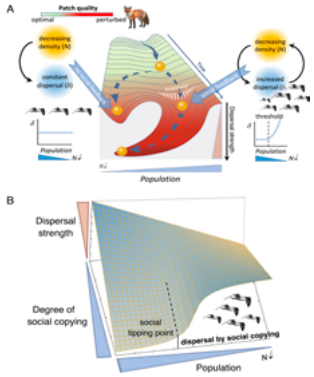
PUBLICATIONS IN HIGH-IMPACT JOURNALS

SOCIAL COPYING DRIVES A TIPPING POINT FOR NONLINEAR POPULATION COLLAPSE

D. Oro, L. Alsedà, A. Hastings, M. Genovart, J. Sardanyés, Social copying drives a tipping point for nonlinear population collapse, Proc. Natl. Acad. Sci. U.S.A. 120 (11) e2214055120.

The paper explores how behavioural feedback mechanisms in social animals can lead to abrupt population declines over a tipping point. Using data from a long-term study on a social bird species, we employed mathematical models and artificial intelligence to uncover how small perturbations in population density could cascade into large-scale dispersal events. This process is driven by "social copying," where the dispersal behaviour of a few individuals influences others to leave.

Once a critical threshold in habitat quality is crossed (i.e. the tipping point), this feedback loop accelerates, leading to population collapse. After the collapse, population densities are very low and dispersal slows, likely due to the remaining individuals' stronger philopatry. These findings highlight the role of collective behaviour not only in decision-making but importantly in population dynamics.

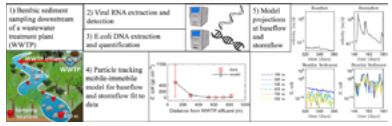


BENTHIC SEDIMENT AS STORES AND SOURCES OF BACTERIA AND VIRUSES IN STREAMS: A COMPARISON OF BASEFLOW VS. STORMFLOW LONGITUDINAL TRANSPORT AND RESIDENCE TIMES

Drummond, J. D., Gonçalves, J., Aquino, T., Bernal, S., Gacia, E., Gutierrez-Aguirre, I., Turk, V., Ravnikar, M., Krause, S., & Martí, E. (2023). Benthic sediment as stores and sources of bacteria and viruses in streams: A comparison of baseßow vs. stormßow longitudinal transport and residence times. Water Research, 245, 120637.Volume 245,

Urban-origin bacteria and viruses tend to accumulate in riverbeds, particularly downstream from wastewater treatment plants, posing a risk to public health. The study by Jennifer Drummond et al. (2023) analyzed the dynamics of these pathogens in an intermittent Mediterranean river receiving urban effluent.

The research found that during dry periods, the abundance of Escherichia coli (a fecal indicator) is high in the riverbed near the effluent inflow but decreases downstream. Using empirical data and particle transport models, the study demonstrated that the riverbed acts as a reservoir for E. coli during low flow and as a source during high flow events, highlighting how hydrological conditions influence the persistence and spread of these pathogens.



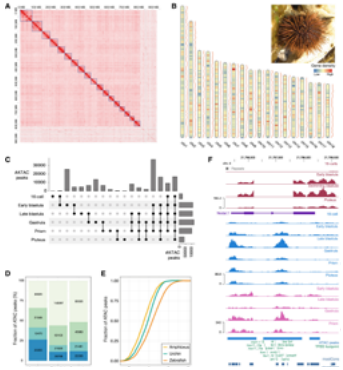
ANALYSIS OF THE P. LIVIDUS SEA URCHIN GENOME HIGHLIGHTS CONTRASTING TRENDS OF GENOMIC AND REGULATORY EVOLUTION IN DEUTEROSTOMES

Marlétaz, F., Couloux, A., Poulain, J., Labadie, K., Da Silva, C., Mangenot, S., Noel, B., Poustka, A. J., Dru, P., Pegueroles, C., Borra, M., Lowe, E. K., Lhomond, G., Besnardeau, L., Le Gras, S., Ye, T., Gavriouchkina, D., Russo, R., Costa, C., Zito, F., Anello, L., Nicosia, A., Ragusa, M. A., Pascual, M., Molina, M. D., Chessel, A., Di Carlo, M., Turon, X., Copley, R. R., Exposito, J.-Y., Martinez, P., Cavalieri, V., Ben Tabou de Leon, S., Croce, J., Oliveri, P., Matranga, V., Di Bernardo, M., Morales, J., Cormier, P., Geneviève, A.-M., Aury, J. M., Barbe, V., Wincker, P., Arnone, M. I., Gache, C., &

The sea urchin Paracentrotus lividus plays a crucial role in Mediterranean benthic ecosystems, shaping seaweed communities but often leading to overgrazed, barren areas. It is also valued for its roe in the market.

This study examines its genome and gene expression to better understand its ecological traits and adaptability to environmental changes. While P. lividus maintains a conserved chromosomal structure, its intrachromosomal gene order differs significantly from other sea urchins and deuterostomes.

The analysis also revealed extensive gene duplications and expansions, with newly evolved genes linked to echinoid features like the feeding organ and locomotory system.



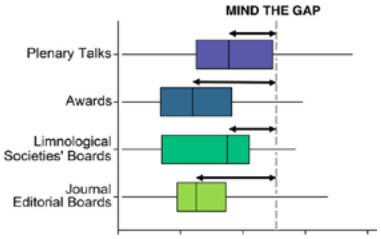
WOMEN IN LIMNOLOGY: FROM A HISTORICAL PERSPECTIVE TO A PRESENT-DAY EVALUATION

Catalan, N., Anton-Pardo, M., Freixa, A., Rodríguez-Lozano, P., Bartrons, M., Bernal,S., Genua-Olmedo, A., Mendoza-Lera, C., Onandía, G., Benito, X., Sanchez-Montoya, M. M., Cañedo-ArgüellesIglesias, M., Pastor, A., & Lupon, A. (2023). Women in limnology: From a historical perspective to a present-dayevaluation. WIREs Water, 10(1), e1616

Research in the field of limnology has been driven by fascinating and passionate women who have greatly contributed to our understanding of inland waters and highlighted the need to protect these ecosystems.

However, their contributions have often gone underrecognized. This article reviews the presence of women in limnology from a historical perspective, focusing on pioneers and those who have driven recent advancements, with the aim of showcasing them as role models. It also examines the current status of women in this discipline, highlighting the scientific and social barriers they face, as well as future prospects.

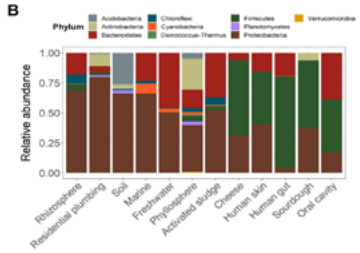
This analysis reveals inequalities in areas such as conferences, awards, and representation on scientific committees, aiming to raise awareness of the challenges faced by women limnologists and to promote more equitable leadership models.



TAXONOMIC AND ENVIRONMENTAL DISTRIBUTION OF BACTERIAL AMINO ACID AUXOTROPHIES

Ramoneda, J., Jensen, T.B.N., Price, M.N. et al. Taxonomic and environmental distribution of bacterial amino acid auxotrophies. Nat Commun 14, 7608 (2023).

Many bacteria are auxotrophic, meaning they cannot produce certain amino acids essential for growth. A study analyzing 26,277 bacterial genomes from 12 phyla found that while auxotrophy is widespread, the majority (78.4%) of bacterial taxa can synthesize all amino acids. Auxotrophies are more frequent in obligate intracellular parasites and free-living bacteria with streamlined genomes, reflecting specific life-history strategies.

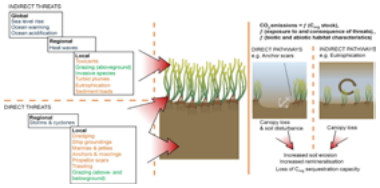


Environmental analysis of bacterial communities from 12 habitats, including 3,813 samples, revealed that auxotrophic taxa are more abundant in host-associated environments, such as the human gut and oral cavity, and in fermented foods. In contrast, auxotrophy is relatively rare in soil and aquatic ecosystems. This research enhances our understanding of amino acid auxotrophy across bacterial diversity and its ecological significance.

RANKING THE RISK OF CO2 EMISSIONS FROM SEAGRASS SOIL CARBON STOCKS UNDER GLOBAL CHANGE THREATSLEVELS OF ANTHROPOGENIC TRANSPORT

Dahl, M., McMahon, K., Lavery, P. S., Hamilton, S. H., Lovelock, C. E., & Serrano, O. (2023). Ranking the risk of CO2 emissions from seagrass soil carbon stocks under global change threats. Global Environmental Change, 78, article 102632Volume 78, January 2023, 102632

Seagrass meadows are vital carbon storage ecosystems, but their loss due to global change threats can release soil carbon as CO2, exacerbating climate change. Using expert opinions and empirical evidence, this study assessed CO2 emission risks from seagrass soils caused by human, biological, and climate-induced threats.



Experts identified climate change factors, such as warming and storminess, as the greatest global risks, while direct local threats like dredging posed the highest localized risks. A literature review supported these views.

The study emphasizes the need for more empirical research to integrate seagrass conservation into blue carbon policies and guide nature-based climate solutions.

LABORATORY SERVICES & FACILITIES

These services are available to all CSIC researchers, as well as to external researchers from public research centers and private corporations.

EXPERIMENTAL PLATFORMS

LABORATORY FOR EXPERIMENTATION WITH LIVE ORGANISMS

The LEOV is an aquarium-lab designed for the experimentation with live organisms in an aquatic environment of either fresh or sea water. The seawater circuit can be used in a continuous or a recycling way and it has a heat interchanging system allowing water heating or cooling ranging from 14ºC to 25ºC.

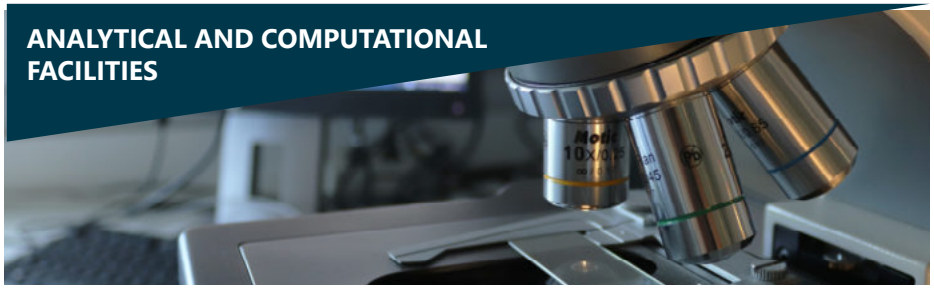
The LEOV facilities also include two high-performance tracking platforms to generate large-scale movement data based on postural images and centroid-based high-resolution tracks of small-bodied organisms.

URBAN RIVER LAB

The URL is an experimental outdoor facility addressed to study the effects of urban activity on streams and rivers aiming to develop innovative tools and strategies to mitigate point source impact and to achieve a more efficient and sustainable management of freshwater ecosystems and resources.

The URL consist of 15 flumes and 12 wetlands designed for experimental studies, fed by the effluent of a wastewater treatment plant in Montornès del Vallès.

ANALYTICAL AND COMPUTATIONAL FACILITIES



ANALYTICAL CHEMISTRY

The nutrient analysis service is equipped with a continuos flow autoanalyser to determine the concentration of dissolved inorganic nutrients, total phosphorus and several reactive nitrogen compounds.

SCANNING ELECTRONIC MICROSCOPY

The electronic microscopy service is available for the observation of samples with the Scanning Electron Microscope (SEM) and for energy dispersive X-ray microanalysis (EDS).

OTOLITH RESEARCH LAB

The analysis of growth structures, such as otholits, offers the possibility to estimate the age and growth rates in diverse organisms and organic structures.

PIGMENT ANALYSIS

The UHPLC service is mainly used for the analyses of liposoluble organic pigments present in water samples, biofilms and sediments.

CLEAN LAB

The Clean DNA Lab is a pioneering scientific infrastructure focused on processing DNA samples from aquatic environments.

COMPUTATIONAL BIOLOGY LAB

The High Performance Computational Cluster (Cluster CAR) was created in order to satisfy the growing demand of computational capacity linked to the border R+D developed at the CEAB, connected to several aspects of marine and continental ecosystems ecology.

FAB LAB

The Fab-Lab is a digital manufacturing laboratory, where we design and build sensor networks and robotic systems for monitoring environmental variables. Here we have a 3D printer and a CNC milling machine, of semi-industrial quality.

MOLECULAR AND GENETIC ECOLOGY LABORATORY

The lab provides support to those projects concerning taxonomy, biodiversity, ecology and evolution of aquatic organisms that requires the use of DNA-based molecular techniques.

MICROPLASTIC LAB

The microplastics laboratory is equipped for the complete processing of environmental samples, as it has facilities and equipment free of synthetic polymers, preventing cross contamination.

OBSERVATIONAL PLATFORMS

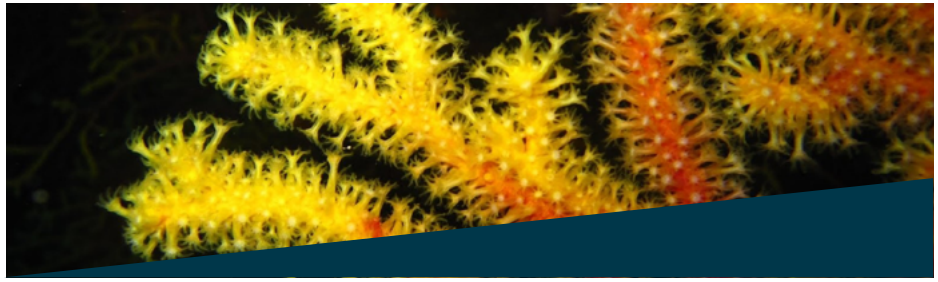
HIGH MOUNTAINS OBSERVATORY

The Long Term Ecological Research site Aigüestortes is an observational facility located in the Central Pyrenees, within the Aigüestortes i Estany de Sant Maurici National Park. It comprises a field station and several monitored catchments. The research sites are equipped with automatic weather stations, discharge gauge stations and lake and stream water temperature loggers.

THE COASTAL BENTHIC OBSERVATORY

The Coastal Benthic Observatory carries out an annual evaluation of the Ecological Quality of the Catalan coastal waters using different biological indicators and the evaluation of invasive species effects.

Temporal surveys are also carried out in the Medes Islands.



ADDITIONAL SERVICES

NAUTICAL SERVICE

We have our own rigid and semi-rigid boats, with moorings in the ports of Blanes and Estartit. These boats are made available – with or without skipper – to the centre's researchers, as well as to associated research staff. In addition, at the CEAB headquarters we have inflatable boats (3 to 4.5 metres long) and transportation trailers, which are also used for observation, diving and sampling tasks.

DIVING STATION

The diving facilities consist of a changing room (which includes individual shower cubicles and a storage area for diving equipment), a compressed air cylinder charging station (separate compartment equipped with a fixed compressor at 200 bar), two portable compressors, and immersion bottles of different capacities (volumes from 6 litres to 18 litres). Furthermore, before entering the changing room, there is an area for cleaning, rinsing and drying the diving equipment.

CONFERENCE ROOMS

The centre has an auditorium/function room with a capacity for 160 people, equipped with projection and public address systems, as well as equipment for the online broadcasting and recording of the events that take place. It also has multipurpose rooms, suitable for meetings, training sessions or video conferences. In addition to these spaces, the CEAB has numerous work and/or meeting areas, such as the terrace, the cloister or the library.

OUR RESEARCH GROUPS

SOCIAL-ECOLOGICAL SYSTEMS IN COASTAL AND MARINE ENVIRONMENTS

Head of Research Group:
Gordoa Ezquerra, Ana

We seek to explore how social-ecological systems work in the coastal and marine environments by developing conceptual and empirical approaches for a better understanding and management and for addressing specific social problems of sustainability

We develop scientific research and applications in the frontier between social and natural systems, how they work and interact, how to cope with present and emerging local and global environmental problems and the role, if any, that science and regulations might play on it.

The group has a long and successful history in the Coordination of International Cooperation Projects mostly in Namibia. Research topics include social-ecological research, sustainable exploitation of living marine resources, operational oceanography and fisheries (both professional and recreational), and

BIOPAIS

Tools for the implementation of the Ecosystem Approach in the Management of Beaches.

Principal Investigator: Rafael Sardá
Entity: Fundación One Ocean Foundation
Budget:
Years: 2022-2024

EFFECTIVE

Enhancing social well-being and economic prosperity by reinforcing the eFFECTIVEness of protection and restoration management in Mediterranean MPAs.

Principal Investigator: Rafael Sardá
Entity: Horizon Europe
Budget: 700.125,00 €
Years: 2023-2027

EFFECTIVE

The main objective of the EFFECTIVE research project is to develop a comprehensive scientific knowledge base and practical guidance, combining science, nature-based technological solutions, digitalization and social implications for the application of Ecosystem-Based Management in the protection and management of the restoration of the EU's Blue Natural Capital of the Mediterranean.

To guarantee the success of this main objective, the project has partners with extensive experience in relevant areas that cover the three pillars of the EBMS (from applying research stages until companies) as follows: management pillar, information pillar and participation pillar , as well as nature-based solutions. Furthermore, this project provides for the implementation of the GBME in four pilot areas (Empordà Sea, Ebro Delta, Northern Sardinia, Cavo Greco) towards protection and restoration solutions, in addition to taking into account the connectivity between them through the Corridor. of Cetacean Migration.

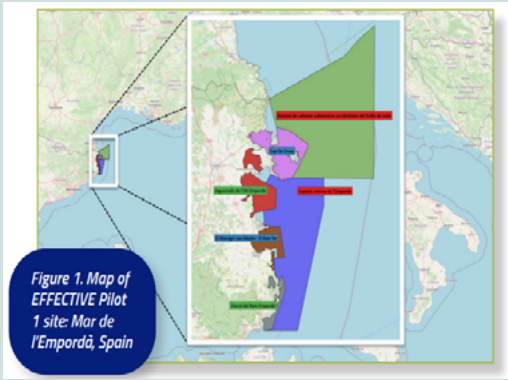


Figure 1. Map of EFFECTIVE Pilot 1 site: Mar de l'Empordà, Spain

INTEGRATIVE FRESHWATER ECOLOGY

Head of Research Group:
Martí Roca, Eugènia

Freshwater ecosystems provide goods and services of critical importance to human societies. However, they are among the most heavily altered ecosystems with an over proportional biodiversity loss. Biogeochemistry of freshwater ecosystems is closely linked to terrestrial, atmospheric, and climatic perturbations, and responds specially to the effects of global change.

We address the interactions between abiotic and biotic factors on different levels of organization qualitatively and quantitatively, looking for a more holistic understanding of biodiversity functioning and ecological processes in freshwaters.

Our expertise covers from microbes to macrophytes and fish, and freshwater biogeochemical cycling. We use cutting edge analytical interdisciplinary methodologies and carry out observational and experimental research over both long temporal and broad spatial scales.

ALKALDIA_2

Alkalinity and pH gradients at fine escale: The basins of the Pyrenees as model ecosystems.

Principal Investigator: Lluís Camarero
Entity: MCIYU
Budget: 90.000,00€
Years: 2020-2023

AEROSMIC

Long range dispersion and colonizing potential of airbone microorganisms in saharian dust masses

Principal Investigator: Emilio O. Casamayor
Entity: MCIYU
Budget: 175.000,00 €
Years: 2022-2026

BIOOCULT

High mountain aquatic ecosystems: refuge of hidden biodiversity and sentinels of global change.

Principal Investigator: Marc Ventura
Entity: OAPN
Budget: 95.991,65 €
Years: 2019-2023

FLUEPRINT

Evaluation of the Biogeochemical Footprint of River Network Configuration on Carbon and Nutrient Processing in Rivers.

Principal Investigator: Anna Lupon
Entity: Europa Excelencia 2023
Budget: 91.610,00 €
Years: 2023-2025

BIODIVERSA+ FISH-ME

Social and ecological effects of fish removal in mountain ecosystems

Principal Investigator: Teresa Buchaca
Entity: BIODIVERSA+
Budget: 120.798,26 €
Years: 2022-2025

NÀIADES

Baseline study on the situation of native naiads in catalonia for the future drafting of their recovery plan – phase 1

Principal Investigator: Marc Ventura
Entity: Programa de desarrollo rural de Cataluña
Budget: 40.386,16 €
Years: 2023-2024

FLUVIAL-P REMOVAL

Phosphorus (P) enrichment and human activity in fluvial ecosystems: P dynamincs, microbial biomarkers and remediation strategies.

Principal Investigator: Eugènia Martí / Helena Guasch
Entity: MCIYU
Budget: 120.000,00 €
Years: 2020-2023

FLORACUA

Changes in the aquatic ßora of the lakes of the Pyrenees related to Global Change.

Principal Investigator: Esperança Gacia
Entity: OAPN
Budget: 58.338,00 €
Years: 2021-2024

PRORISK

Best chemical risk assessment professionals for maximum Ecosystem Services benefit.

Principal Investigator: Helena Guasch
Entity: UE
Budget: 250.904,88 €
Years: 2020-2024

BioPlastiEffect

Bioplastics decomposition and effects on freshwater ecosystems under global change threats.

Principal Investigator: Berta Bonet
Entity: COMFUTURO
Budget: 222.228,00 €
Years: 2023-2026

LIFE RESQUE ALPYR

Restoration of aquatic ecosystems of protected areas from the Alps and Pyrenees

Principal Investigator: Teresa Buchaca
Entity: LIFE PROGRAMME
Budget: 1.057.241,00 €
Years: 2022-2026

RESTAQUATIC

Restoration and Improvement of Aquatic Ecosystems in the Aigüestortes i Estany de Sant Maurici National Park

Principal Investigator: Marc Ventura
Entity: NextGenerationEU
Budget: 222.155,38 €
Years: 2023

APOM-CYCLING

Transport and Retention of Anthropogenic Particulate Matter in Mediterranean Rivers in the Context of Global Change.

Principal Investigator: Helena Guasch
Entity: MCIYU
Budget: 199.000,00 €
Years: 2023-2026

IWAS

Effects of Wastewater on Alpine Rivers: Mitigation Strategies.

Principal Investigator: Stephani Merbt
Entity: MCIYU
Budget: 71.307,10 €
Years: 2023-2026

INVENTWATER

Inventive forecasting tools for adapting water quality management to a new climate.

Principal Investigator: Rafael Marcé
Entity: H2020
Budget: 206.348,63 €
Years: 2021-2025

INTODBP

Innovative tools to control organic matter and disinfection byproducts in drinking water.

Principal Investigator: Rafael Marcé
Entity: Horizon Europe
Budget: 115.598,81 €
Years: 2023-2026

EVASIONA

Influence of Lateral Inputs of Carbon and Nitrogen on River Metabolism and CO2 Emission in Mediterranean Rivers.

Principal Investigator: Susana Bernal
Entity: MCIYU
Budget: 105.000,00 €
Years: 2022-2025

IN-HOT

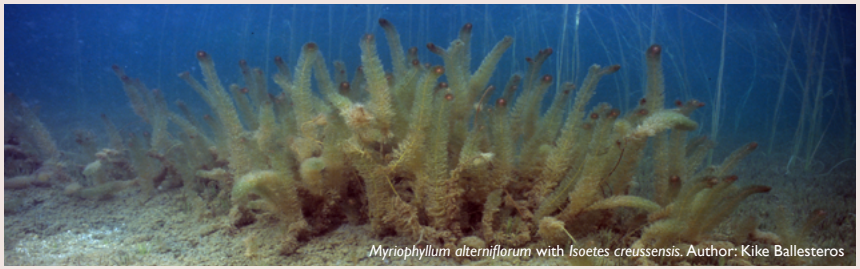
Assessing the role of preferential lateral inflows as biogeochemical hot spots along Mediterranean fluvial networks.

Principal Investigator: Anna Lupon
Entity: MCIYU
Budget: 155.920,00 €
Years: 2023-2025

FLORACUA

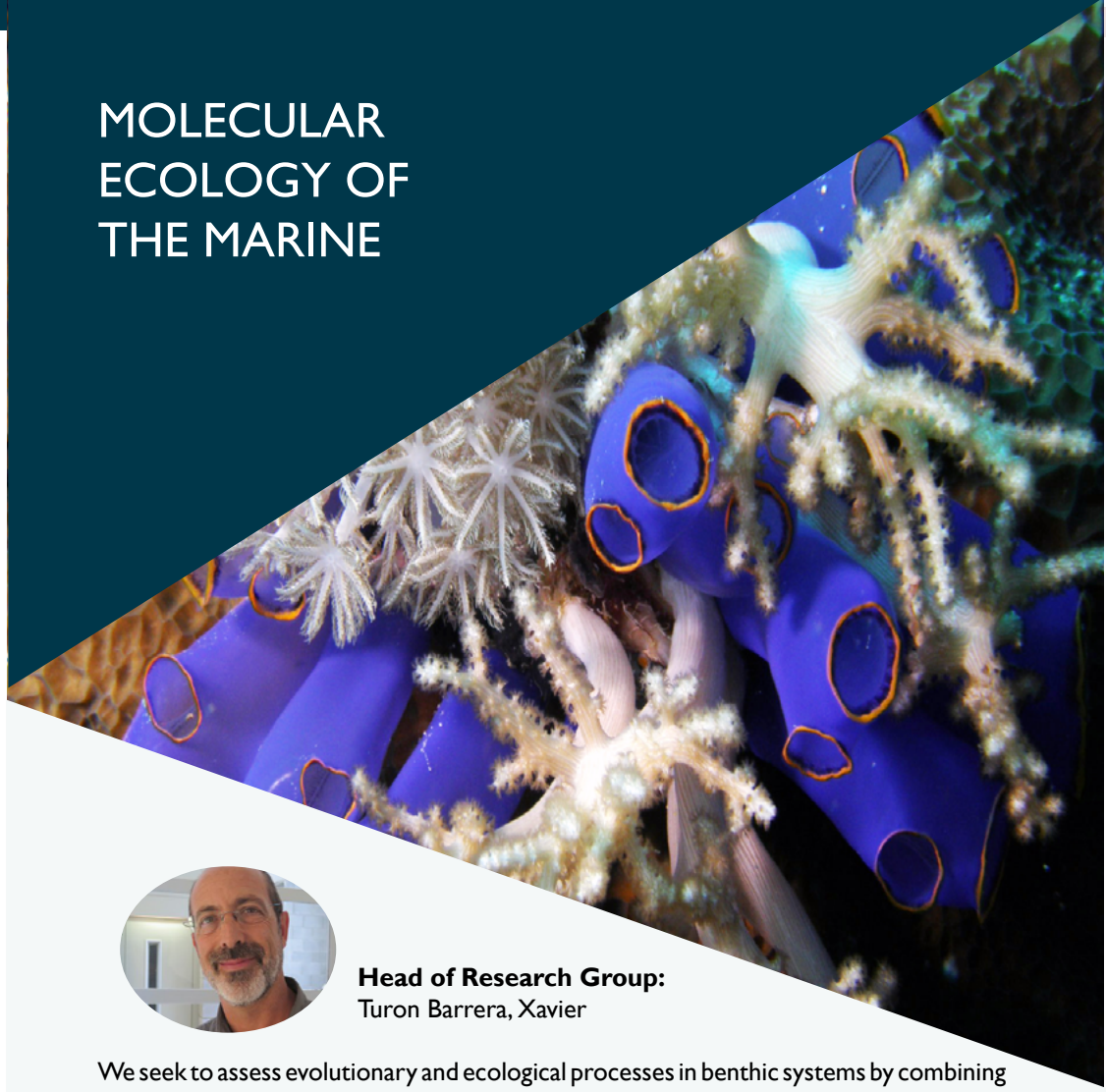
Principal Investigator: Esperança Gacia
Entity: OAPN
Budget: 58.338,00 €
Years: 2021-2024

National Parks are epicenters for monitoring the effects of Global Change on the country's natural ecosystems. In this context, mountain lakes are sentinel ecosystems that have already allowed us to verify some of the trends in our mountain ranges.



Myriophyllum alterniflorum with *Isoetes creussensis*. Author: Kike Ballesteros

MOLECULAR ECOLOGY OF THE MARINE



Head of Research Group:
Turon Barrera, Xavier

We seek to assess evolutionary and ecological processes in benthic systems by combining field observation, experimentation, and molecular tools. We aim to understand the diversity, functioning, and responses of the marine benthos to environmental changes, both natural and human-induced, to predict future scenarios of marine ecosystems.

Current topics cover the taxonomy and molecular phylogeny and ecology of benthic assemblages (metagenomics) and species (sponges, polychaetes, crustaceans, ascidians, and fishes), with particular emphasis on symbiotic interactions. Life cycles, population genetics, demography, and phylogeography studies help us to detect and understand the colonization pathways and the fate of exotic (introduced) marine species in native ecosystems.

Moreover, the production of secondary metabolites by marine benthic organisms is studied under the dual perspective of their ecological functions and biotechnological applications.

PROJECTS

BIGPARK

Biodiversity evolution in the seabeds of National Parks impacted by invasive species and climate change: genetic and ecological monitoring.

Principal Investigator: Xavier Turon
Entity: OAPN
Budget: 49.818,00 €
Years: 2019-2023

MARGECH

Marine genomics challenges: massive data from communities as sentinels of climate change and biosecurity.

Principal Investigator: Xavier Turon / Marc Rius
Entity: MCIYU
Budget: 142.000,00 €
Years: 2021-2024

MBON EUROPE

Marine biodiversity monitoring for europe

Principal Investigator: Daniel Martin
Entity: European Marine Research Network
Budget: 12.500,00 €
Years: 2022-2024

TEMPOINVASIONS

Towards understanding the temporal dimension of the invasion process: implications for RESTORATION

Principal Investigator: Marc Rius
Entity: MCIYU
Budget: 110.000,00 €
Years: 2022-2025

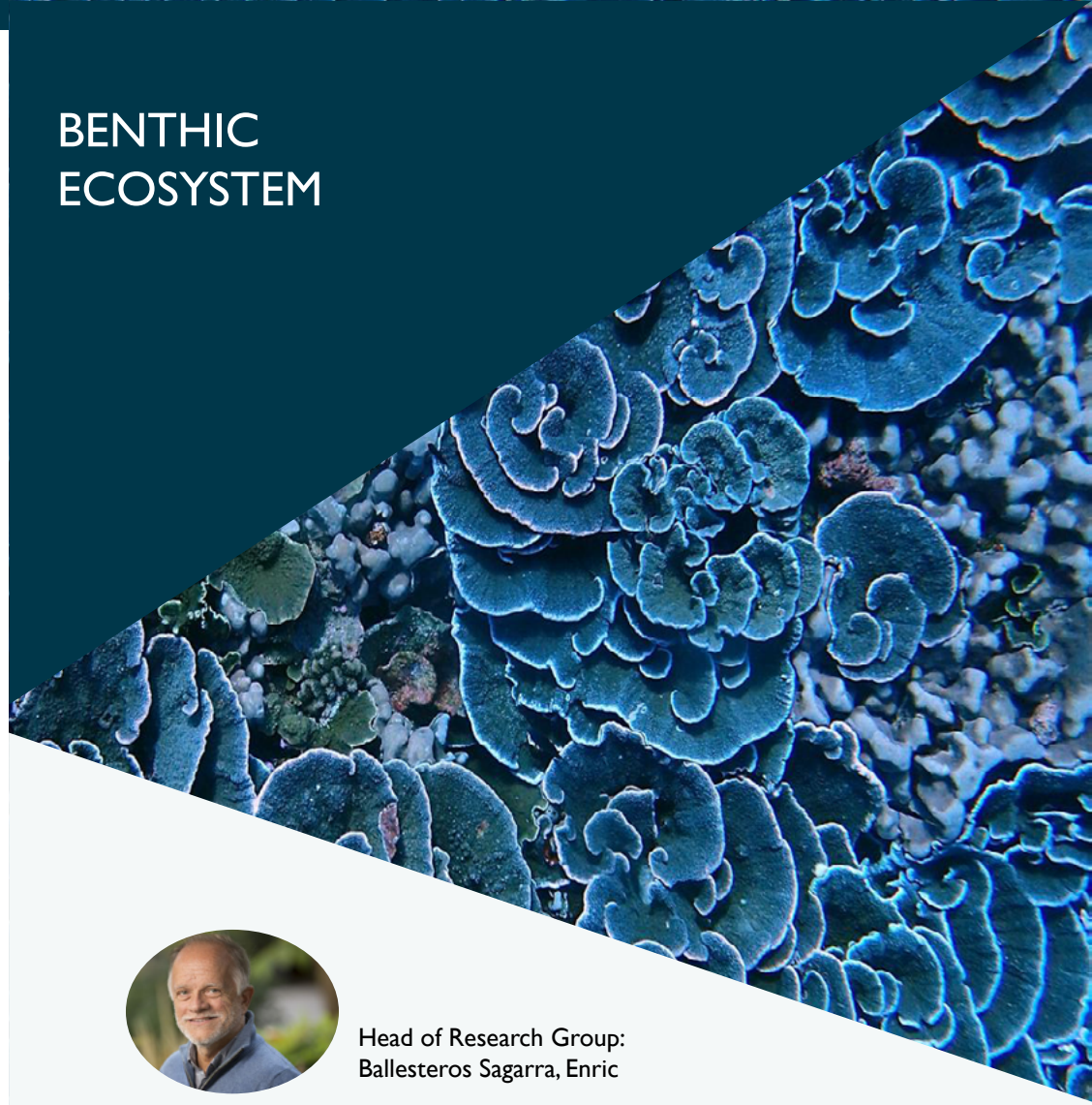
TEMPOINVASIONS

Biodiversity loss is a global concern due to the ever-increasing pressures of human activities on worlds ecosystems. Non-indigenous species (NIS) are one of the greatest drivers of biodiversity loss and ecosystem change. Despite recent research progress in many areas of invasion science, little is known about how temporal dynamics (e.g. time lag, time since the first introduction) mediate invasion success.

To fill this gap TEMPOINVASIONS will use the latest molecular tools to analyse sedimentary sequences from well-preserved sites along the Spanish coast (Cádiz bay, Cabo de Gata, Ebro Delta). We will focus on the past six centuries when major translocation of marine species started due to the beginning of the transoceanic exploration.

Aerial view of the coastline. Author: Marc Rius

BENTHIC ECOSYSTEM



Head of Research Group:
Ballesteros Sagarra, Enric

We aim to understand patterns and processes underlying the structure and functioning of the marine benthos at multiple temporal and spatial scales and at different environmental situations.

We combine descriptive field ecology and natural history with experimental and modelling approaches to understand functional drivers of species, communities and ecosystems. We are interested on how benthic ecosystems may be influenced by human alterations at local, regional and global scales.

Most of the ecosystems studied are shallow rocky bottoms and seagrass meadows in a wide range of geographical areas: Mediterranean Sea, Atlantic, Indian and Pacific Oceans and Gulf of California and Caribbean Sea.

PROJECTS

COASTFRAG

Impact of habitat fragmentation and loss on coastal ecosystems: implications for sustainable management under climate change.

Principal Investigator: Emma Cebrian
Entity: NIVA
Budget: 108.020,00 €
Years: 2021-2024

FORESTA

Conservation and restoration of algal forests: adaptation to future scenarios of global change.

Principal Investigator: Emma Cebrian
Entity: MCIYU
Budget: 153.000,00 €
Years: 2021-2024

FORESQUE

Innovative approaches FOr RESCUE and management of algal forests in the Mediterranean Sea Mediterranean Sea Mediterranean Sea Innovative approaches FOr RESCUE and management of algal forests in the Mediterranean Sea.

Principal Investigator: Enrique Ballesteros
Entity: MCIYU
Budget: 213.056,00 €
Years: 2022-2025

MITNPOINT

From Collapse to Solutions. Submarine Vegetation Ecosystems as Agents of Climate Change Mitigation and Tipping Points.

Principal Investigator: Jordi Boada
Entity: MCIYU
Budget: 63.000,00 €
Years: 2023-2026

STORM

Storms of change: How extreme weather phenomena alter the mediterranean coastal ecosystems.

Principal Investigator: Teresa Alcoverro
Entity: MCIYU
Budget: 155.000,00 €
Years: 2021-2024

SPONGE-PUMP

The sponge carbon pump and the missing roles of marine sponges in biogeochemical cycles

Principal Investigator: Rafel Coma
Entity: MCIYU
Budget: 16.000,00 €
Years: 2022-2025

MURFOR

Managing sustainable sea urchin Þshery and marine forest conservation.

Principal Investigator: Rafel Coma
Entity: MCIYU
Budget: 172.529,00 €
Years: 2022-2025

OCEAN CITIZEN

Marine forest coastal restoration: an underwater gardening socio-ecological plan.

Principal Investigator: Rafel Coma
Entity: Horizon Europe
Budget: 115.598,81 €
Years: 2023-2026

MUrFor

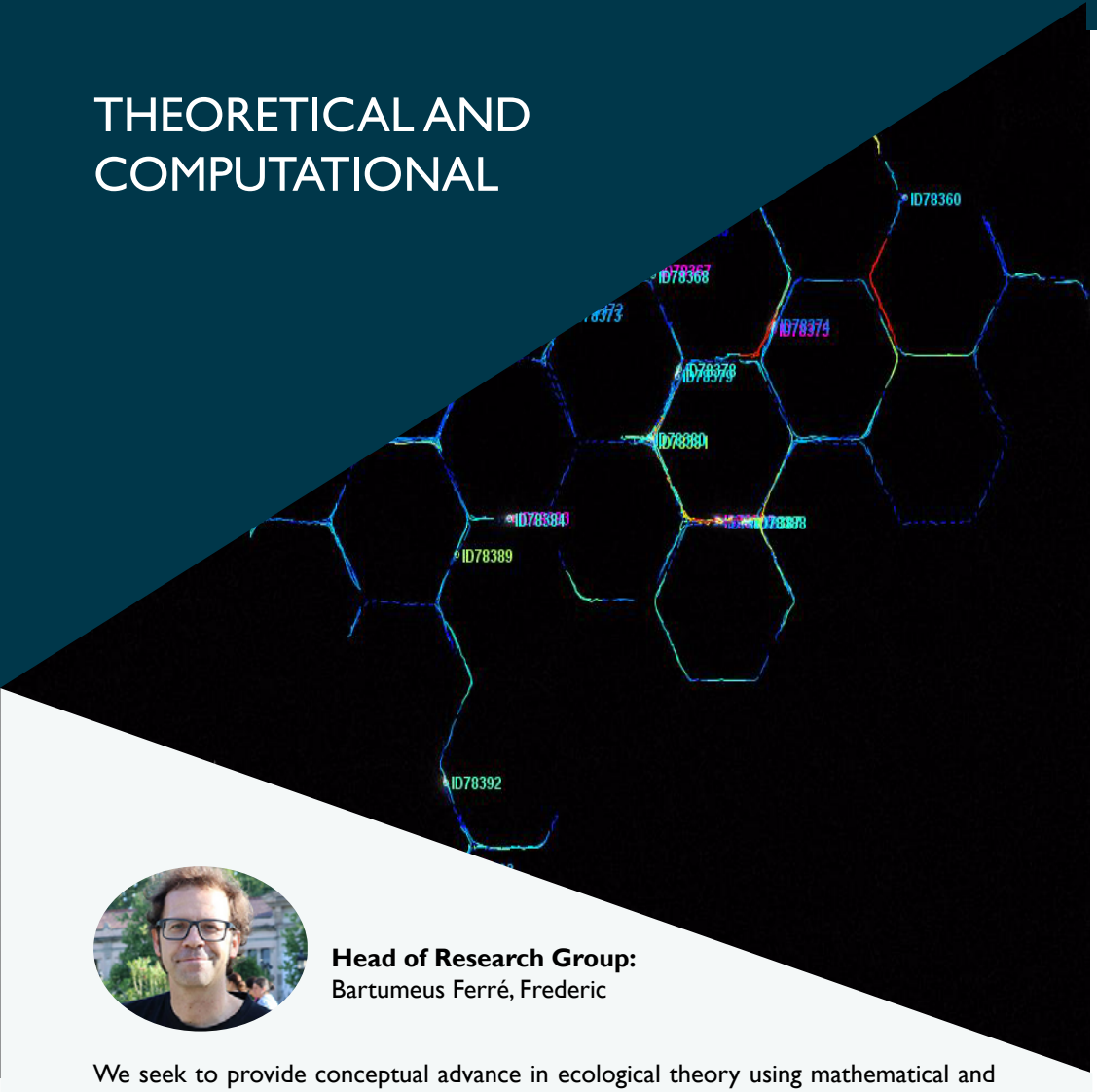
Global anthropogenic changes are rapidly disassembling the structure of natural ecosystems, leading to detrimental consequences for their functioning and services to human society (e.g., food production). In the Mediterranean Sea, fishing can reduce the abundance of coastal fish which feed on sea urchins, allowing these to increase uncontrolled, and overgraze marine macrophyte forests.

These are a biodiversity hotspot, supporting multiple species of marine organisms and the ecosystem services they provide. Guaranteeing food security from natural resources while maintaining healthy marine forest ecosystems and conserving biodiversity remains a complex challenge for managers.

To accomplish this purpose, it is necessary to deeply understand the processes regulating the ecological and socio-economic systems including the sea urchin Paracentrotus lividus that plays a key role, both as one of the main Mediterranean herbivores controlled by fish (mainly the commercial species of Sparids), and for its value as a highly prized delicacy.

Sea urchin, project MUrFor. Author: Fabbio Russo

THEORETICAL AND COMPUTATIONAL



Head of Research Group:
Bartumeus Ferré, Frederic

We seek to provide conceptual advance in ecological theory using mathematical and computational techniques. We are particularly interested in building a bridge between theory and data.

We are a highly collaborative and multidisciplinary research group that develops specific research lines and provides general theoretical foundations of observational and empirical research in ecology mostly in the context of Community Ecology & Biodiversity, Population Ecology, Movement & Behavioural Ecology, Invasion Biology, and Epidemics.

We aim to evaluate ecological theory trough the analysis of empirical data, the development of mechanistic and integrative (across scales) modeling approaches, and the study of the role of environmental and biological stochasticity in ecological phenomena, from foraging behavior to biodiversity patterns.

BIG MOSQUITO BITES

Community-Driven Big Data Intelligence to Fight Mosquito-Borne Disease.

Principal Investigator: Frederic Bartumeus
Entity: La Caixa Foundation
Budget: 507.600,00 €
Years: 2019-2023

DRYFISH

Fish in Dry Streams: From Individual and Social Behavior to Population Persistence

Principal Investigator: Jolle Jolles
Entity: MCIYU
Budget: 149.000,00 €
Years: 2023-2026

H-MIP

Human-Mosquito Interaction Project: Host-vector networks, mobility, and the socio-ecological context of mosquito-borne disease.

Principal Investigator: Frederic Bartumeus / Marc Ventura
Entity: H2020 UE
Budget: 499.990,00 €
Years: 2020-2025

OCEAN NIGHT

OCEAN NIGHT: helping society understand the importance of the marine ecosystem

Principal Investigator: Meritxell Genovart
Entity: H2020 UE
Budget: 299.000,00 €
Years: 2022-2024

ONE HEALTH PACT

Preparing for vector-borne virus outbreaks in a chaning world: a One Health Approach.

Principal Investigator: Frederic Bartumeus
Entity: Netherlands Organisation for Scientific Research
Budget: 314.000,00 €
Years: 2020-2025

IDALERT

Infectious Disease decision-support tools and Alert systems to build climate Resilience to emerging health Threats

Principal Investigator: Frederic Bartumeus
Entity: Horizon Europe
Budget: 429.888,00 €
Years: 2022-2027

PREDICTOR

Butterflies as indicators and predictors of global change in the Natura 2000 Network.

Principal Investigator: Dani Oro
Entity: CSIC
Budget: 31.555,00 €
Years: 2020-2023

UNIQUE

Unveiling the Dynamic Equations in Eco-Evolutionary Systems in the Context of Environmental Uncertainty and Limiting Data.

Principal Investigator: David Alonso
Entity: MCIYU
Budget: 157.000,00 €
Years: 2022-2025

VANESSA

Agro-ecological systems and biodiversity dynamics in mountain systems

Principal Investigator: Dani Oro
Entity: MCIYU
Budget: 146.050, 00 €
Years: 2022-2024

VEO

Versatile Emerging infectious disease Observatory

Principal Investigator: Frederic Bartumeus
Entity: H2020 UE
Budget: 675.375,00 €
Years: 2020-2024

SLEEP

Social Dynamics in Ecology: An Interdisciplinary Approach

Principal Investigator: Dani Oro
Entity: MCIYU
Budget: 222.473,00 €
Years: 2022-2026

DEMORES

Infectious Disease decision-support tools and Alert systems to build climate Resilience to emerging health Threats

Principal Investigator: Meritxell Genovart
Entity: MCIYU
Budget: 72.600,00 €
Years: 2022-2026

E4WARNING

Eco-Epidemiological Intelligence for early Warning and response to mosquito-borne disease risk in Endemic and Emergence settings.

Principal Investigator: Frederic Bartumeus
Entity: Horizon Europe
Budget: 997.700,00 €
Years: 2023-2026

DURABLE

Delivering a UniPed Research Alliance of Biomedical and public health Laboratories against Epidemics.

Principal Investigator: Frederic Bartumeus
Entity: Horizon Europe
Budget: 400.916,00 €
Years: 2023-2027

INOVEC

A research and InNOvation Partnership for enhancing the surveillance and control of mosquito VECtors of emerging arboviruses.

Principal Investigator: Frederic Bartumeus
Entity: Horizon Europe
Budget: 36.800,00 €
Years: 2023-2026

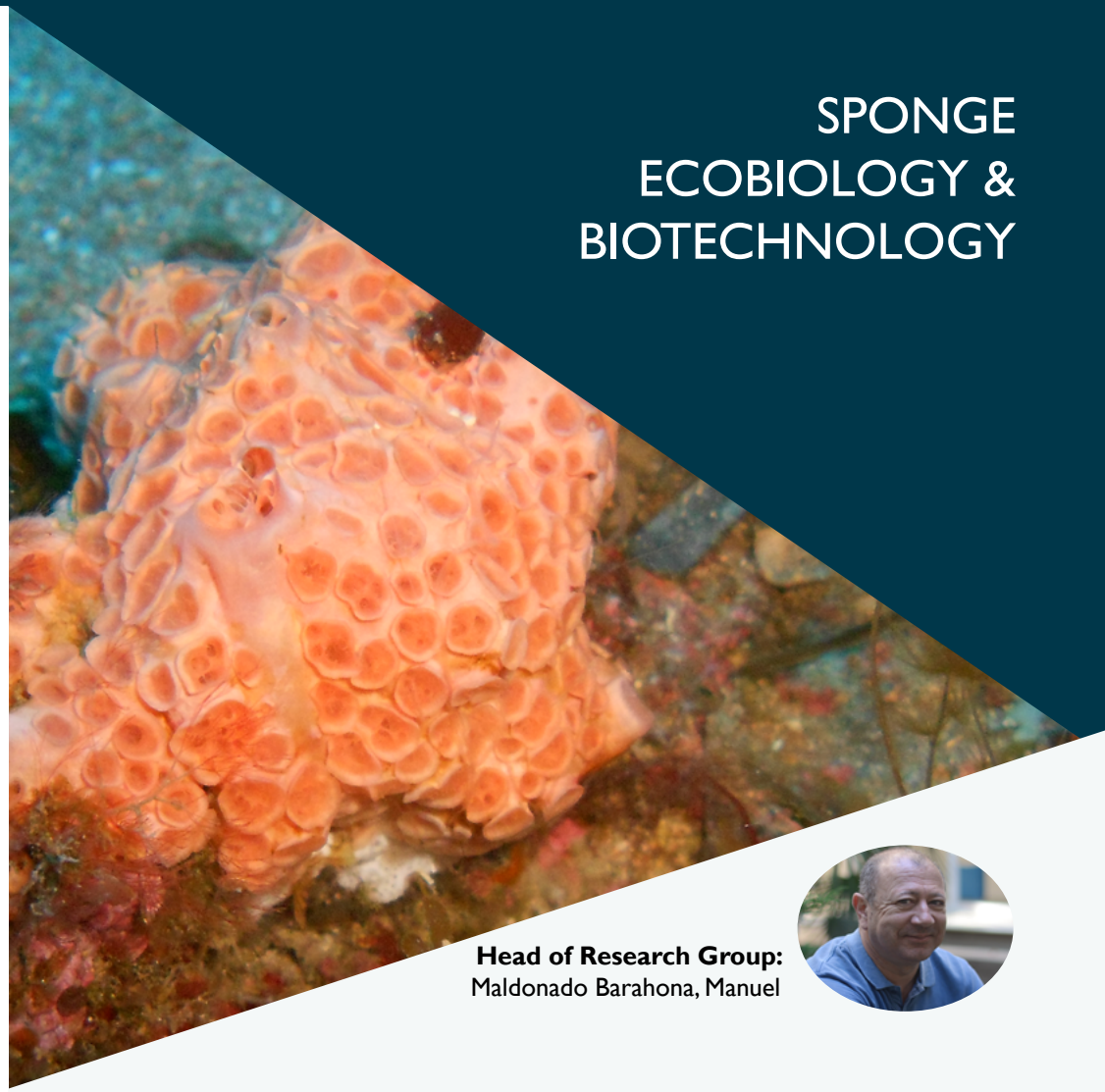
DURABLE

Outbreaks of infectious diseases are increasing due to multiple local and global interaction changes disrupting the fragile balance of the complex human-animal-environment ecosystem. The increased frequency and complexity of health threats require a different, unified form of preparedness and a coordinated, fast, reliable and effective emergency response.

DURABLE is a tailored solution to this recognised need – a strong network of world-class basic and translational research institutes and public health centres across Europe with an outstanding track record in public health support with global reach. The project aims to provide high-quality scientific information in record time to support HERA's decision-making in preparing for and responding to cross-border health threats and assessing the impact of countermeasures.

Tiger mosquito larva. Author: Elisa Mora

SPONGE ECOBIOLOGY & BIOTECHNOLOGY



Head of Research Group:
Maldonado Barahona, Manuel

We combine objectives concerning fundamental research with others of potential practical application. The work is structured around marine invertebrates, mainly sponges (Porifera) which play a relevant ecological role and show a high biotechnological potential.

We use sponges to address the evolutionary links between protozoan and metazoan for a better understanding of the evolutionary emergence of the Animal Kingdom.

We explore the eco-biology of Porifera silicification aiming to unveil biotechnological applications.

DARKSI

Exploring the bioecological, biogeochemical and technological implications of dark silica in the ocean.

Principal Investigator: Manuel Maldonado
Entity: MCIYU
Budget: 163.000 €
Years: 2020-2023

SIFS-B

Silicon isotope fractionation by sponges for biotechnology.

Principal Investigator: Manuel Maldonado
Entity: PIE
Budget: 46.994,94 €
Years: 2021-2024

SponBIODIV

Marine sponge biodiversity from genes to ecosystems: delivering knowledge and tools for sustainable management and conservation.

Principal Investigator: Manuel Maldonado
Entity: ERANET BIODIVERSA+
Budget: 59.982 €
Years: 2023-2026

SponBIODIV

SponBIODIV's main goal is to establish baseline knowledge on sponge diversity and distribution, while providing tools to enhance the management and conservation of sponges across the Atlantic and Mediterranean. The project aims to identify biodiversity and phylodiversity hotspots for sponges and their habitats in these regions by compiling the most comprehensive dataset of sponges. It will also focus on establishing ecological and genetic corridors, as well as refugia areas between species and regions, using a combination of biophysical modeling and population genomic approaches.

The project will develop new methodologies for broader biodiversity detection and monitoring of sponge habitats, particularly through the use of eDNA and leveraging sponges as natural samplers of eDNA. Additionally, SponBIODIV will assess the current conservation status of species and habitats, in alignment with key international processes. Finally, the project seeks to engage relevant stakeholders for the co-production and delivery of data and practical tools that will inform management, conservation, and restoration efforts.

Aggregations of marine sponges. Author: Manuel Maldonado

GROUP OF AQUATIC MACROPHYTE ECOLOGY (GAME)

Head of Research Group:
Mateo Mínguez, Miguel Ángel

GAME has pioneered in the study of the carbon cycle associated to coastal vegetated ecosystems. Emphasis is made in the phenomenon of refractory accumulation of organic carbon during centuries or millennia in their sediments. Our studies triggered the nowadays worldwide spread and fertile research field of Blue Carbon, of which GAME is considered a reference group.

Taking advantage of the high chronological coherence in the accumulation of those highly organic sediments and their exceptional state of preservation, we also aim at studying long-term changes in the ecosystems at the land-ocean interface using a multiproxy palaeo-ecological approach.

With an integrative, inclusive and collaborative vocation, GAME makes incursions in a wide variety of scientific disciplines such as biogeochemistry, molecular biology, edaphology, geophysics, palaeo-ecology, palynology, microbiology, genetics, or archaeology.

HOLOCENO

Environmental changes in coastal ecosystems in response to anthropogenic drivers during the Holocene.

Principal Investigator: Oscar Serrano
Entity: PIE
Budget: 150.000 €
Years: 2021-2024

MEDCHANGE

Millennary changes in the Mediterranean

Principal Investigator: Oscar Serrano
Entity: MCIYU
Budget: 165.000 €
Years: 2021-2024

HOLOCENO

Ecosystem change occurs at multiple patial and temporal scales. Discriminating between real state changes, cycles, and trends, is often difficult or impossible without an adequate time perspective, since multiple processes interact at multiple temporal and spatial scales.

For this reason, long, detailed and reliable temporal series of data on relevant ecosystem functional and structural variables are a priority for researchers and managers since this allows them to distinguish between normal and abnormal conditions and deliver the appropriate diagnostic.

The aim of this research is to study long-term temporal series of data from seagrass Posidonia archives in the Mediterranean Sea and Australia to answer key and novel questions relating to coastal environmental change.

Cores for paleoecological studies Author: GAME-CSIC

COMMUNICATION AND OUTREACH

RELEVANT ACTIVITIES

NEW EDUCATIONAL MATERIALS ON BIODIVERSITY

These materials are designed to reflect on the concept of "biodiversity". This notion has been created by humans to assess biological diversity and encompasses all forms of life, evolutionary processes, ecological, and cultural processes that support it. Formulas have been developed to quantify biodiversity, and the goal is to understand it on all scales, whether it be an individual organism, a group of organisms, a species, an ecosystem, or the entire planet Earth. These educational proposals have been developed within the framework of the Ocean Night outreach project.

150 PEOPLE PARTICIPATE IN THE EVENING DEDICATED TO THE OCEAN

It was held at the headquarters of the Center for Advanced Studies in Blanes (CEAB) on September 29, within the framework of the European Research Night. The objective of the event was to bring together the scientific evidence that is available today about the ocean, the threats it faces and the actions that we must urgently carry out to protect it.

MORE THAN FOUR HUNDRED PARTICIPANTS IN THE OPEN DOOR DAYS

300 students from Blanes, Lloret de Mar, Palafolls, Pineda and Malgrat de Mar have visited the CEAB-CSIC these November 15, 16 and 17. They have completed, organized in small groups, six scientific routes that allowed them to discover the entire process followed in research and participate in certain phases such as the preparation of field work or the analysis of samples in the laboratory. Open days are held every year coinciding with Science Week.

MEDIA RELATIONS

21 Press releases

>350 Press impact

SOCIAL MEDIA

4.684 followers
>650.000 impressions
>64.000 visits

1.527 followers
>30.000 impressions
>2.000 visits

1.129 followers
>2.800 impressions
>550 visits

40 followers
46 videos
>3500 views

WEBSITE

60 News on blog

39.185 Number of visits

30.218 Unique visitors

Sanidad impulsa la aplicación Mosquito Alert, para generar el primer mapa de picaduras de España
TV1
Jun-2023

Campaña para eliminar las truchas y los piscardos de diez lagos de los Pirineos
La Vanguardia
Jul-2023

Detectada "por primera vez" en el litoral de Barcelona una alga invasora
20 Minutos
Jul-2023

Descubiertas dos nuevas especies de gusanos en una cueva de Mallorca
El Periódico
Aug-2023

Científicos descubren una planta que reduce la salinización
TV3
Aug-2023

La sobrepesca amenaça els boscos d'algues a la Costa Brava
El Punt Avui
Sept-2023

Un factor clave en el éxito de una especie invasora es su microbioma
La Sexta
Oct-2023

Alcoverro insta a mejorar los sistemas de depuración para evitar vertidos que perjudican a la posidonia
Nou diari (Illes Balears)
Nov-2023

Quins canvsi produeix el canvi climàtic al fons marí?
TV1
Nov-2023

Un estudi internacional revela el paper del paisatge en les emissions de gasos d'efecte hivernacle
TV3
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Reintrodueixen una alga al parc natural del Cap de Creys que porta més de 4 dècades extingida
TV3
Dec-2023

Muerte masiva de esponjas marinas en el Mediterráneo
Telecinco
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