INSTITUTE OF MARINE SCIENCES

BIANNUAL REPORT 2017-2018
&
STRATEGIC PLAN

CSIC
Consejo Superior de Investigaciones Científicas

ICM Institut de Ciències del Mar

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WELCOME

We are happy to present our biannual report (2017–2018) and strategy plan for the 2019–2021 period. In the following pages we will expose what we do as public servants but, above all, we will attempt to transmit who we are and why we are so proud and committed to our work. The Institute of Marine Sciences (*Institut de Ciències del Mar*, ICM; http://www.icm.csic.es/) is not only the largest marine research centre in Spain, most of all it is a centre with committed people, people who love the sea, who devote their greatest energy to observing and understanding the oceans and their role in the living Earth, and who happily dedicate extra-energy to communicate their knowledge and transmit their love to society.

The last decade has not been easy for science in Spain, nor for ICM. Since the 2008 financial crisis, basal funding from the regional and national governments has been at minimum levels. Throughout six years there were no new research positions and several national calls either disappeared or were largely reduced. This represented a major threat to ICM because, as for most CSIC centres, its funding relies heavily on CSIC's headquarters and the national R&D plans. During the last few years the situation has slowly recovered but it remains still below the investment before 2008 (1.2% versus 1.4% of the gross national product) and far below other European countries (the European average is nearly 2.1%). To adapt to this situation, ICM has had to search for international funding sources, especially from the European Union. However, ICM and most Spanish research institutions did not have the right tools for this transition; for example, the Spanish administrative regulations do not allow ICM to hire personnel for fund-raising activities and other structural tasks.

At ICM, we have been able to partly counteract these threats thanks to the extraordinary commitment and dedication of our staff and a very dynamic internal organization. But we all know that Science is a long-term course. This commitment is hardly sustainable over a long

period of time unless it is properly organized and it translates into fruitful results. This means optimizing our own resources and organization but also developing policies such that our work properly translates into services for society, which will then be supported by local and regional companies and administrations.

We ask our readers to take this as a draft report: it has not been easy to do because we are in the middle of strategic planning and because we have lacked proper annual reports for many years. We take it as an opportunity to identify the "state of ICM", taking a pause and reflecting on where we are and where we are heading, identifying which is the best track to reach our goals. This time we will do so with the help of our recently created External Scientific Advisory Committee, whose initial meeting is on 14–15 March, 2019.

We wish to end this brief introduction once again by praising and thanking the extraordinary work done by our staff, their commitment to the accomplishment of the present and the planning of the future of ICM—very often much beyond their scientific and technical duties. This does indeed include our temporary staff, particularly those personnel that have supported ICM's activities over many years and whose pledge has certainly not yet been properly recognised. We sincerely hope that the actions we are planning and implementing will serve ICM to both reach its scientific-societal goals and to acknowledge the great effort of all its team members.

Josep L. Pelegrí
Director, on behalf of ICM's directive team

CHAPTER 1 — ABOUT ICM

VISION

The oceans are fundamental to life on Earth. They sustain natural systems and provide resources that make Earth habitable for humankind. Human activity however, is causing rapid global changes that affect the ocean's health and productivity. Global warming, changing weather patterns, sea level rise, ocean acidification, and extreme weather events, disrupt economies and deeply affect our daily lives. These environmental stressors modify the coastline and, along with pollution and fishing activity, alter marine populations, harm ecosystems, and threaten biodiversity. Moreover, oceans host the sources of devastating natural hazards, which episodically hit the coasts causing enormous human and economic losses. In-depth knowledge, determined action, and coordinated management are essential to confronting global challenges, thereby driving sustainable development of humankind. ICM contributes to these goals by conducting frontier research and fostering knowledge and technology transfer on topics related to ocean and climate interactions, conservation and sustainable use of marine life and ecosystems, and impact mitigation of natural and anthropogenic hazards.

This report is divided into five sections. The first one aims to provide a general overview of the structure and functioning of ICM. In this first section we will explain the external structure that frames the way ICM operates and we will give some key facts and figures about ICM. In the following two sections we will turn to the tasks undertaken by the very active internal working groups and committees at ICM, starting with its regular government bodies in Section 2 (as reflected in CSIC's general lines for research institutions) and continuing with its internal organization specificities in Section 3. This introductory chapter will finish with a brief introduction to ICM's research and service units (Section 4).

CSIC and ICM

The Spanish National Research Council (*Consejo Superior de Investigaciones Científicas*, CSIC; http://www.csic.es/) is the largest public institution dedicated to research in Spain and the third largest in Europe. Belonging to the Spanish Ministry of Science, Innovation and Universities through the Secretary of State for Universities, Research, Development, and Innovation, CSIC's main objective is "to develop and promote research that will help bring about scientific and technological progress, and to prepare to collaborate with Spanish and foreign entities in order to achieve this aim".

CSIC's research encompasses all fields of knowledge, with over 15,000 staff, among them 3,000 researchers. CSIC generates approximately 20% of all scientific production in Spain. CSIC's research is structured into 120 research centres, with 63 of them belonging entirely to CSIC and the remaining 57 being mixed centres, run jointly with other research agencies or institutions. ICM is one of the five marine research centres belonging to CSIC. It has the peculiarity of being the only one entirely dedicated to marine sciences, with its tenure researchers representing about half of the entire CSIC permanent marine science research workforce.

ICM's mission is to study the seas and oceans with an integrated approach, seeking to describe their role and impact on the geophysical and biogeochemical dynamic equilibrium of planet Earth. Research at ICM spans many temporal (from high-frequency turbulence to geological time periods) and spatial (from the micro-scales to the global connections) scales, and it can be very specific as well as fully inclusive and interdisciplinary. ICM is a singular institution in that multidisciplinary knowledge and expertise are synergistically combined to achieve scientific objectives that are unattainable by most narrowly focused research centres. Our main research topics are coastal evolution, continental margins, marine subsoil, natural risks, coastal water quality, genomics of organisms, marine species and communities, marine ecosystems, fishery resources and aquaculture, physical-biological interaction processes, biogeochemical fluxes, ocean dynamics, physical-chemical structure of the water column, ocean-atmosphere interaction, climate change, global change, garbage and marine pollutants, marine energies and the transition towards a sustainable economy.

A BRIEF HISTORICAL RECAP

The Fisheries Research Institute (*Institut d'Investigacions Pesqueres*, IIP) was created on October 3, 1951, attached to CSIC. It was based in Barcelona, with coastal laboratories in four other Spanish locations (Blanes, Castellón, Vinarós, and Vigo). In 1978 the IIP split into different centres, among them the one in Barcelona, which maintained its original name.

During these decades the original lines of research (within the departments of Marine Biology and Marine Renewable Resources) diversified, which was eventually reflected in the creation of the departments of Marine Geology (1994) and Physical Oceanography (2007). This interdisciplinary nature was visualized in 1987, when the centre was renamed to the Institute of Marine Sciences (ICM).

In 1992, the Oceanographic Ship Management Unit (*Unidad de Gestión de Buques Oceanográficos*, UGBO, 1992) was created as a support and maintenance unit for oceanographic vessels, later also to become responsible for the management of the Antarctic base Juan Carlos I (1999). In 2000 the UGBO was reorganized and transformed into an independent Marine Technology Unit (UTM; www.utm.csic.es). In 2012, a new reorganization of UTM resulted in all its researchers being transferred to ICM, specifically to the departments of Marine Geology and Physical and Technological Oceanography, leaving the UTM exclusively with technical personnel.

During these last 15 years, ICM's evolution has been influenced by its collaboration with many

national and international public and private entities. In particular, it has meant the creation of several mixed research units: the Barcelona Expert Center (together with Barcelona Tech, 2007, http://bec.icm.csic.es/) and the Barcelona Center for Subsurface Imaging (together with UTM and the Catalan Institute for Research and Advanced Studies, 2007, http://www.barcelona-csi.cmima.csic.es/), and the Catalan Institute for Governance of the Sea (together with the Government of Catalonia, 2017), as well as associate units with the Polytechnic University of Catalonia and the University of Las Palmas de Gran Canaria.

ICM, UTM and CMIMA

ICM has its offices in a privileged location in the city of Barcelona. UTM and ICM together occupy a building located right by the seafront, at walking distance (about 1 km) from downtown Barcelona. This two-and-a-half story building, together with its basement, represents some 15,000 m^2 of floor space. It includes laboratories, offices, meeting rooms and warehouses, plus a library and an auditorium with a capacity for 150 people. Most of the spaces are occupied by ICM staff and facilities. In addition, UTM uses about one-third of the second floor and part of the basement and another CSIC research center, the Institute for Evolutive Biology (*Institut de Biologia Evolutiva*, IBE), is temporally located in about another one-third of the second floor.

ICM and UTM are together under the umbrella of an administrative structure, the Mediterranean Centre for Marine and Environmental Research (*Centre Mediterrani d'Investigacions Marines i Ambientals*, CMIMA), which is responsible for the economic supervision and execution of their economic activities as well as for the supervision of their housing infrastructures. CMIMA runs its task with a staff of some 15 people, operating under the supervision of its general manager. The directors of ICM and UTM respectively act as CMIMA's director and vicedirector. Together with CMIMA's general manager and a representative from CMIMA's administrative personnel, ICM and UTM directors form CMIMA's executive board.

ICM and UTM are perfectly complementary: ICM is focused on basic and applied research while UTM provides technological support to the Spanish oceanographic fleet and Antarctic research bases, which in turn serve ICM. In a natural way, UTM and ICM collaborate closely on numerous

scientific and technological projects, as well as on dissemination activities aimed at local and global players.

ICM TODAY

The permanent ICM staff consists of 64 researchers, in addition to some 50 technicians. These are joined by over 150 technical and scientific staff and graduate students that are incorporated within the framework of competitive projects and contracts. The entire scientific and technical ICM staff are integrated into scientific groups—a total of 15 groups as of the end of 2018. Similarly, all technical staff are distributed into technological units that provide services to both the ICM research groups as well as to external requests. Additionally, there are a number of scientists and technicians that participate in several associate research units. According to CSIC's internal classification—A, B or C, from highest to lowest, chosen in terms of their scientific productivity, income through research projects, and staff number during the 2016–2018 period—ICM stands as a **Category A** research centre.

The major strength of ICM comes precisely from its interdisciplinary character, its ability to broadly address numerous questions and challenges related to marine sciences and technologies. This multi- and inter-disciplinary focus has driven a sustained collaboration with many other national and international research groups. The major outcome has been the granting of many national and international projects and contracts that have led to numerous high quality scientific articles and to the development of new technologies. Nowadays, ICM is the first Spanish centre in scientific productivity on marine issues and one of the leading centres on the Mediterranean. Every year ICM staff runs some 50 active projects and contracts with annual revenues of about € 5-6 million, publishes some 200 articles in the first quartile of the Science Citation Index (SCI), (including between 10 and 20 high-impact articles), while supervising about 15 doctoral theses. Additionally, ICM is a very dynamic research centre in the areas of dissemination and scientific communication, specialized training activities, and undergraduate and graduate mentoring and advising.

The root of all of ICM's scientific productivity is its interdisciplinary observation and modelling of ocean processes at very different spatial and temporal scales, with special emphasis on the Mediterranean Sea, the Atlantic Ocean and the subpolar regions, yet extending to practically all seas and oceans of our planet. Besides the historical and real-time datasets available through international programs, ocean processes are observed and analysed using very diverse, often

interdisciplinary, techniques that include laboratory, field and remote sensing experiments. The technologies include novel remote sensors (ICM generates and distributes surface salinity deliverables in real time, presently being the only centre in the world that performs this activity), instrumented observation stations, instrumented drifters and floats (designed at the centre itself), underwater vehicles, monitoring of catches in fishing vessels, seismic lines (which allow the recording not only of the marine subsoil but also of the thermohaline finestructure of the water column), as well as thematic and interdisciplinary oceanographic campaigns.

The very diverse measurements of essential physical, chemical, and biological variables are noteworthy. This monitoring is carried out periodically at seven points distributed along the Catalan coast, in addition to their participation in a Mediterranean network for the monitoring of temperature in large parts of the Mediterranean coasts. Also remarkable are the oceanographic cruises on regional and transoceanic scales, carried out on board a variety of Spanish and foreign vessels, including the Mediterranean on board the R/V García del Cid (based in Tarragona), and the Atlantic and Austral Oceans during transits between the Iberian Peninsula and the Antarctic continent, on board the R/Vs Hespérides and the Sarmiento de Gamboa. Significantly, over the last half century ICM has built and proudly hosts a vast volume of collections, databases, and knowledge on the marine sciences, of great scientific and socio-economic value. Furthermore, it is important to highlight ICM's initiatives in citizen science, and in promoting and accompanying civil society as to the observation of the marine environment and its inhabitants (http://www.observadoresdelmar.es; https://natusfera.gbif.es/).

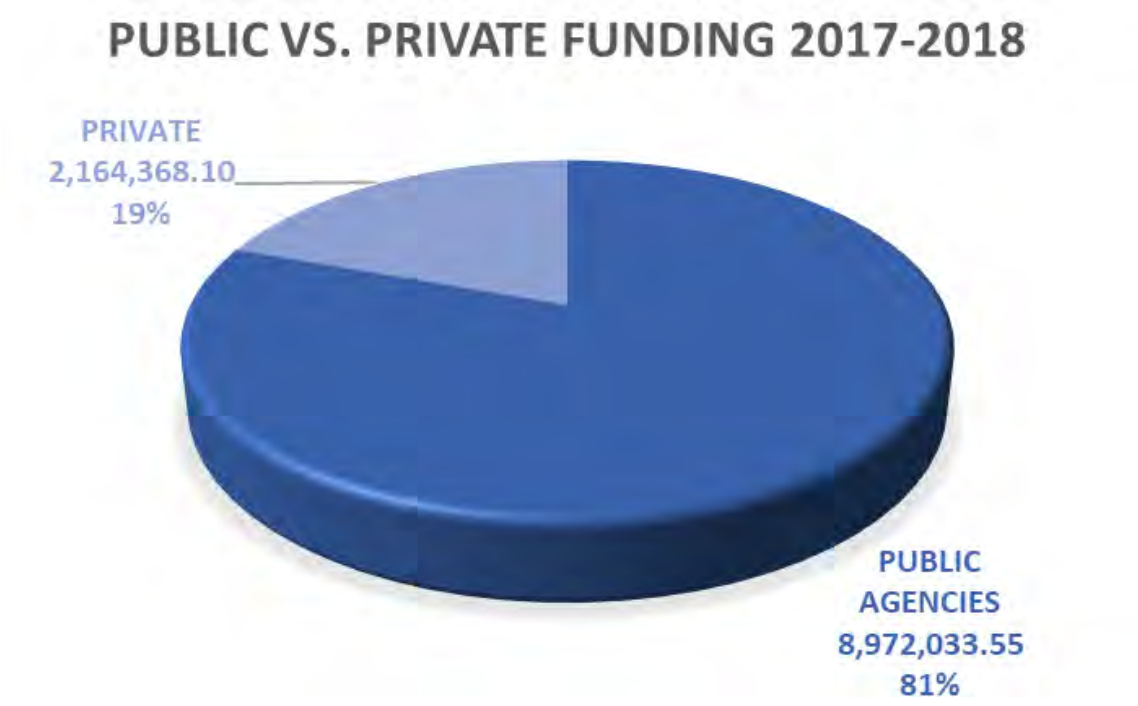
The available datasets are then used by the research groups towards attaining ICM's principal goal: to model and understand the mechanisms behind the very diverse specific oceanic processes, as well as to comprehend the interconnections of the different oceanic subsystems,

which give rise to the complexity of the living ocean. The outcome has been and continues to be a significant contribution to marine basic and applied knowledge. These range from the pioneering implementation of satellite observations of sea surface salinity to inventories of biodiversity and ecosystem resilience, including worldwide recognized marine genomics, paleoceanography, climate change, Antarctic science, tectonic processes, or environment protection achievements.

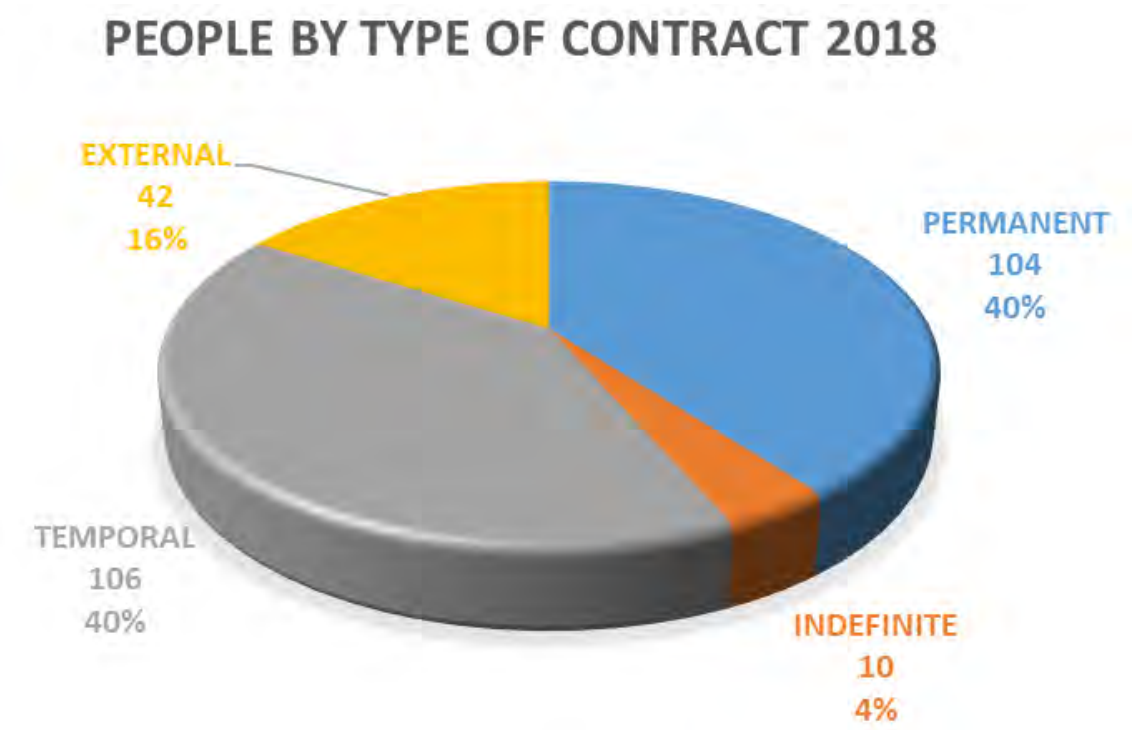
As an integral part of the research process, ICM is fully committed to the formation and mentoring of undergraduate and graduate students as well as to the dissemination and communication of marine science to society. With regards to capacity building, ICM's researchers and technicians participate in many formative events, such as national and international conferences, workshops and highly specialized courses, including an annual summer course (*The Ramon Margalef Summer Colloquium*). Furthermore, ICM staff supervise many final-degree works at the undergraduate and graduate levels, including some 15 doctoral theses every year In the social aspect, ICM is fully committed to the dissemination of its work at many different levels. ICM facilities often host meetings of national and international projects, programs, societies, and committees. ICM is also engaged in explaining to the different social players (for example, government and corporate leaders, and concerned citizens) what marine sciences are about, including open-door events that run several times per month, year-long programs of collaboration with schools, exhibitions at museums, and marine awareness activities together with civil associations (ICM currently hosts five civil associations, including its own student and sea-of-science divulgation associations). Lastly, ICM edits and, together with CSIC's headquarters' publication services, publishes *Scientia Marina*, a Q2 (Scopus rankings for 2018) journal (Journal of Citation Reports) on marine sciences.

HIGHLIGHTS

During the 2017–2018 period, ICM has obtained projects and contracts for a total amount of 11.2 million €, with 80% of it coming from competitive public calls and 20% from contracts with private companies and the administration itself. Additionally, ICM has 114 people with either permanent or indefinite contracts whose salary comes from public sources, and every year it receives over 1 million € from CSIC headquarters for maintenance of its infrastructures. All these together represent an annual budget of about 12-13 million €.

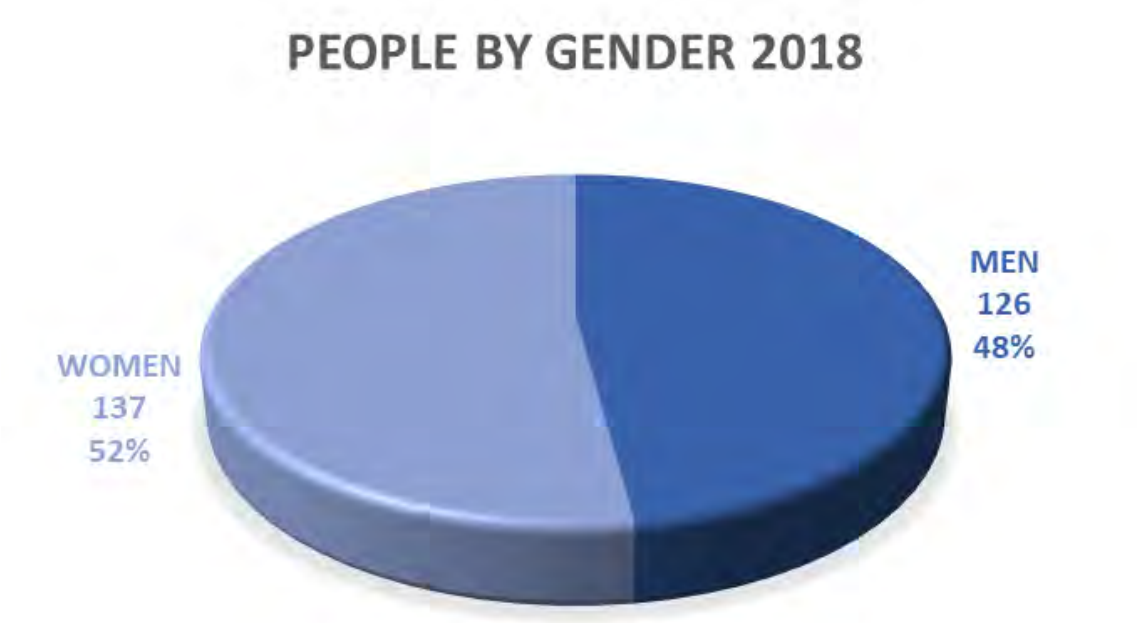


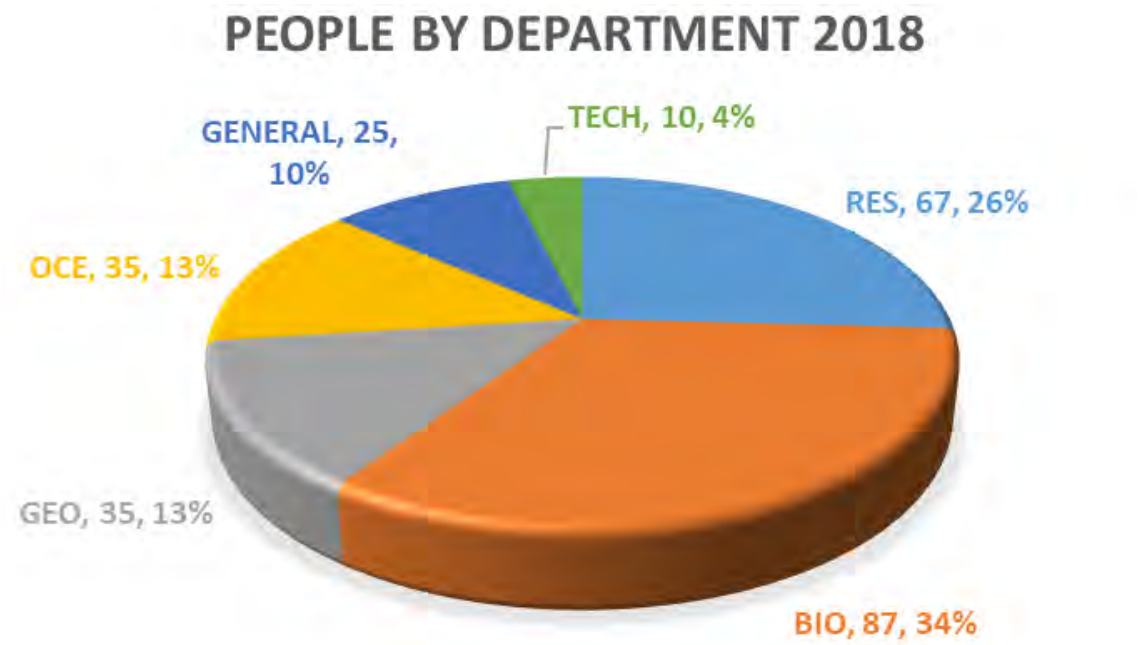
During the last 15 years the number of staff at ICM has remained fairly constant, in the 250–300 range. In 2018 there were a total of 262 people: 44% of the personnel (114 people) corresponded to permanent or indefinite contracts, 40% (106 people) were hired as technicians or postdocs through research projects, and 16% (42 people) had external projects such as national or international funded contracts. These numbers do not consider the centre's visitors in any way, which range between 150 and 250 people. These visitors represent many different circumstances, mostly undergraduate and graduate students but often also international researchers on sabbatical.



The 262 staff during 2018 are fairly well distributed between men and women, with 52% women (137) and 48% men (126). However, among the permanent researchers, the proportions were not as even, with 40 men and only 24 women.

The staff distribution among departments shows that two departments (Marine Biology and Oceanography, Renewable Marine Resources) account for 60% of the staff, while Marine Geosciences and Physical and Technological Oceanography represent only 26%. The remaining 14% are technicians or assistant personnel doing tasks that support the entire institute.





Finally, in terms of scientific publications, during 2017–2018 there have been a total of 432 SCI articles (according to the Scopus database), with about 80% of them belonging to Q1 journals. During this same period, 27 articles have been published in Nature, PNAS, or Science high-impact journals, and 23 successful doctoral theses have been supervised by ICM researchers. In the Appendix we present other accomplishments by ICM staff, such as their participation in international committees and the granting of recognitions.

ICM has a relatively standard hierarchical structure that closely reflects the decision from its headquarters: a directive and managing team (director, deputy directors, heads of departments, and a manager) and the collegiate bodies (ICM Board, Research Faculty board, and the entire staff Assembly and, starting this year, the External Scientific Advisory Committee (*Comisión Externa de Asesoramiento Científico*, CEAC). This typical structure is described in the following section.

ICM'S GOVERNING BODIES

Directive Team

The ICM director is appointed for a 4-year period by the CSIC president, after a consultation to ICM's Faculty Board. They are the representative of the centre and are therefore responsible for the design, supervision, and coordination of its strategy, services and activities, including the general supervision of its staff, research projects and facilities. The director appoints the deputy directors and the heads of department. Since March 2018, following the appointment of Josep Lluís Pelegrí as director, ICM has been operating with four deputy directors – Elisa Berdalet, Albert Calbet and Valentí Sallarés – and one technical vice director – Òscar Chic.

Each of the deputy directors is responsible for one of the three principal areas that encompass the internal organization of the centre: Cultural Science (Elisa Berdalet), Scientific-Technical Services (Albert Calbet), and Research Strategy (Valentí Sallarés). Òscar Chic, the technical vice-director, is in charge of the three internal general services: maintenance, informatics and library. Additionally there is one member of the directive team in each of the advisory working groups (Cultural Science, Scientific-Technical Services, and Research Strategy) and task committees (Waste Management, Working Hazards, Sustainability, and Equality). These will be described with more detail in next section.

Departments

ICM is divided into four departments: Marine Biology and Oceanography, Marine Geosciences, Renewable Marine Resources, and Physical and Technological Oceanography. The heads of these departments, appointed by the Director after consultation with the staff of each department, are Francesc Peters, Pere Puig, Joan Batista Company, and Joaquim Ballabrera, respectively.

The heads of these department are responsible for coordinating and supervising their departmental activities, as well as for supervising their respective facilities. In particular, most of the scientific services provided by ICM, and hence the laboratories and facilities associated with these services, depend directly one the departmental heads. Further, the departmental heads form part of the Centre's directive board, which is to meet at least once a month, hence facilitating the dissemination of information from the directive team to all researchers and technicians.

All research scientists and most technicians (except those working on internal general services) belong both to one department and to one research group (see next section). In contrast, in order to favour the overlapping interdisciplinary character of the centre, one research group may be composed of researchers belonging to more than one department.

Management

The ICM office manager, César García, is directly appointed by the CSIC president after consultation with the General Secretary. He is responsible for all administrative tasks, including the internal administration of the centre, the supervision of the annual budget and the supervision of all works and services. The ICM office manager also acts as the manager for UTM and the entire CMIMA, with the support of Eva López, the paymaster.

ACADEMIC BODIES

Directive Board

The directive team along with the heads of the four departments, the office manager and three representatives from the non-scientific personnel constitute the directive board of the institute. This board meets once a month to assess the scientific, technical, administrative, and logistic issues that determine everyday life at ICM. They are also informed on the advancement of the different working groups and committees and give their advice on current and future strategic actions.

Scientific Board and General Assembly

The scientific board is formed by all permanent researchers and non-permanent doctors with contracts of five years or longer, a total of 64 people as of the end of 2018. Its mission is to foster discussions and to propose initiatives regarding the current activities and future planning for the centre. The scientific board votes every four year for a candidate for director who is eventually confirmed by the president of CSIC. The general assembly is a consultative body formed by all personnel of the centre. Formally, it has a voice but no vote in establishing the institute's planning and policies.

Starting in 2018, both the scientific board and the general assembly gather together in regular sessions at least three times per year, with both bodies participating in the voting of ordinary recommendations that affect everyday life at the centre. Additionally, there may be other extraordinary or telematics meetings to discuss and vote on specific strategic issues.

External Scientific Advisory Committee

The External Scientific Advisory Committee (*Comité Externo de Asesoramiento Científico*, CEAC) is formed by researchers of international prestige. It is nominated by ICM's scientific board and confirmed by CSIC's president. Its task is to assess and evaluate the institute's activities and help it to develop its strategic planning.

ICM's CEAC was first approved in December 2018 and is to first meet during 14–15 March, 2019. Its members are the following: Eduardo Balguerías, Philippe Cury, Isabel Cacho, Christine Gommenginger, Karen Heywood, Peter Herzig, Thomas Kiørboe, Berta Levavi-Sivan, Ingrid Obernosterer, Deborah Power, and Satish Singh.

ICM is structured into three working groups, which reflect the three pillars on which any modern research centre must stand on: *scientific culture*, *scientific-technical services,* and *research strategy*. All three groups are connected through the directive team, as the facilitator of each group is one member of the ICM's directorate. Additionally, there are four committees, two of them related to practical issues on waste management and working hazards, and the other two dealing with sustainability and equality themes. All groups and committees, except the waste management and working hazards committees, were created during the second quarter of 2018.

ADVISORY WORKING GROUPS

Research Strategy

The main mission of the Research Strategy working group is to define and implement a scientific institutional strategy that enhances the research capabilities of the centre. The definition of a solid, high-impact, and viable complementary research project should enhance the synergies among the different groups, hence creating the critical mass necessary to participate in highly competitive calls that provide specific institutional funding (e.g., Severo Ochoa, CSIC's thematic platforms, the R&D+i Catalan network). Such institutional funding shall allow a differential increase in the centre's competitiveness and will favor the implementation of actions supporting a constructive working environment (e.g., HRS4R-Euraxess).

The working group meets regularly, at least once a month, to develop the centre's strategy. It acts as a consultative body to the centre's directorate on all topics related to the internal organization of research, such as the priorities in the opening of new scientific tenure positions, and is the best way to promote its image. The group is made up of two researchers from each department, acting under the coordination of the research deputy director. The current members of the group are: Joaquim Ballabrera, Eulàlia Gràcia, Cèlia Marrasé, Ramon Massana, Pilar Olivar, Albert Palanques, Marcos Portabella, Anna Sabatés and Valentí Sallares (coordinator).

Scientific-Technical Services

The main mission of the Scientific-Technical Services group is to structure and adapt the services and external services of the centre to its strategic plan, taking into account the needs of the research groups and developing them so that they are attractive to organizations, administrations, and public and private companies. The specific tasks include: (1) developing a strategic plan of service provisions, (2) correcting the current list of services, (3) identifying the services that fit this plan, which implies checking, debugging, and completing it if the current services list requires so, and (4) structure these services in terms of their content and organization.

Internally, the objective is to update the portfolio of services, integrating all different services within a complementary and efficient structure that has clear and informative websites. This includes, when necessary, the reorganization of the technical teams according to the restructuring and resizing of their services. At the external level, it is necessary to identify the potential clients of these services and also those relevant calls for specific services where the centre can participate in a coordinated manner.

The group is facilitated by the corresponding deputy director and includes technicians from all services and representatives of all the departments. The current members of the group are: Maravillas Abad, Raul Bardaji, Elisa Berdalet, Albert Calbet (coordinator), José Manuel Fortuño, Josep M. Gasol, Jorge Guillén, Gemma Ercilla, Paloma Martín, Elvira Martínez, Francesc Peters, José Pozo, Antonio Turiel and Roger Villanueva.

Scientific Culture

The mission of the Scientific Culture group is to design a strategy for developing actions of dissemination, communication, and education relative to the marine sciences, reaching from the neighbourhood to international forums. This includes explaining the consequences of anthropogenic impacts, in order to develop respectful attitudes towards the marine environment.

Through the Outreach and Communication service, the centre responds to the demand for disseminating (reaching as many people as possible) and communicating (ensuring that the selected public gets the message), the results of its research projects. This requires a coordination effort of all ongoing dissemination initiatives at ICM, both scientific and educational

projects, under the umbrella of a single strategy. In this regard, one objective is to establish a stable platform, through proper alliances with other players in the marine world (e.g., museums and the Harbor Authority) that facilitate the development of high-impact educational projects.

The working group, in collaboration with the association Sea-of-Science, will also supervise the training activities at ICM. This includes the specialized courses that are currently being taught through the Barcelona Ocean platform, as well as other actions that are aimed at high school students and universities, both national and international.

The group, facilitated by the deputy director of Scientific Culture, is formed by a representative from each department as well as the personnel in the Outreach and Communication service. The current participants are: Pere Abelló, Belén Alonso, Vanessa Balagué, Elisa Berdalet (coordinator), Albert Calbet, Anabel Colmenero, Carolina Gabarró, Esther Garcés, Josep M. Gili, Mariví Martínez, Montserrat Ramón, Carine Simón, María Vicioso and Magda Vila.

TASK COMMITTEES

Waste Management

The Waste Management commission (*Comissió de Residus*) was created in 2010, made up of workers from ICM and IBE. Its objective is to coordinate and execute tasks for the correct management and elimination of chemical, biological, and cytotoxic residues generated in the building laboratories and during the oceanographic cruises run by UTM and ICM.

The principal tasks of the commission are the following: (1) promotion of best practices aimed at minimizing the generation of chemical waste, (2) pilot tests aimed at the reduction of wastes, (3) update and disclosure of protocols for selection and removal of toxic waste, (4) ensuring the availability of materials for handling and storage of waste materials in the security cabinets, (5) continuous online update of the waste materials stored in the building and maintenance of the historical record, (6) handling and elimination of chemical, biological, and cytostatic and cytotoxic waste, (7) coordination with the company in charge of moving the materials out of CMIMA installations, including the administrative procedures required by law, and (8) prospection for future waste requirements.

The Waste Management commission also carries out, in close collaboration with the Sustainability Commission, activities aimed at raising public awareness of the impact of toxic waste to our environment and health. These include participating in the European Waste Prevention Week, visits to hazardous chemical waste plants, collection of plastics on beaches and in coastal waters, and other awareness activities in collaboration with several civil associations.

The commission meets once every quarter but remains in continuous virtual communication. By the end of 2018 the members of the commission were: Mara Abad, Blanca Álvarez, Elisa Berdalet, Silvia Diago, Elena Martinez, Cristina Olivella (from IBE), Ana Pérez, Francesc Peters, and and, Josep Sánchez (coordinator) from ICM. Josep Sánchez retired in November of 2018 and the coordination tasks are currently done by Mara Abad, under the joint responsibility of Ana Pérez and Elisa Berdalet. Other staff members supporting the commission activities are Rafael Hernando, José María Anguita, Carlos Exposito, Carlos Santandreu, Eva López, Eva Aguilar, and Cristina Rodríguez.

Working Hazards Prevention

The Working Hazards Prevention commission (*Comissió de Prevenció de Riscos Laborals*) was created in 2010, integrated by personnel from UTM, CMIMA, IBE and ICM. Its objective is to provide all workers of these institutions with advice and support relative to their labour risks, in compliance with the law of labour risk prevention.

The main commission tasks are the following: (1) identify, promote and follow up actions to reduce the risk conditions in the working spaces, such as the availability of personal protection, equipment and spill collection kits, guidelines for equipment and material distribution, installation of elements against fire, monitoring of laboratory conditions and cleaning of laboratories, (2) to inform and train workers on prevention issues; (3) preparation of guidelines for new workers; (4) revision of installations; (5) advice on the use of chemical products and associate risks, (6) support and training of vessels' personnel, (7) participation in the preparation of emergency plans, (8) organization of fire and evacuation drills, and (9) collection of security-related questions and concerns by workers.

All members of the commission meet once a year and before the evacuation drills. In addition, in small groups, they meet more frequently to address the different issues that may arise. The members of this commission have different degrees of training in occupational risk prevention. As of the end of 2018 the commission was formed by representatives of the four entities: Rafael Hernando and Sergi Rodríguez from CMIMA; Vanessa Balagué, Elisa Berdalet (coordinator), José Manuel Fortuño, Neus Maestro, Fernando Pérez, Celia Rovira and Josep Sànchez (retired in November 2018); Marc Ambrós from UTM, and Blanca Álvarez from IBE. The commission works in coordination with the Prevention Service of CSIC's Delegation in Catalonia.

Sustainability

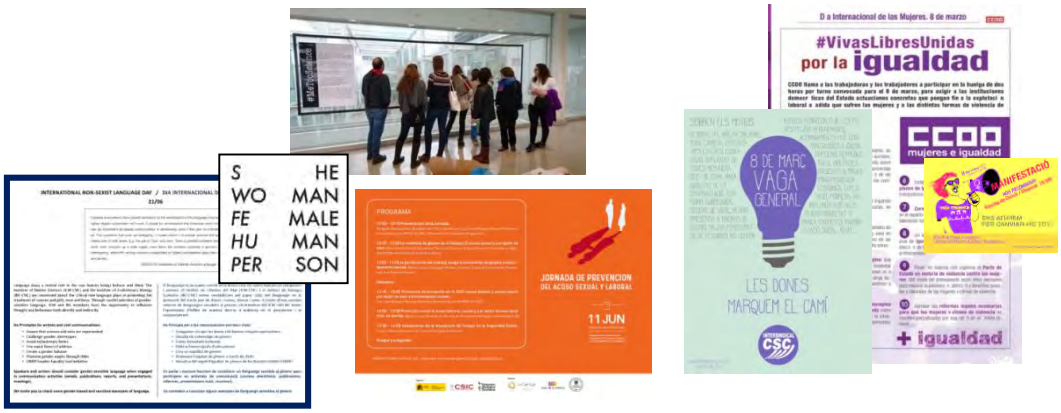
The ICM Sustainability Commission was established in 2018, with a firm commitment towards sustainability within ICM personnel and its facilities, including the research vessels and Antarctic bases, as well as towards the city of Barcelona and indeed, to the entire planet. This includes specific sustainability actions within CMIMA's facilities, the realization of awareness actions, and participation in sustainability research projects.

Some of the commission's tasks are the following: (1) raising employer awareness on energy saving actions, (2) analysis of water and energy utilization, (3) preparation of an energetic study for CMIMA's building, in collaboration with Barcelona's energy agency, (4) collaboration with civil associations and other collectives in awareness actions on ecosystem resilience, energy sustainability and climate change, (5) participation in dissemination and research events on sustainability, (6) participation in Barcelona's plans for sustainability, as part of Barcelona's working groups in energy and climate change.

The members of the Sustainability commission maintain a regular telematic connection and meet once every trimester in person. As of the end of 2018 its members were: Maravillas Abad, Elisa Berdalet, Albert Calbet, Morane Clavel, Silvia de Diago, Antonio García-Olivares, José Antonio García del Arco, Silvia Joly, Elena Martínez, Maria Pascual, Marina Pastor, José Antonio Pozo, Marta Ribes, Sergi Rodríguez, Cristina Roldan, Carles Santandreu, Carine Simon, Jordi Solé and Montserrat Solé.

Equality

The ICM Equality Committee was established in 2018 with the mission to promote equal opportunities for all employers regardless of their gender, race, age, nationality, religion, or disability. In particular, the commission develops actions aimed at either promoting or ensuring: (1) the best possible working conditions and the employers' advancement in their professional careers, (2) a working environment where individuals are treated with respect, equality and courtesy, (3) the eradication of any sort of discrimination or harassing behavior or bullying, (4) an open debate of all initiatives raised by the ICM community, in particular on gender equality.



In order to reach its objectives, the Equality Committee carries out the following actions: (1) participation in courses and workshops, (2) nformation exchange with universities, associations, CSIC's Gender Equality committee and the Catalan Women Institute, (3) participation as a partner in a European proposal on gender balance in research, (4) an anonymous mail box to gather all sort of queries and help requests, (5) participation in the European Platform of Women in Science, (6) design of a ICM gender equality plan according to the charter and code principles promoted by the Human Resources Strategy for Research (HRS4R) of the European Commission, (7) development of a mentoring program for Ph.D.s and postdocs; numerous awareness raising activities.

The committee meets regularly, at least once per month, and maintains a fluid telematics connection. The members of the ICM Equality Committee are representative of all ICM's groups; as of the end of 2018, it was composed of the following persons: Belen Alonso, Mercedes Blazquez, Albert Calbet, Clara Cardelús, Gemma Ercilla, Eva Flo, Esther Garcés, Elena Lloret, Marta Masdeu, Josep Lluís Pelegrí, Pere Puig, Laura Recasens, Carlos Rodero, Cristina Romero, Sara Soto, Elena Torrecilla, Antonio Turiel, and María Vicioso.

RESEARCH GROUPS

All ICM research personnel belong to one of 15 research groups. This includes both the permanent staff as well as personnel hired through research projects, plus graduate students and postgraduate researchers that have obtained competitive contracts. These groups are the heart of all basic and applied research at ICM. Their focus is quite interdisciplinary, often integrating researchers that belong to different departments.

As of the end 2018 the research groups are the following:

- Physical and Technological Oceanography
- Ecology and Genomics of Marine Microorganisms
- Biological Oceanography: Plankton Ecology and Biogeochemical Cycles
- Marine Biogeochemistry, Atmosphere and Climate
- Coelenterate Ecology
- Littoral Biological Processes
- Functioning and Vulnerability of Marine Ecosystems
- Ecology of Marine Communities
- Group of Biology of Reproduction
- Fisheries Bioeconomic Modelling
- Deep Sea Ecology (Diversity and Trophic Webs)
- Barcelona Center for Subsurface Imaging
- Continental Margins Group
- Ocean and Littoral Sedimentary Processes
- Laboratory of Seafloor and Subseafloor Geological Processes

A full description of all 15 groups is found in the Research Groups section of this report.

JOIN RESEARCH UNITS

Some of ICM's personnel are also structured into specific topic-oriented units that are associated with institutions external to CSIC. The researchers in these associate units, approved at the CSIC

level, can use the facilities or participate in internal calls from both institutions. At ICM there are currently four such units: the Barcelona Expert Center, the Barcelona Center for Subsurface Imaging, the Technologies for Remote Acquisition unit and the Ocean and Climate unit.

Additionally, ICM participates together with the Government of Catalonia as part of the Catalan Research Institute for the Governance of the Sea, an autonomous entity aimed at the development of fishery and oceanographic tools and strategies for Catalonia.

Barcelona Expert Center

The Barcelona Expert Center (BEC, http://bec.icm.csic.es/) was created in 2007 as an associate unit between CSIC and Barcelona Tech (UPC; https://www.upc.edu). Its aim is to provision the validation and calibration activities of the Soil Moisture and Ocean Salinity (SMOS) European Space Agency mission (whose PI, Jordi Font, was a research professor at ICM) and also to support the data production centre CP34 (at that time managed by INDRA, https://www.indra-company.com). In 2013, Spain decided not to continue maintaining the CP34 activities and BEC went on to assume the production and distribution of the SMOS data. BEC undertook this task and has progressively expanded its responsibilities towards the development of algorithms for the production of other SMOS ocean variables (notably, surface currents and sea winds) as well as land and cryosphere products.

At present, the BEC is based on a cooperation agreement between CSIC, Barcelona Teach (UPC) and the Catalan Institute for Spatial Studies (http://www.ieec.cat). The ICM personnel that participate in BEC are three researchers, one research assistant, six contracted researchers, and two Ph.D. students. BEC also contributes to the maintenance of ICM's data processing centre and maintains a remote sensing data production service. BEC's future lines of action are oriented towards the production of high value-added remote sensing products, mainly oceans, and their oceanographic exploitation, both at the operational and climatic levels.

Barcelona Center for Subsurface Imaging

The Barcelona Center for Subsurface Imaging (Barcelona CSI, http://www.barcelona-csi.cmima.csic.es/) was created in 2007 in association with UTM and the Catalan Institute for Research and Advanced Studies. Its mission is to conduct leading-edge investigations to obtain unique know-how and to advance conceptually in basic research on geosciences. The group also seeks to apply the conceptual know-how and novel methodologies to technological transfer with

industry.

The Barcelona CSI is formed by an interdisciplinary group of 20–25 people, with six senior staff researchers plus doctoral and postdoctoral researchers and visiting scientists. The development of novel high-performance computing geophysical methods is combined with seismic imaging and the estimation of physical properties of the subsurface in order to study geological processes. These involve using field data, often collected by the group itself, and the integration of a wide range of observations. The research of the Barcelona CSI spans all main geological systems including subduction zones, mid-ocean ridges, and extended continental margins, with particular emphasis on geo-hazards.

Technologies for Remote Acquisition Systems

The Centre for Technological Development of Remote Acquisition Systems and Signal Processing (SARTI UPC; https://cit.upc.edu/es/centros_upc/centros/45/sarti_upc) was created in 2000 as an associate unit between Barcelona Tech, the Institute of Earth Sciences Jaume Almera (http://www.ictja.csic.es/), UTM and ICM. Its main objective is the development of equipment and systems for remote data acquisition as well as tools for data visualization, processing, and quality control in the field of Earth sciences.

The ICM staff participates in the development and application of marine science technologies as well as in the design of data processing software. The projects comprise the management of fisheries, the establishment of coastal and benthic stations, and the application of new observational techniques. The outcome is real-time data monitoring of physical and chemical parameters in the marine environment.

Among the ongoing initiatives, it is worth mentioning project SAP (Monitoring and evaluation of fishery-management measures in Catalonia) aimed at monitoring and evaluating the main species of fishing interest in the Catalan coast. This project evaluates the state of fishing stocks and creates a biological-fishery database, to be used as an advisory service for local, regional and state administrations.

Ocean and Climate

The Ocean and Climate unit was created in November 2018 as the outcome of a long-time collaboration between researchers from ICM and the Institute of Oceanography and Global

Change at the University of Las Palmas (*Instituto de Oceanografía y Cambio Global*, IOCAG; http://iocag.ulpgc.es). At the time of its creation, the unit incorporated 20 researchers from all ICM departments. It stands as a scientific and strategic initiative that takes advantage of the complementary skills and geographical locations of both research groups; in particular, for ICM it represents the possibility of having an even greater presence in Atlantic studies.

The scientific objectives are aimed at powering those studies that represent new marine approximations: comparing processes in different geographic regions, bio-physical studies at different spatial and temporal scales, evolution of harmful algal blooms, molecular characterization of microbial diversity, assessing the health status of marine ecosystems, energy fluxes in the water column, coupling of diverse model subsystems, the increasing of complex ocean systems, monitoring of seismic and volcanic activity, and the tectonic characterization of island dynamics.

The strategic objectives include the establishment of observatories in both the western Mediterranean and the Canary Basin, the execution of regional studies during the transits of the Spanish vessels to Antarctica, the support towards a joint participation in European calls, the design of capacity building activities for Latin American and African researchers, and the joint dissemination and communication of scientific results.

ICATMAR

In May 2017 the Government of Catalonia (Generalitat de Catalunya; https://web.gencat.cat) created the Catalan Research Institute for the Governance of the Sea (*Institut Català de Recerca per a la Governança del Mar*, ICATMAR) as an autonomous body of cooperation with ICM, remaining subscribed to the General Directorate of Fisheries and Maritime Affairs. The main directive body of ICATMAR is the Governing Council, formed by three representative of the Catalan Government (including the General Director of Fisheries and Maritime Affairs) and three representatives from ICM (including its director and the head of the department of Renewable Marine Resources).

Its main objectives are: to provide scientific advice to the Government of Catalonia in the field of fishing, the state of marine resources and marine ecosystems, the bioeconomics of maritime activities and other oceanographic issues; to provide technical and scientific advice to the fishing sector and other public or private agents; to develop tools in support of bioeconomic,

sustainable and adaptive management of maritime activities; to collaborate with other bodies and research organizations, both national and international, in the field of fisheries and marine sciences; to promote studies and disseminate knowledge in the marine sciences.

SERVICES

ICM's services can be divided between internal services, which provide the necessary general support for the normal operation of the entire centre, and specialized services, which provide specific scientific-technical support for all sorts of basic and applied research projects and contracts.

Internal

Three services fall into the category of internal or general services: maintenance, informatics, and library.

The maintenance service is dedicated to the preservation and updating of the general infrastructure of the building and its facilities. Its members are Xavier Leal and Sergi Rodríguez, who carry out the essential maintenance tasks and supervise the subcontracting of specific works, including cleaning tasks.

The informatics service is responsible for all tasks relative to the design, installation, and management of the communication and information infrastructure. This includes the coordination and supervision of computer service contracts, informatics support to the ICM staff, the supervision of computer or communication equipment, and the management and supervision of security in computer systems. These tasks are carried out by four people – Alejandro Amorós, Manuel León, Lluís Miralles (supervisor), and Miquel Angel Rodó —with the support of Fernando Pérez.

Finally, the Carles Bas Library is open to the public and forms part of CSIC's library network. It houses one of the largest collections of scientific literature on oceanography and marine sciences in Spain, with an archive of about 8,300 books and 1,800 journals, with some 500 journals still receiving printed subscriptions. It also offers access to about 9,000 electronic journals. The library staff is formed by Natalia Rodríguez (supervisor) and Ignacio Castaño.

Scientific-technical

The scientific-technical services aim at providing specialized support to both ICM's own research projects and contracts as well as to external public and private institutions. There are a total of 19 specialized services which can be classified as:

- General infrastructure
- Reference collections
- Field sampling and remote sensing
- Physico-chemical characterization of water and sediments
- Biological characterization of the water column
- Marine cultures
- General engineering support

Among these services, specifically as part of the field sampling and remote sensing services, we may include two of the associate units described in last section: the Barcelona Expert Center and the Barcelona Center for Subsurface Imaging. A full description of all 19 services is found in the Infrastructure and Services section of this report.

OUTREACH AND COMMUNICATION

ICM has a long tradition of dissemination, communication, and education. Its efforts in this way come as part of the dissemination activities within research projects, such as specific educational and dissemination projects, including citizen science initiatives, and as volunteering activities by ICM's staff. In the last section of this report they are classified as *outreach, education, citizen science,* and *communication* actions.

CAPACITY BUILDING

ICM scientists regularly participate in numerous graduate programmes in marine sciences, including many master programmes and two doctoral programs. These are the doctoral programs run by the University of Barcelona (UB) and Barcelona Tech. In particular, the doctoral programme led by Barcelona Tech, which began in 1984, is the oldest doctoral programme in Spain and holds a quality mention by the Spanish education system (http://www.ub.edu/masteroficial/cienciesdelmar/, http://doctorat.upc.edu/programas/ciencias-mar).

Junior researchers at ICM are either master's or doctoral students. A student must first successfully complete a one-to-two year master's programme, where all formal lectures are held, before enrolling in the research doctoral activities, which will typically last four more years. A master's student has a research director (who is an ICM scientist) and an academic tutor (either an ICM scientist lecturing in the graduate programme or an external university professor). The same is true for a doctoral student, with a very important role for the research director (in the guidance of daily and weekly research activities) and additional supervision by a doctoral advisory committee.

Doctoral students are funded through either doctoral fellowships or junior research contracts. The most common types of fellowships come from the University Formation Program (FPU, funded by the Ministry of Education), the Research Formation Program (FPI, funded by the

Ministry of Science), and the European Union (Marie Curie Actions). Additionally, there are a relatively small number of students funded through the Catalan Government (University Research Agency), or through foreign governments—often from Latin American countries. Junior research contracts, on the other hand, are usually funded through national and European research programmes. The outcome of these training activities has been the continuous formation of graduate students, at both the master's and doctoral levels. During the 2017–2018 period, scientists from ICM successfully advised 21 doctoral dissertations.

The mobility programmes for graduate students deserve special mention. Every student with a fellowship from the Spanish government can request funding for mobility to leading national and international research centres. Besides these programmes, students also travel abroad to present their results at international meetings, for short visits and to participate in field measurements, for example on oceanographic cruises on board research vessels in any of the world's oceans. Student training often takes place in foreign centres with well-established collaborations, but many times it takes place with new research groups, therefore helping to widen ICM's network of international contacts. ICM has always encouraged its students to apply for this mobility, assisting by handling of all the paperwork to that end. The importance and effectiveness of these programmes is immense since it provides a key tool for graduate students to gain international exposure, learn new techniques, and establish research networks. Its most visible outcome is probably the important number of internationally co-authored papers, with graduate students often as first authors.

Training and mentoring is part of the everyday activities at ICM. An example of an important ICM activity leading to the formation of graduate students is the seminar series held within the Institute as well as at the department level. Most of these have weekly periodicity, bringing the possibility to expand all research activities in the centre as well as for the exchange of ideas within different working groups. In the departmental seminars, graduate students often present their research to fellow students and senior staff for open discussion. Another example is the continuous organization of meetings, workshops, and symposia addressed to scientists at all career levels, from undergraduate and graduate students to junior doctors. This includes local meetings among students in the Barcelona area as well as colloquia for graduate students and young postdocs. Most of these meetings have arisen through the effort and enthusiasm of researchers and scientific/civil associations, and even graduate students, in the framework of research projects and, in some cases, partly funded by international organizations. ICM has always encouraged these initiatives, and has supported them logistically and often with

economic funding. The participation of graduate students in these meetings has always been outstanding, presenting both posters and oral communications.

Finally, it is important to point to ICM's own offer of specialized courses, in two different ways. The first one is the *Barcelona Ocean* platform (http://barcelona-ocean.com/), which started in 2015 and has so far offered 24 courses. The second one is the annual summer course, the *Ramon Margalef Summer Colloquium* (http://www.acoio.org/margalef-summer-colloquia/), which began in 2013. This summer course typically hosts 20–25 graduate students or young postdoctoral researchers, focusing on one specific topic.

RECRUITING AND PROFESSIONAL DEVELOPMENT

ICM has become a very important locus of attraction for junior level scientists (hereafter, postdoctoral positions, or postdocs). The main reason for this has been the excellent research at ICM and its strategies for internationalization, but other factors such as the scientific and cultural environment of Barcelona, have indeed helped. Given this high demand, ICM has taken every effort to incorporate the best possible young scientists.

The number of postdoctoral positions during the last decade has remained fairly stable, with an average of close to 40 positions per year. The male to female ratio is close to parity, and likewise for the Spaniard to foreigner ratio, clearly proving that ICM has attracted scientists independent of their gender or nationality. The addition of all these young postdocs has been possible through three types of contracts: government-funded positions, European mobility grants, and research projects.

There are several governmental calls aimed at supporting young outstanding scientists during the early steps in a scientific career. Among these, the three most important are the national

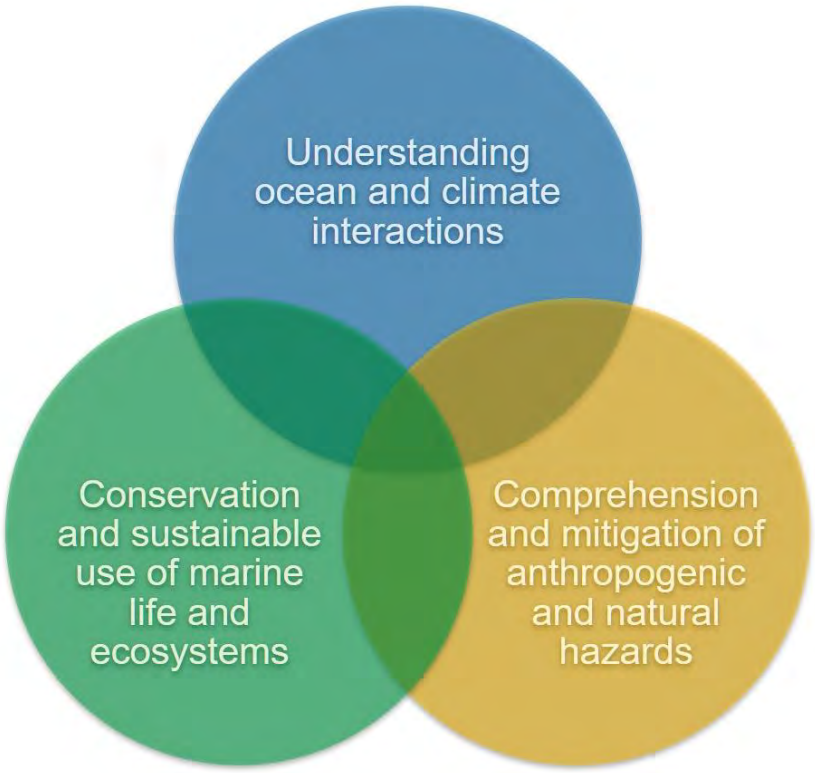
programmes Juan de la Cierva (three-year positions for recent doctors) and Ramón y Cajal (five-year positions for candidates who apply no more than 10 years after getting the doctoral degree). Currently ICM hosts three Ramón y Cajal contracts and six Juan de la Cierva contracts. ICM also routinely receives postdoctoral researchers arriving through European, and sometimes international, mobility programmes. These contracts usually last only one or two years but enhance the exchange of ideas and bring the possibility of a continued relationship with these scientists as they possibly go to research positions in other international institutions. Additionally, many postdocs are routinely hired through ICM's national and international research projects.

The incorporation of tenure positions at ICM has been a much more difficult issue—particularly during recent years—collapsing alongside the 2008 economic crisis and returning to only several positions per year only in 2017 and 2018. In particular, ICM incorporated four new permanent researchers during 2018.

The entire CSIC, and ICM in particular, is currently undergoing a stabilization process for its personnel. Regarding ICM, this process shall lead to the regularization of 11 indefinite positions and the opening of an undetermined number of new scientific and technical positions.

CHAPTER 2 — RESEARCH

FROM CHALLENGES TO RESEARCH



At ICM we identify three broad, overlapping **challenges** that frame and guide our research:

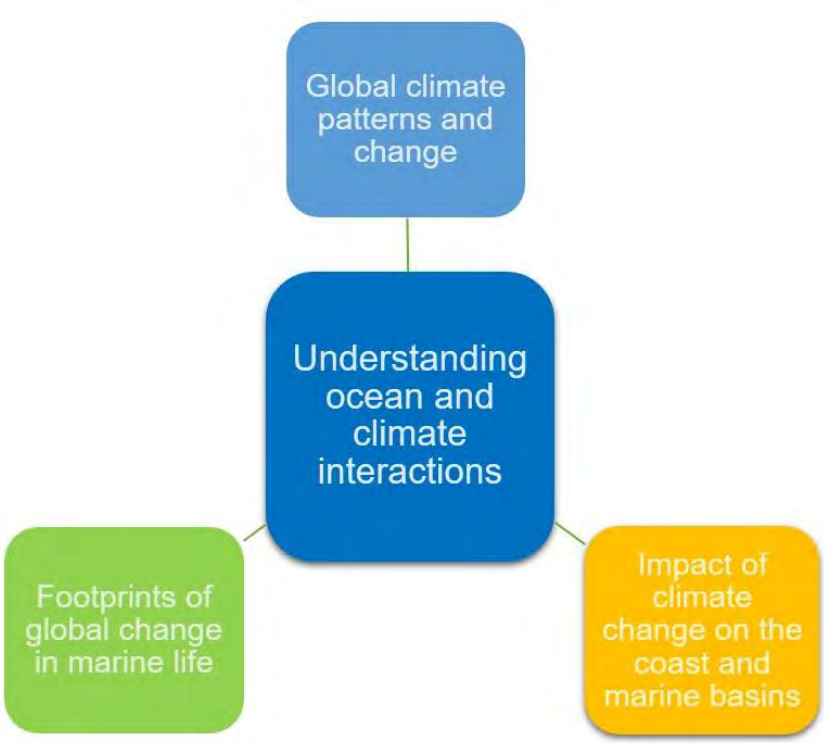
1. **Understanding Ocean and Climate Interactions**
2. **Conservation and Sustainable Use of Marine Life and Ecosystems**
3. **Comprehension and Mitigation of Anthropogenic and Natural Hazards**

Research activities of ICM's groups aim at tackling a range of topics related to one or some of these challenges. In this way, each of the challenges can be broken down into smaller, actionable **research lines** within the fields of physical oceanography, biosciences, and geosciences.

CHALLENGE #1:
UNDERSTANDING OCEAN AND CLIMATE INTERACTIONS

Without the oceans, Earth would be barren and deprived of life. Although it is known that oceans and the atmosphere make Earth habitable, the precise mechanisms by which oceans define local and regional climates remain unclear. One of the goals of the ICM is to fully understand ocean dynamics and its role in the Earth's past, present and future climate, but also to elucidate how climate-driven processes and global change affect the state of the ocean, including marine life. To achieve this goal, we contribute to the development of innovative approaches to observe and monitor the oceans.

We address this challenge through the following three **research lines**:



GLOBAL CLIMATE PATTERNS AND CHANGE

The oceans are the greatest reservoir of water on Earth. Due to the unique physical and chemical properties of water, the oceans play a key role as a thermostat and as a chemical buffer. One of the goals of ICM is to understand the evolution of the ocean's heat and carbon content (storage, transport, and exchange) and how it impacts weather and climate across temporal scales, from past to present and future. We also study the variability modes of climate interactions that are modulated by the ocean, in addition to the effects on sea level rise.

FOOTPRINTS OF GLOBAL CHANGE IN MARINE LIFE

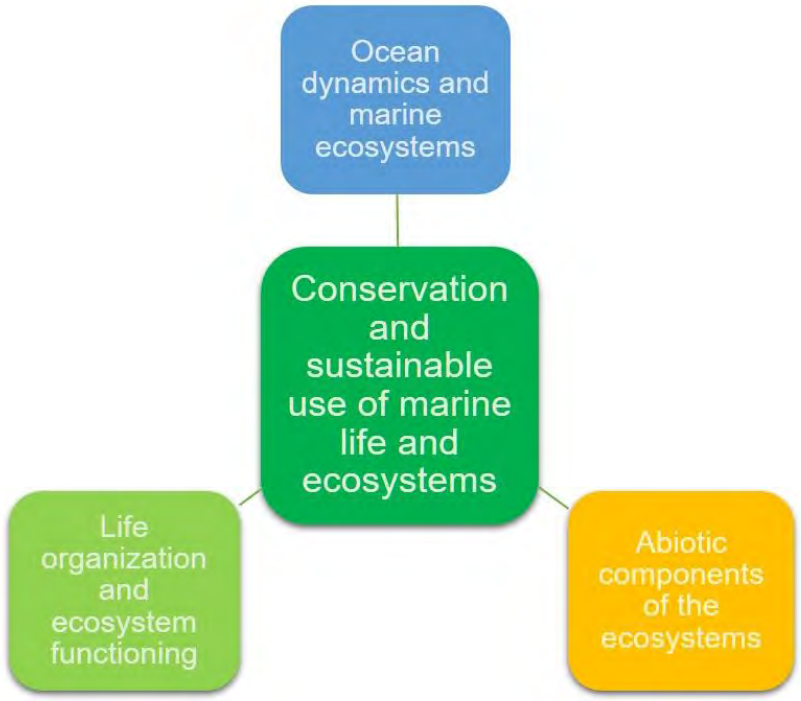
Alterations induced by global change such as warming, stratification, acidification, and deoxygenation are processes that affect marine life, from primary producers to top predators. Species and populations respond to these environmental stressors by changing their distribution (temporal and spatial), phenology (annual migrations), and physiology (development, growth, and reproduction). Reproductive and feeding migrations are also affected by global change. All these modifications lead to changes in trophic food webs and mismatches in terms of species interactions. Marine life responses also include feedbacks to atmospheric chemistry and climate. To assess future scenarios, we pursue a better understanding of the interactions among physical, chemical, and biological processes.

IMPACT OF CLIMATE CHANGE ON THE COAST AND MARINE BASINS

Natural climatic changes have induced sea level oscillations on geological-time frequencies. The present anthropogenic forcing however, is causing faster-than-ever changes as oceans warm, water expands, ice melts, and the sea level consequently rises. Therefore, the frequency of coastal floods increasingly affects highly populated coastal areas. Other consequences are longer droughts and stronger floods that alter the river sediment discharges and the impact on dense water formation, changing the continent-ocean mass exchanges. Sea level changes can also affect sea floor stability, generating geological hazards. Our goal is to study and quantify all these changes.

CHALLENGE #2:
CONSERVATION AND SUSTAINABLE USE OF MARINE LIFE AND ECOSYSTEMS

The conservation of the marine environment is one of the most important human challenges for the next decades. Anthropogenic impacts on coastal zones (e.g., exploitation of living resources, pollution, changes in ecosystem use, etc), threaten the functioning of the ecosystem. The goal of this challenge is to provide sound scientific knowledge towards the conservation and sustainable use of marine life and ecosystems. This knowledge will contribute to strengthening



the **science-to-policy interface** and will supply the necessary science-based criteria and technical tools to cope with the needs of a rapidly increasing human population.

We address this challenge through the following **research lines**:

OCEAN DYNAMICS AND MARINE ECOSYSTEMS

The comprehensive study of marine ecosystems shows that most of the variations in marine productivity are linked to ocean dynamics. We aim to understand how physical processes define and modulate the spatial and temporal structure of marine ecosystems over all scales by means of models, and using both in-situ and satellite observations. The conservation and sustainable use of marine ecosystems will not be possible without this knowledge.

LIFE ORGANIZATION AND ECOSYSTEM FUNCTIONING

The number and distribution of species determines ecosystem diversity and influences its structure. This structure regulates biotic and abiotic interactions and in doing so, determines the ecosystem function in terms of energy fluxes, biogeochemical cycles and biological production. One goal of ICM is to study the links between structure and function, which is essential to guide implementation plans of marine protected areas and to assess marine food provisions, while prioritizing sustainable aquaculture and fisheries practices.

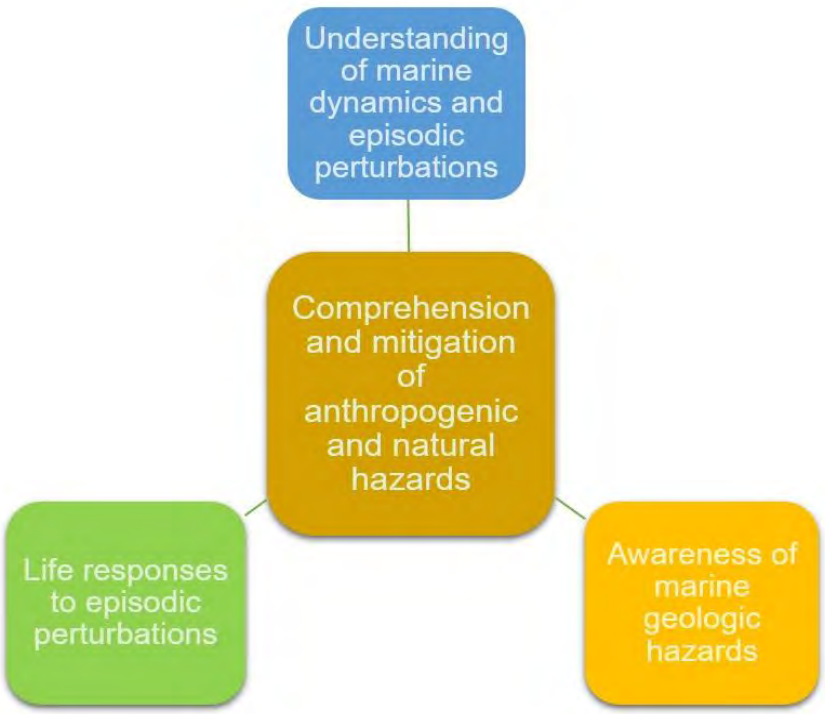
ABIOTIC COMPONENTS OF THE ECOSYSTEMS

The abiotic components of the ecosystems are the geological, chemical, and physical factors that are active in a given environment. We study the relationships between the seafloor characteristics and the organisms, which can be characterized in habitat mapping studies. We also study the hydrodynamics, sediment dynamics, and biogeochemical fluxes in key ecosystems (such as coastal environments, submarine canyons, and cold water coral mounds). Another aspect is the study of the effects of anthropogenic physical alterations on the seafloor and the water column (trawling, dredging, marine infrastructures) and their consequences for marine ecosystems.

CHALLENGE #3:
COMPREHENSION AND MITIGATION OF ANTHROPOGENIC AND NATURAL HAZARDS

The effects of marine anthropogenic processes, such as the impacts of bottom trawling, pollutants and marine litter accumulation in the water column and on seafloor, marine mining, and ocean-based tourism have severe consequences on marine life habitats in the oceans. Anthropogenic forcing may influence and trigger natural phenomena and increase in turn their associated hazards. Natural hazards are geological, meteorological, and/or biological processes that can have a negative effect on humans or the environment. Hazard mitigation now focuses on building stronger, safer, and smarter—and therefore resilient—communities able to mitigate future damage.

We address this challenge through the following **research lines**:



UNDERSTANDING MARINE DYNAMICS AND EPISODIC PERTURBATIONS

Integrated Marine Policies are being implemented at international, national, and regional levels to design coordinated actions in order to ensure coastal and marine security, sustainability, and management. One goal of ICM is to develop observation and prediction capabilities for time series data of marine dynamics, extreme weather, and disaster monitoring. We aim to provide stakeholders with the knowledge and the tools to mitigate environmental impacts and for disaster management. We contribute to the design of innovative space-borne and ground-based observing systems, as well as to improve the observation of ocean hazards.

LIFE RESPONSES TO EPISODIC PERTURBATIONS

Episodic and abrupt perturbations may drastically affect marine life and challenge the resilience of ecosystems. The present topics of concern are contamination events such as oil spills and heavy metal pollution, the appearance of harmful algal blooms due to natural and anthropogenic causes, massive mortality events caused by heat waves, or the impact of invasive species suddenly appearing in our neighboring ecosystems. Understanding how organisms combine genomic and environmental information to produce phenotypic variation is essential to gauging the effects of perturbations on marine life. Their capacity to respond is crucial to assess and mitigate the consequences of these events.

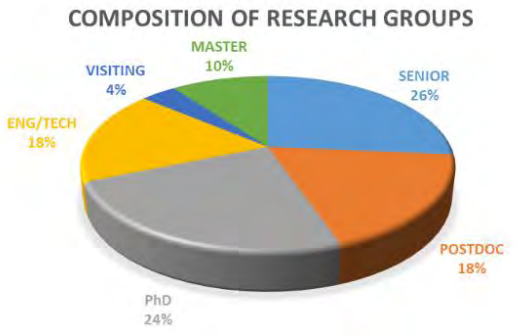
AWARENESS OF MARINE GEOLOGICAL HAZARDS

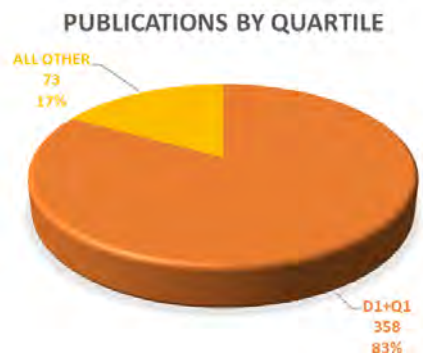
Marine geological hazards, such as earthquakes, landslides, and submarine volcanic eruptions, are major societal concerns. They are capable of generating tsunamis, which threaten coastal communities and offshore infrastructures with severe impacts for the population and for global economies. One goal of ICM is to investigate and appraise the role of seismogenic faults and submarine landslides, and to determine their potential to trigger tsunamis. A comprehensive perception and quantification of these active processes is essential to properly assess their associated seismic and tsunami hazards.

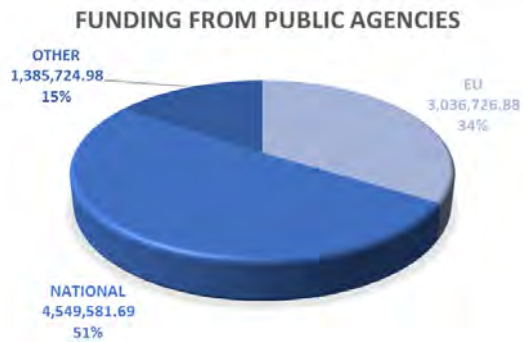
RESEARCH GROUPS

Research toward addressing the challenges presented in the previous sections is conducted by a team of **near 260 persons,** including senior researchers, postdocs/ early career scientists, Ph.D. and Master's students, visiting scientists, as well as research engineers and technicians. They belong to **15 research groups** with different sizes and with an almost perfect **gender balance**. In 2017 and 2018, ICM researchers have published a total of **431 SCI papers**, >80% of them in journals of the first quartile*, and have **directed 21 Ph.D.s**. They have also obtained a total of **8.97 M€** from competitive programs of European, National, and Regional research funding agencies. Moreover, they have raised **2.16 M€** through contracts of technological and knowledge transfer to companies and administration.

ICM research groups **in figures**:



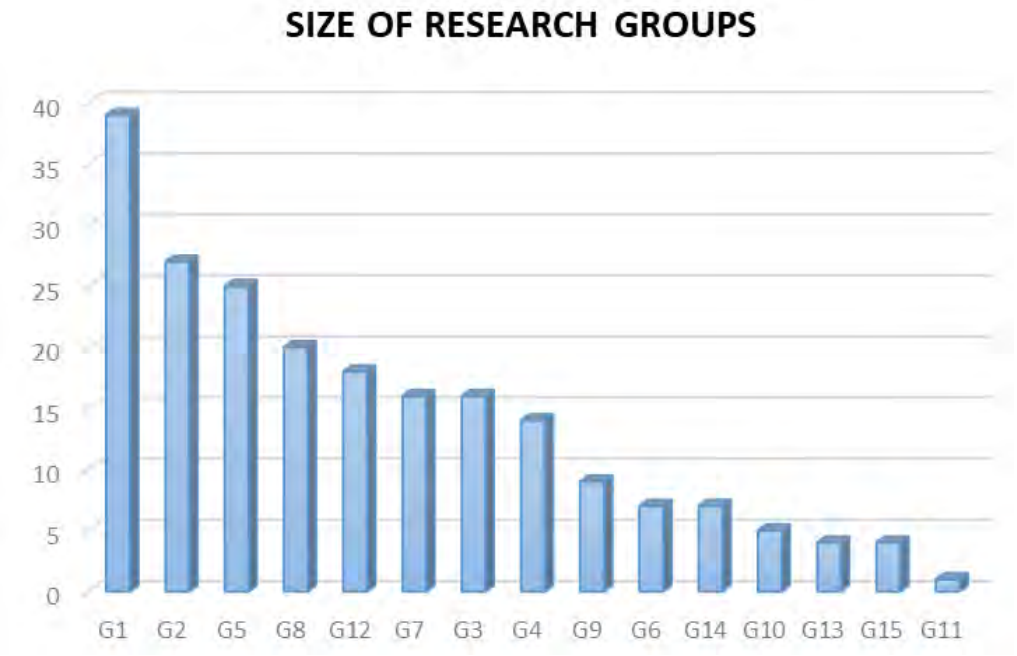




source: SCOPUS

ICM is made up of the following 15 research groups

1) **Physical and Technological Oceanography**
2) **Ecology and Genomics of Marine Microorganisms**
3) **Biological Oceanography: Plankton Ecology and Biogeochemical Cycles**
4) **Marine Biogeochemistry, Atmosphere and Climate**
5) **Coelenterate Ecology**
6) **Littoral Biological Processes**
7) **Functioning and Vulnerability of Marine Ecosystems**
8) **Ecology of Marine Communities**
9) **Group of Biology of Reproduction**
10) **Fisheries Bioeconomic Modelling**
11) **Deep Sea Ecology (Diversity and Trophic Webs)**
12) **Barcelona Center for Subsurface Imaging**
13) **The Continental Margins Group**
14) **Ocean and Littoral Sedimentary Processes**
15) **Laboratory of Seafloor and Subseafloor Geological Processes**



You can find detailed information about each of our reseach groups below.

PHYSICAL AND TECHNOLOGICAL OCEANOGRAPHY

Head of Group	Joaquim Ballabrera Poy

Group Components	**PERMANENT RESEARCHERS** Josep Lluís Pelegrí Llopart (Profesor científico) Joaquim Ballabrera Poy (Científico Titular) Carolina Gabarró Prats (Técnico Superior Especializado) Emilio García Ladona (Investigador Científico) Antonio José García-Olivares Rodríguez (Científico Titular) Mikhail Emelianov Kolomitski (Técnico Superior Especializado) Jaume Piera Fernández (Científico Titular) Marcos Portabella Arnús (Científico Titular) Jordi Salat Umbert (Técnico Superior Especializado) Carine Simon (Laboral Indefinido) Antonio Turiel Martínez (Científico Titular) Álvaro Viudez Lomba (Científico Titular) **POSTDOCTORAL RESEARCHERS** Anna Cabré Albos (Beatriu de Pinós) Paola Castellano Ossa (Contracted) Verónica González Gambau (Contracted) Carlos Alberto Guallar Morillo (Contracted) Mukesh Gupta (Contracted) Jordi Isern Fontanet (COMFUTURO) José Antonio Jiménez Madrid (Contracted) Wenming Lin (Contracted) Teresa Madurell López (Contracted) Justíno Martínez González (Contracted) Estrella Olmedo Casal (Contracted) Oleg Osychenko (Contracted) Federica Polverari (Contracted) Cristina Romera Castillo (Juan de la Cierva) Miquel Rosell Fieschi (Contracted) Jordi Solé Ollé (Contracted) **Ph.D. STUDENTS** Marc Gasser Rubinat

	Ana Filipa Mestre Trindade (FPI) Dorleta Orue-Echevarria Iglesias (FPU) Marta Ramírez Pérez (FPI) Ignasi Berenguer Vallès Casanova (FPI) **ENGINEERS/TECHNICIANS** Raúl Bardají Benach (Contracted) Iñigo Capellan Pérez (Contracted) Pedro Fernández Gallego (Laboral Indefinido) Neus Figueras Balaña (Laboral Garantía Juvenil) Nina Hoareau (Laboral Indefinido) Fernando Pérez López (Contracted) Sergio Ramírez Garrido (Contracted) Carlos Rodero García (Contracted) Miguel Angel Rodríguez Arias (Contracted) Celia Rovira Garrobo (Funcionaria) Joaquin Ignacio Salvador Castiella (Laboral Indefinido) **STUDENTS** Marta Masdeu Navarro (Contracted) **EXTERNAL VISITORS** María Belmonte Rivas (KNMI)

Key Words	Earth system science, Physical oceanography, Climate, Large-scale dynamics, Meso-scale dynamics, Submeso-scale dynamics, Air-Sea interactions, Instrumentation, Remote Sensing, Data analysis, Time series, Modelling, Salinity, Temperature, Currents, Lagrangian drifters, Data assimilation, Optics, Citizen Science

The Physical and Technological Oceanography group is composed of all members of this department from the Institute of Marine Sciences, clearly searching for a collaborative critical mass. It is the largest physical oceanography group, with the most extensive scientific

production, in Spain. Its interests focus on the observation and analysis of the ocean's physical environment at a broad range of spatio-temporal scales, and on the study of the role of the ocean in the Earth system. Its members include mostly physicists and oceanographers with complementary skills, working coordinately over very diverse themes with a common objective of advancing in our understanding of ocean dynamics, combining experimental, numerical and theoretical approaches, as well as new data analysis and observational technologies (both in situ and remote). Group members are notably committed at mentoring students and offering specialized courses, as well as in numerous public outreach activities.	
Most relevant publications during this period of time	• Mason. E., A. Pascual, P. Gaube, S. Ruiz, J.L. Pelegrí and A. Delepoulle (2017) Subregional characterization of mesoscale eddies across the Brazil-Malvines Confluence, Journal of Geophysical Research-Oceans, 122, 3329-3357, doi: 10.1002/2016JC012611 • Olmedo, E., J. Martínez, A. Turiel, J. Ballabrera-Poy and M. Portabella (2017) Debiased non-Bayesian retrieval: A novel approach to SMOS Sea Surface Salinity, Remote Sensing of Environment, 193, 103-126, doi: 10.1016/j.rse.2017.02.023 • Casanova-Masjoan, M., J.L. Pelegrí, P. Sangrà, A. Martínez, F. Grisolía-Santos, M.D. Pérez-Hernández and A. Hernández-Guerra (2017) Characteristics and evolution of an Agulhas ring, Journal of Geophysical Research-Oceans, 122, 7049-7065, doi: 10.1002/2017JC012969 • Jordà, G., K. Von Shuckmann, S.A. Josey, G. Caniaux, J. García-Lafuente, S. Sammartino, E. Özsoy, J. Polcher, G. Notarstefano, P.-M. Poulain, F. Adloff, J. Salat, C. Naranjo, K. Schroeder, J. Chiggiato, G. Sannino and D. Macías (2017) The Mediterranean Sea heat and mass bugets: Estimates, uncertainties and perspectives, Progress in Oceanography, 156, 174-208, doi: 10.1016/j.pocean.2017.07.001 • Isern-Fontanet, J., J. Ballabrera-Poy, A. Turiel and E. García-Ladona (2017) Remote sensing of ocean surface currents: A review of what is being observed and what is being assimilated, Nonlinear Processes in Geophysics, 24, 613-643, doi: 10.5194/npg-24-613-2017 • Romera-Castillo, C., M. Pinto, T.M. Langer, X.A. Alvarez-Salgado, and G.J. Herndl (2018) Dissolved organic carbon leaching from plastics stimulates microbial activity in the ocean, Nature Communications, 9, Article number 1430. DOI: 10.1038/s41467-018-03798-5 • García-Olivares, A., J. Solé and O. Osychenko (2018) Transportation in a 100% renewable energy system, Energy Conversion and

	Management, 158, 266-285. DOI: 10.1016/j.enconman.2017.12.053 • Olmedo, E., I. Taupier-Letage, A. Turiel and A. Alvera-Azcárate (2018) Improving SMOS sea surface salinity in the Western Mediterranean sea through multivariate and multifractal analysis, Remote Sensing, 10, 485. DOI: 110.3390/rs10030485 • Cardellach, E., J. Wickert, R. Baggen, J. Benito, A. Camps, N. Catarino, B. Chapron, A. Dielacher, F. Fabra, G. Flato, H. Fragner, C. Gabarro, C. Gommenginger, C. Haas, S. Healy, M. Hernandez-Pajares, P. Høeg, A. Jäggi, J. Kainulainen, S.A. Khan, N.M.K. Lemke, W. Li, S.V. Nghiem, N. Pierdicca, M. Portabella, K. Rautiainen, A. Rius, I. Sasgen, M. Semmling, C.K. Shum, F. Soulat, A.K. Steiner, S. Tailhades, M. Thomas, R. Vilaseca, and C. Zuffada (2018) TGNSS Transpolar Earth Reflectometry exploring system (G-TERN): Mission concept, IEEE Access, 6, 13980-14018. DOI: 10.1109/ACCESS.2018.2814072 • Ramírez-Pérez M., M. Twardowski, C. Trees, J. Piera and D. McKee (2018) Inversion of In Situ Light Absorption and Attenuation Measurements to Estimate Constituent Concentrations in Optically Complex Shelf Seas, Journal of Geophysical Research-Oceans, 123, 720-737. DOI: 10.1002/2017JC013453
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • COMMON SENSE: Cost-effective sensors, interoperable with international existing ocean observing systems, to meet EU policies requirements (Grant agreement no. 614155). European Commission FP7-ENVIRONMENT. 01/11/2013 – 28/02/2017, Granted: 4.664.072,00 € (148.352,00 € ICM). Coordinator: Leitat, Local person in charge: J. Salat. • ICE-ARC: Ice, Climate, and Economics – Arctic Research on Change (Grant agreement no. 603887). European Commission FP7-ENVIRONMENT. 01/01/2014-31/12/2017. Granted: 8.874.626,00 € (720.954,25 € ICM). PI: M. Portabella. • ConnectinGEO: Coordinating an Observation Network of Networks EnCompassing saTellite and IN-situ to fill the Gaps in European Observations (Grant agreement no. 641538). European Commission H2020. 01/02/2015-31/01/2017. Total cost: 999.995,94 € (47.760,00 € ICM). PI: J. Masó (CREAF). Local person in charge: E. García. • MEDEAS: Guiding European Policy toward a low-carbon economy. Modelling Energy system Development under Environmental And Socioeconomic constraints (Grant agreement no. 691287). H2020-

	LCE-2015-2. European Commission H2020. 01/01/2016-31/12/2019. Granted: 3.735.308,75 € (844.250,00 € ICM). PI: J. Solé. • PANELFIT: Participatory Approaches to a New Ethical and Legal Framework for ICT (Grant agreement no. 788039). H2020-SWAFS-2017, European Commission H2020. 01/11/2018-31/10/2021. Granted: 2.798.031,25 € (84.550,00 € ICM). PI: Euskal Herriko Unibertsitatea (EHU, Spain). Local person in charge: J. Piera • MONOCLE: Multiscale Observation Networks for Optical monitoring of Coastal waters, Lakes and Estuaries (Grant agreement no. 776480). H2020-SC5-2017-OneStageB, European Commission H2020. 01/02/2018-31/01/2022. Granted: 4.999.862,50 € (258.059,23 € ICM). PI: S. Simis (Plymouth Marina Laboratory, UK). Local person in charge: J. Piera. **SPANISH/CATALAN** • VA-DE-RETRO: Retroflexiones de frontera oeste: conectando los transportes latitudinales y las recirculaciones en el océano Atlántico (CTM2014-56987-P). Ministerio de Economía y Competitividad, 01/01/2015-31/12/2018. Granted: 415.030,00 € (415.030,00 € ICM). PI: J.L. Pelegrí. • L-BAND: Sobre la continuidad de las misiones satelitales de banda L: Nuevos paradigmas en productos y aplicaciones (ESP2017-89463-C3-1-R). Ministerio de Ciencia, Innovación y Universidades. 01/01/2018-31/12/2020. 1.010.350,00 € (574.750,00 € ICM). PI: M. Portabella y A. Turiel.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	**CONTRACTS** • Moist convection by two ASCATs and MSG rain, EUMETSAT, 26/10/2015-31/01/2017. Total Budget: 44.660,00 € (44.660,00 € ICM). PI: M. Portabella, participants: 2 • SMOS ESL: SMOS Expert Laboratories. ARGANS LTD, 15/06/2015-14/06/2020. Total Budget: 217.198,00 € (217.190,00 €). PI: A. Turiel, participants: 2 • OSI_AVS_16_03: inter-comparison of high/low microwave frequency sea ice concentration algorithms, EUMETSAT, 01/11/2017-15/12/2017. Total Budget: 10.407,00 € (10.407,00 € ICM). PI: C. Gabarró, participants: 1 • Assessment on ALL-LICEF mode and improvements, DEIMOS ENGENHARIA SA, 28/11/2016-28/05/2017. Total Budget: 27.000,00 € (27.000,00 € ICM). PI: A. Turiel, participants: 2

	• To derive the physical and empirical Geophysical Model Functions and associated error models, as well as to contribute to the consolidation and validation of Level1 to Level2 inversion algorithms. SATELLITE OCEANOGRAPHIC CONSULTANTS LTD, 01/05/2016-30/04/2018. Total Budget: 449.501,00 € (70.000,00 € ICM). PI: M. Portabella, participants: 2 • SMOS: Sea Surface Salinity ECV. ARGANS LTD. 09/08/2018-09/08/2021. Total Budget: 57.544,00€ (57.544,00 € ICM). PI: A. Turiel, participants: 3 • CHEFS: High and Extreme Winds from C-band radar measurements, EUMETSAT, 01/10/2017-31/12/2018. Total Budget: 155.520,00 € (40.585,00 € ICM). Local PI: M. Portabella, participants: 3 • LAMBDA: Scientific and technical innovations for improving the Copernicus. MERCATOR OCEAN. 01/04/2018-31/03/2020. Total Budget: 30.000,00 € (30.000,00 € ICM). PI: A. Turiel, participants: 4
Doctoral theses defended during this period of time	• Marta Ramírez Pérez, New observational approaches for optically complex waters based on high-resolution transmissometry. Date: 09/06/2017. Supervisor: Jaime Piera • Marc Gasser Rubinat, The Mediterranean Outflow water: Transformations and Pathways into the Gulf of Cadiz. Date: 19/11/2018. Supervisor: Josep Lluís Pelegrí.
Master's theses defended during this period of time	• Gabriela Dangl, Antioxidant properties of marine dissolved organic matter produced by marine phytoplankton, Universität Wien. ICM adviser: Cristina Romera. • Fanny Dufresne, Development of a model for tracking trajectories of driftig objects, ENSTA Foreign Intership Program. ICM adviser: Joaquim Ballabrera • Raphael Sapede, Análisis de datos del experimento MEDGIB en el marco del proyecto COSMO. ENSTA Foreign Intership Program. ICM advisers: Emilio García, Jordi Isern. • Nuria Aparicio Camín. Title: Análisis de la Riqueza de Especies en las Playas de Barcelona utilizando un enfoque basado en la Ciencia Ciudadana. Máster de Biodiversidad, Universidad de Barcelona. Date: 28/09/2018. Director: Jaume Piera. Tutor: Cristina Linares. Departament de Biologia Evolutiva, Ecologia i Ciències Ambientals. • Maria Escolano Suárez. Title: Análisis de wavelets para determinar el espectro energético a partir de la velocidad de boyas de deriva

	Lagrangiana. Máster en oceanografía y Gestión del Medio Marino. Date : 19/10/2018. Director: Jose Luis Pelegri Llopart y Joaquín Salvador Castiella. Tutor: Manuel Espino. Laboratorio de Ingeniería Marítima. Universidad politécnica de cataluña.
Other relevant contributions	**CAMPAIGNS** • RETRO-BMC. South Atlantic Ocean. R/V Hespérides (Spain). Project: VA-DE-RETRO. PI: Josep Lluís Pelegrí. Dates: 08/04/2017-28/04/2017. • RETRO-EZR. Location: Atlantic Ocean. Ship: Hespérides (ESP). Project: VA-DE-RETRO. PI: Josep Lluís Pelegrí. Dates: 26/04/2018-13/05/2018 • COSMO-GIB2. Location: Alboran Sea. Ship: Salvamar Danebola (SASEMAR). Project: COSMO. PI: Joaquim Ballabrera, Emilio García. Dates: 20/02/2018. • Petits Oceanògrafs. Location: Barcelona. Ship: Santa Eulalia (Museu Marítim de Barcelona). Project: Petits Oceanògrafs. PI: Carine Simon. Dates: 07/03/2018, 14/03/2018, 21/03/2018, 16/05/2018. **TIME SERIES** • SMOS-BEC: Series of global maps of surface salinity, soil moisture. Spatial resolution: 5-25 km. Series starting from 2011.
Highlights	• J.L. Pelegrí: Associated Editor of Progress in Oceanography; Member of the Science Team on Observing and Modeling the Meridional Overturning Circulation in the South Atlantic; Member of the *Laboratorio Internacional de Cambio Global*. • C. Gabarró: Spanish delegate to the International Arctic Science Committee (IASC). • J. Piera: Member of the steering committee of the European Citizen Science Association (ECSA) • C. Gabarró: Spanish delegate to the International Arctic Science Committee (IASC). • J. Isern: Member of ICATMAR Steering Committee. • M. Portabella: Member of the ESA & EUMETSAT SCA Science Advisory Group (ECSA).

ECOLOGY AND GENOMICS OF MARINE MICROORGANISMS

Head of Group	Ramon Massana
	
Group Components	**PERMANENT RESEARCHERS** Josep Maria Gasol Pique (Professor) - PI Ramon Massana Molera (Researcher) -IC Dolors Vaque Vidal (Researcher) -IC Maria Montserrat Sala Farre (Researcher) - CT Silvia González Acinas, Silvia (Researcher) –CT **NON-PERMANENT RESEARCHERS** Ramiro Logares Haurie (RyC) **POSTDOCTORAL RESEARCHERS** Javier del Campo (JdC) Isabel Ferrera (Contracted) Jean-François Mangot (Contracted) Eva Ortega (JdC) Clara Ruiz Gonzalez (JdC) Marta Sebastián (Project)Miquel Rosell Fieschi (Contracted) Jordi Solé Ollé (Contracted) **Ph.D. STUDENTS** Adrià Auladell (FPI) Yaiza-Mercedes Castillo De La Peña (FPI) Ina Maria Deutschmann (ITN) Celio Días Santos Jr. (Universidad Federal de Sao Carlos, Brasil) Francisco Latorre (FPI) Carolina Marin (Universidad Central de Costa Rica) Mireia Mestre Martín (FPI) Aleix Obiol Plana (Contracted) Caterina Rodríguez Giner (FPI) Marta Royo Llonch (FPI) Isabel Sanz Saez (FPI) **ENGINEERS/TECHNICIANS** Carolina Antequera Bellorín (Contracted) Vanessa Balague Año (Permanent) Clara Cardelus Juan (Permanent) Irene Forn Hernan (Permanent)

	Lidia Montiel Fontanet (Contracted) Elisabet Laia Sa Lago (Contracted) Pablo Sanchez Fernandez (Dr, Contracted) Elena Torrecilla Ribalta (Dr, Contracted)

Key Words	Biodiversity, microbes, biogeography, biogeochemical cycles, global change, microbial evolution, community ecology, microscopy, genomics, metagenomics, metatranscriptomics, single cell genomics, microbial observatories, respiration, osmotrophy, phagotrophy, microbial food webs, microbial activity

Modern marine microbial ecology started in the 1970s, when it was shown that microbes were very abundant and active in seawater. Nowadays, marine microbes are known to be responsible for about half of Earth's primary production, most of the respiration of the ocean and the sustainability of marine food webs, harboring a huge reservoir of taxonomic and functional biodiversity. The change of perspective has been spectacular and has given birth to the field of Microbial Oceanography to reflect the wide range of scales and methodological approaches used. The Ecology and Genomics of Marine Microorganisms Research group integrates scientists from different disciplines and research topics, using complementary methods to address the ecological and functional role of marine microorganisms at different resolutions: from communities to species or ecotypes. Current interests are summarized in the following research lines: 1) Biodiversity and Biogeography, 2) Microbial Activities: from Single Cells to Biogeochemical Cycles, and 3) Genes and Genomes: Function and Evolution.

Most relevant publications during this period of time	• Ferrera, I., O. Sánchez, E. Kolárová, M. Koblízek, J.M. Gasol. 2017. Light enhances the growth rates of natural populations of aerobic anoxygenic phototrophic bacteria. ISME J. 11, 2391-2393. • Mangot, J.F., R. Logares, P. Sánchez, F. Latorre, Y. Seeleuthner, S. Mondy, M.E. Sieracki, O. Jaillon, P. Wincker, C. de Vargas, R. Massana. 2017. Accessing the genomic information of unculturable oceanic picoeukaryotes by combining multiple single cells. Sci. Rep. 7, 1-12.

	• Mestre, M., E. Borrull, M.M. Sala, J.M. Gasol. 2017. Patterns of bacterial diversity in the planktonic particulate matter continuum. ISME J. 11, 999-1010. • Royo-Llonch, M., I. Ferrera, F.M. Cornejo-Castillo, P. Sánchez, G. Salazar, R. Stepanauskas, J.M. González, M.E. Sieracki, S. Speich, L. Stemmann, C. Pedrós-Alió, S.G. Acinas. 2017. Exploring microdiversity in novel Kordia sp. (Bacteroidetes) with proteorhodopsin from the tropical Indian Ocean via single amplified genomes. Front. Microbiol 8, 1-14. • Vaqué, D., J.A. Boras, F. Torrent-Llagostera, S. Agustí, J.M. Arrieta, E. Lara, Y.M. Castillo, C.M. Duarte, M.M. Sala. 2017. Viruses and protists induced- mortality of prokaryotes around the Antarctic Peninsula during the Austral summer. Front. Microbiol. 8, 1-12. • del Campo, J., M. Kolisko, V. Boscaro, L. Santoferrara, R. Massana, L. Guillou, A. Simpson, C. Berney, C. de Vargas, M. Brown, P. Keeling, L. W. Parfrey. 2018. EukRef: Phylogenetic curation of ribosomal RNA to enhance understanding of eukaryotic diversity and distribution. Plos Biol. 16, 1-14. • Mangot, J.F., I. Forn, A. Obiol, R. Massana. 2018. Constant abundances of ubiquitous uncultured protists in the open sea assessed by automated microscopy. Environ. Microbiol. 20, 3876-3889. • Mestre, M., C. Ruiz-González, R. Logares, C.M. Duarte, J.M. Gasol, M.M. Sala. 2018. Sinking particles promote vertical connectivity in the ocean microbiome. PNAS 115, 6799-6807. • Sebastián, M., J.C. Auguet, C. Restrepo-Ortiz, M.M. Sala, C. Marrasé, J.M. Gasol. 2018. Deep ocean prokaryotic communities are remarkably malleable when facing long-term starvation. Environ. Microbiol. 20, 713-723. • Villarino, E., J.R. Watson, B. Jönsson, J.M. Gasol, G. Salazar, S.G. Acinas, M. Estrada, R. Massana, R. Logares, C.R. Giner, M.C. Pernice, M.P. Olivar, L. Citores, J. Corell, N. Rodríguez-Ezpeleta, J.L. Acuña, A. Molina-Ramírez, I. González-Gordillo, A. Cózar, E. Martí, J.A. Cuesta, S. Agustí, E. Fraile-Nuez, C.M. Duarte, X. Irigoien, G. Chust. 2018. Large-scale ocean connectivity and planktonic body size. Nature Comm. 9, 1-13.
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • MixOCarb - The role of mixotrophs in the oceanic carbon cycle. Funding entity: EU H2020 MSCA PIOF-GA-2013-626182.

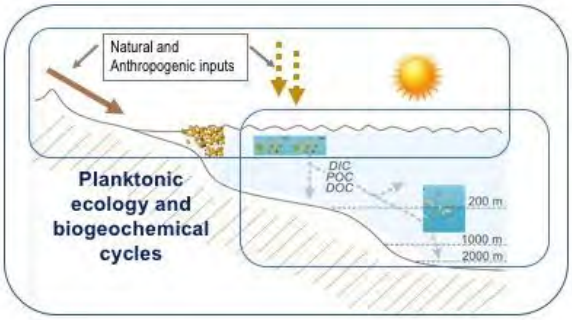
	01/04/2015 - 31/03/2018 ICM budget: 254.474 €, IP: Ramon Massana • PROMISE - Prostist Metabolome Screening, Funding entity: MINECO PCIN-2017-025 ERA-MBT. 01/12/2017 - 30/11/2020, ICM budget: 140.000 €, IP: Ramon Massana • SINGEK - Promoting Single Cell Genomics to explore the ecology and evolution of hidden microeukaryotes, Funding entity: EU H2020 MSCA-ITN -2015-ETN 675752. 01/01/2016 - 31/12/2019, Total: 3.889.393 €. ICM budget: 753.306 €, Project Coordinator: Ramon Massana • MER-CURE - Using global marine metagenomics to understand mercury microbial associated processes: finding a cure for mercury contaminated environments Funding entity: EU H2020-MSCA-IF-2016-749645. 01/09/2018 - 31/08/2020 ICM budget: 158.121 €, IP: Josep M. Gasol **SPANISH/CATALAN** • ALLFLAGS - Global assessment of the abundance, diversity and activity of marine heterotrophic flagellates species. Funding entity: MINECO. 30/12/2016 - 29/12/2019, ICM budget: 210.540 €. IP: Ramon Massana • EcoRare - Ecología de las bacterias raras marinas: actores clave, banco de semillas o diversidad inerte, Funding entity: MINECO. 01/10/2015 - 15/09/2017, ICM budget: 195.381 €, IP: Marta Sebastián • Equipo de computación de alto rendimiento (HPC) para bioinformática y modelización marina. Funding entity: MINECO/ AEI - Ayudas a infraestructuras y equipamiento científico-técnico, convocatoria 2015, CSIC-15-EE-3579. 01/01/2016 - 31/12/2017, ICM budget: 120.000 € concedidos, IP: Ramon Massana • Estructura i funció de Xarxes Tròfiques Microbianes Planctòniques, Funding entity: Generalitat de Catalunya. 01/01/2014 - 30/04/2017, ICM budget: 24.000 €, IP. Josep M. Gasol • INTERACTOMICS - Unveiling core ecological interactions in marine microbial communities using omics approaches. Funding entity: MINECO. 01/01/2016 - 31/12/2018, ICM budget: 163.582 €, IP: Ramiro Logares • MEFISTO - Impact of viruses on marine microbial assemblages using virus-host models and metagenomics, Funding entity:

	MINECO. 01/01/2014 - 31/12/2017, ICM budget: 203.280 €. IP: Dr. Dolors Vaqué • REMEI - Regulation of the prokaryotic metagenome of a coastal marIne environment: the biological and oceanographic factors determining the presence and biogeochemical function of plankton prokaryotes, Funding entity: MINECO. 01/01/2016 - 31/12/2018, ICM budget: 219.010 €, IP: Josep M Gasol • ANIMA - Aportes atmosféricos como fuente de nutrientes orgánicos y microorganismos en ecosistemas marinos. Funding entity: MINECO. 01/01/2016 - 31/12/2018. ICM budget: 240.000 €, coIP: M. Montserrat Sala • MAGGI - Reconstruction of marine microbial keystone genomes using metagenomics, single cell genomics and cultured isolates. Funding entity: MINECO. 01/01/2018 - 31/12/2020, ICM budget: 155.848 €, IP: Silvia González Acinas • Renovación de Instrumentos de Contaje de Partículas del ICM. Funding entity: Ayudas a infraestructuras y equipamiento científico-técnico, convocatoria 2015. 01/01/2018 - 31/12/2019, ICM budget: 227.996 € concedidos, IP: Josep M. Gasol
Doctoral theses defended during this period of time	• Francisco Miguel Cornejo Castillo. Diversity, ecology and evolution of marine diazotrophic microorganisms. Universitat Politècnica de Catalunya (UPC), 2017. Supervisor: Silvia González Acinas • Caterina Rodríguez Giner. Spatial, temporal and behavioral patterns of marine protists. Universitat Politècnica de Catalunya (UPC). 2017. Supervisors: Ramon Massana, Ramiro Logares • Mireia Mestre Martín. Spatial and temporal patterns of marine prokaryotic diversity along the particulate matter continuum. Universidad de Las Palmas de Gran Canaria. Supervisors: Josep M Gasol i M. Montserrat Sala • Célio Dias Santos Júnior. Aspectos moleculares de la degradación de materia orgánica terrestre por microorganismos del Río Amazonas: metagenómica y genómica poblacional. Universidad Federal de San Carlos, Brasil. 2018. Supervisors: Prof. Flavio Henrique Silva, Ramiro Logares
Master's theses defended during this period of time	• Joan Martí Carreras. Biogeography profiling and expression pattern of the merA and merB genes retrieved from global deep ocean metagenomes and metatranscriptomes. Universitat Pompeu Fabra (UPF). 2017. Supervisors: Silvia González Acinas, Pablo Sánchez

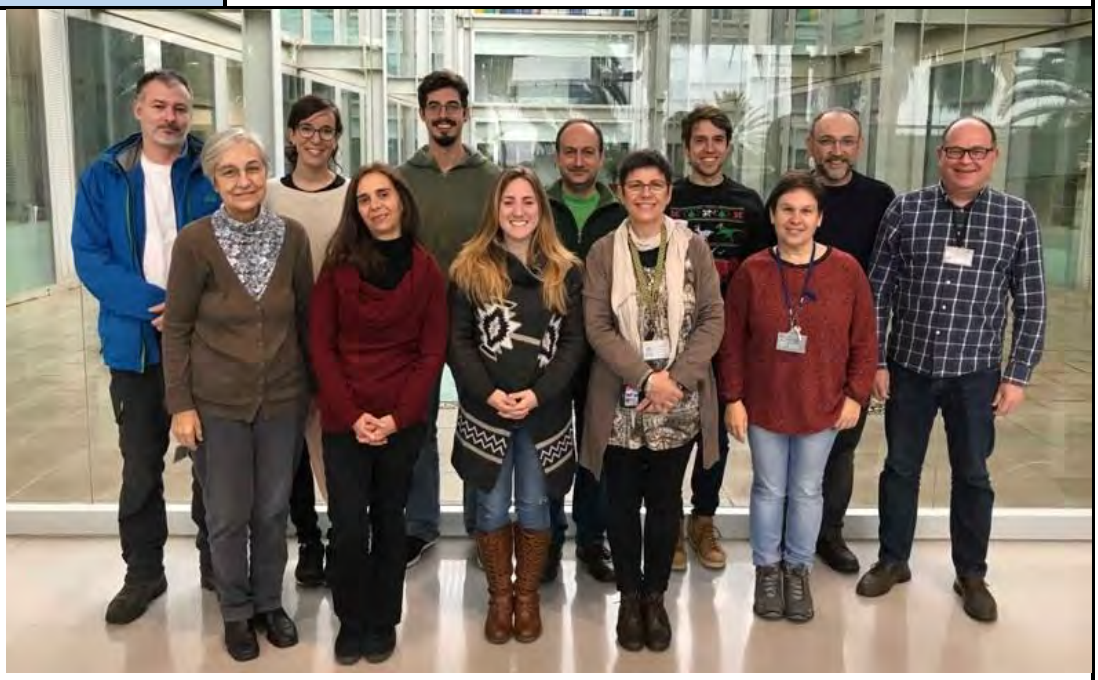
	• Adrià Auladell Martin. Interannual seasonal dynamics of aerobic anoxygenic photoheterotrophs in the NW Mediterranean Sea. Universitat Pompeu Fabra (UPF). 2017. Supervisors: Isabel Ferrera, Pablo Sánchez • Sergio Estruch. Marine planktonic protist diversity in the Palma Bay (Mallorca) as revealed by Illumina sequencing. Universitat de Barcelona (UB). 2017. Supervisors: Isabel Ferrera, Albert Reñé • Daniel Romano Gude. Microbial diversity study of an underwater volcano in a degassing stage: island of El Hierro (Canary Islands). Universitat de Barcelona (UB). 2017. Supervisor: Isabel Ferrera • Maria Serrano Cuerva. Papel y distribución de los virus en zonas contrastadas de la Antártida. Universitat de Barcelona (UB). 2017. Supervisor: Dolors Vaqué • Martí Pla Ferriol. Phylogenetically diverse and widespread tolerance to mercury and methylmercury of marine bacterial isolates. Universitat de Barcelona (UB). 2017. Supervisor: Silvia González Acinas • Ana Sotomayor Garcia Viral communities distribution among four contrasting areas in the Southern Ocean and their implication to marine aerosol formation. European Marine Biodiversity and Conservation (EMBC). 2017. Supervisor: Dolors Vaqué • Carles A. Belenes Rotllant. Aplicació de noves tècniques per la detecció de la interacció entre els virus marins i els seus hostes. Universitat de Barcelona (UB). 2018. Supervisor: Dolors Vaqué • Miguel Capilla Lloris. Phenotyping characterization of methylmercury marine bacteria detoxifiers. Universitat Autònoma de Barcelona (UAB). 2018. Supervisor: Silvia González Acinas • Marina Perez Garcia. Potential Microbial Detoxifiers of MeHg in Barcelona City Continental Shelf. Universitat de Barcelona (UB). 2018. Supervisors: Silvia González Acinas y Andrea García Bravo
Other relevant contributions	• Blanes Bay Microbial Observatory, 41.7N, 2.8E. Monthly sampling since 2001. Microbial abundance, diversity and activity. • Field campaign AMICS. Sampling area: Mediterranean NO. IP: M. Montserrat Sala. Vessel: García del Cid. September 2017. • Field campaign REMEI. Sampling area: Mediterranean NO. IP: I. • Ferrera, JM. Gasol. Vessel: García del Cid. September 2017.

Highlights	• Grup de Recerca Consolidat 2014 SGR 1179 – AGAUR/Generalitat de Catalunya: Estructura i funció de Xarxes Tròfiques Microbianes Planctòniques. 01/01/2014 - 30/04/2017. 24.000 €. IP: Josep M. Gasol • Premi als 30 millors projectes Marie-Curie Individual Fellowships: Francisco Cornejo. Projecte UCYN2PLAST, Programa EU MSCA-IF-GF - Global Fellowships • Coordination of the EU Innovative Training Network SINGEK (www.singek.eu). H2020 MSCA-ITN -2015-ETN 675752. 3.9M€. IP: Ramon Massana • Organization of the International discussion meeting "Single Cell Ecology". The Royal Society. Organizers: Thomas Richards (UNEXE), Ramon Massana (ICM-CSIC), Neil Hall (Earlham Institute) • Landmark Paper Award 2018 of the Deep-Sea Biology Society (trienial award): Mestre M., Ruiz-González C., Logares R., Gasol J.M., Sala M.M. (2018) Sinking particles promote vertical connectivity in the ocean microbiome. Proceedings of the National Academy of Science of the United States of America. 115(29): 6799-6807. doi:10.1073/pnas.1802470115 • Organization of the International Ramon Margalef Summer Colloquia (6th edition). "Ecology through the omics lens". Directors: Ramiro Logares y Javier del Campo. July 2018, ICM (http://www.acoio.org/margalef-summer-colloquia/)

BIOLOGICAL OCEANOGRAPHY: PLANKTON ECOLOGY AND BIOGEOCHEMICAL CYCLES

Head of Group	Cèlia Marrasé
	
Group Components	**PERMANENT RESEARCHERS** Elisa Berdalet (Scientist) Albert Calbet (Scientist) Pedro Cermeño (Scientist) Marta Estrada (Ad Honorem Research Professor) Francesc Peters (Scientist) Enric Saiz (Scientist) **Ph.D. STUDENTS** Anna Arias (FPI) Isabel Marín (FPI) Miguel Cabrera (FPU) Charlie Gaborit (FPI) Manuel Olivares (FPU) **ENGINEERS/TECHNICIANS** Carolina Antequera (Hired technician) Laura Arin Lluïsa Cros Kaiene Griffell (Hired technician) Laia Viure (Hired technician) **STUDENTS** Roger Bueno (Technician School, January-May 2017) Mar Caballé Junquera (Technician School, February-June 2017) Kaja Czajkowska (University of Gdansk, Poland, Jun3-July2017)) Edgar Fernández (Institut Químic de Sarrià – Universitat Ramon Llull, Jun-Jul 2017) Raul Caparrós (BSc Degree practicum UB, 20/06/2016-26/06/2017) Júlia Garcia (Universitat Autònoma de Barcelona, June-August 2017) Sergio González (Master- Univ. La Laguna 2017-2018) Patricia Madriñan Borrás (Technician School, December 2016-June 2017).

	SABBATICAL VISITORS 2017.Prof. Chul Park, Dept. of Oceanography and Ocean Environmental Sciences, Chungnam National University, Daejon, Rep. of Korea, (01/07/2016- 30/06/2017)



Key Words	Plankton ecology; Land-ocean interactions; Benthic-plankton interactions; Mixotrophy. Atmosphere-ocean interactions; Global change; Biogeochemical cycles; Acidification; Time-series; Harmful algae blooms; Marine ecosystems; Aerosols; Small-scale -turbulence; Photochemistry; Aquatic optics; Organic matter; Tele-detection; Multiple stressors.

The biological oceanography group seeks to advance the knowledge of marine pelagic ecosystems, promote novel research, and foster social awareness of the significance of protecting ocean health. Our main research focuses on studying the interplay between meteorological and hydrographical variability, the structure and dynamics of plankton communities, and the cycling of key chemical elements in the ocean. We investigate the response of plankton ecosystems to ocean warming, stratification, and acidification, atmospheric deposition, continental runoff, and pollution, and explore solutions to abate anthropogenic impacts. In order to tackle these objectives, we use a wide array of laboratory techniques, innovative experimental and field approaches, time series monitoring, remote sensing data analysis, and computer model simulations. By integrating all these approaches, methodological techniques and analytical tools, we achieve a comprehensive understanding of ocean plankton ecosystems.

Most relevant publications during this period of time	• Marin I, Nunes S, Sánchez-Pérez, ED, Aparicio FL, Estrada M, Marrasé C, Moreno T, Wagener T, Querol X, Peters F (2017) Anthropogenic versus mineral aerosols in the stimulation of microbial planktonic communities in coastal waters of the northwestern Mediterranean Sea. Science of the Total Environment 574: 553-568.

- Cermeño P, Benton MJ, Paz O & Vérard C (2017) Trophic and tectonic limits to the global increase of invertebrate diversity. Scientific Reports|7: 15969 DOI:10.1038/s41598-017-16257-w

- Saiz, E., Calbet, A. and Griffell, K. Sex-dependent effects of caloric restriction on the ageing of an ambush feeding copepod. Scientific Reports 7, 12662, doi:10.1038/s41598-017-12661-4 (2017)

- Berdalet, E., M. Montresor, B. Reguera, S. Roy, H. Yamazaki, A. Cembella, and R. Raine. (2017). Harmful algal blooms in fjords, coastal embayments, and stratified systems: Recent progress and future research. Oceanography 30(1):46–57, https://doi.org/10.5670/oceanog.2017.109

- S.G. Leles, A. Mitra, K. J. Flynn, D. K. Stoecker, P. J. Hansen, A. Calbet, G. B. McManus, R. W. Sanders, D. A. Caron, F. Not, G. M. Hallegraeff, P. Pitta, J. A. Raven, M. D. Johnson, P. M. Glibert, S. Våge. (2017) Oceanic protists with different forms of acquired phototrophy display diverse biogeographies and abundance. Proceedings of the Royal Society B. 284: 20170664.

- Marañón, E., Pérez-Lorenzo, M., Cermeño, P., Mouriño-Carballido, B. 2018. Nutrient limitation suppresses the temperature dependence of phytoplankton metabolic rates. ISME Journal. : 1-10. doi: 10.1038/s41396-018-0105-1. IF: 9.664. Q1

- M. Vassalli, A. Penna, F. Sbrana, S. Casabianca, N. Gjeci, S. Capellacci, V. Asnaghi, E. Ottaviani, V. Giussani, L. Pugliese, C. Jauzein, R. Lemée, L. Açaf, M.A. Hachani, S. Turki, M. Abboud-Abi Saab, A. Fricke, L. Mangialajo, R. Bertolotto, C. Totti, S. Accoroni, E. Berdalet, M. Vila, M. Chiantore (2018).

- Calbet, A., Saiz, E. 2018. How much is enough for nutrients in microzooplankton dilution grazing experiments? Journal of Plankton Research. 40: 109-117. doi: 10.1093/plankt/fbx070 . IF: 1.983. Q2

- Rigual-Hernández, A.S., Flores, J.A., Sierro, F.J., Fuertes, M.A., Cros, L., Trull, T.W. 2018. Coccolithophore populations and their contribution to carbonate export during an annual cycle in the Australian sector of the Antarctic zone. Biogeosciences. 15: 1843-1862. doi: 10.5194/bg-15-1843-2018. IF: 3.851. Q1.

- Ortega-Retuerta E., C. Marrasé, A. Muñoz-Fernández, M.M. Sala, R. Simó, J.M. Gasol. 2018. Seasonal dynamics of transparent exopolymer particles (TEP) and their drivers in the coastal NW Mediterranean Sea. Sci. Tot. Environ. 631-632, 180-190.

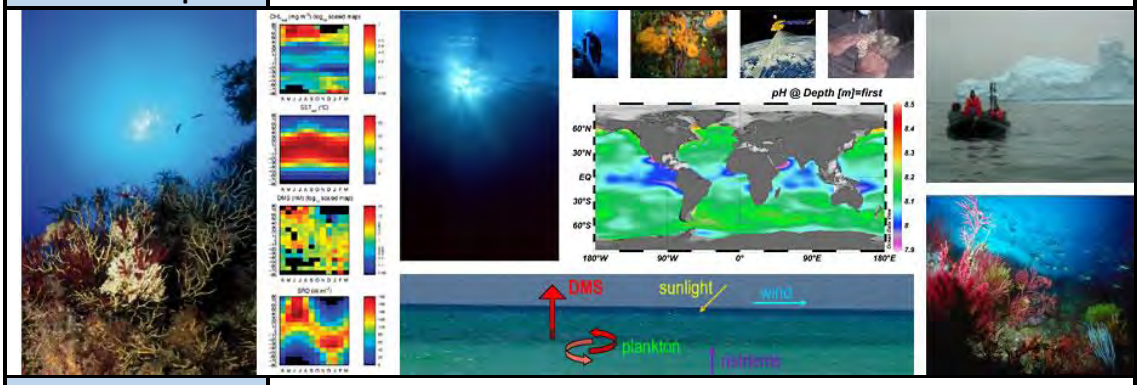
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • Programme title: CoCliME: Co-development of Climate services for adaptation to changing Marine Ecosystems (Ref. OPE01531) Funding agency: FORMAS (Sweden)Participant entities: Marine Institute, DOMMRS, Ifremer, UNantes, UPMC, AWI, CICERO, IMR, NIMRD, CSIC, SEI, SMHI, Starting date: 15/09/2017End date: 14/09/2020. Principal investigator: Eleanor O'Rouke (MI), E. Berdalet (CSIC)). Funding: 149k€ • Bringing the paradigm for marine pelagic production into the 21st century: incorporating mixotrophy into mainstream marine research (MixITiN, MSCA-ITN-ETN #766327). EUROPEAN COMMISSION, Marie Skłodowska-Curie Innovative Training Networks. Integrated by Institut de Ciències del Mar (CSIC) and 7 international partners. 01/10/2017 to 30/09/2021. CSIC budget: 495.745,92 €. Coordinator: Aditte Mitra; IP CSIC: Albert Calbet. **SPANISH/CATALAN** • SUAVE: Fertilización natural del océano y eficiencia de la bomba biológica en escalas de tiempo. Ministerio de Economia y Competitividad 1/1/2015-31/7/2017. 125,840 €. CTM2014-54926-R. PI Pedro Cermeño. • ANIMA: Aportes armosféricos como fuente de nutrientes orgánicos y microorganismos en ecosistemas marinos. Ministerio de Economia y Competitividad. 01//01/2016 – 31/12/2019. 290,400 €. CTM2015-65720-R. PI F.Peters (co-PI M.M. Sala). • OSTREORISK. Proliferaciones nocivas de Ostreopsis en el Mediterráneo noroccidental: evaluación de los riesgos potenciales para la salud. 01/01/2015-31/12/2017. 198,440 €. CTM2014-53818-R. PI Elisa Berdalet (ICM-Univ Barcelona). • FERMI (Ritmos diarios de alimentación en microzooplancton marino. Ministerio de Economia y Competitividad (01/01/2015-31/12/2018). 199.650 €. CGL2014-59227-R. PI A Calbet (co-PI E Saiz) • PI-ICE. Polar atmosphere-ice-ocean Interactions: Impact on Climate and Ecology. CTM2017-89117-R, Funding agency: Ministerio de Economía y Competitividad (MINECO) Participant entities: ICM (CSIC), University of Barcelona
Doctoral theses defended during this period of time	• Isabel Marín. Effects of atmospheric deposition on microbial dynamics and composition in two anthropogenically-influenced contrasted coastal sites. 2017. Universitat de Barcelona. Director: F. Peters

	• Sdena O. Nunes. Application of chemotaxonomy to the study of the phytoplankton community structure in the Mediterranean Sea and in the Atlantic and Southern Oceans 2018. Universitat de Barcelona. Supervisors: M. Estrada i M. Latasa
Master's theses defended during this period of time	• Student: Raquel Bañón SuñerTitle: Respuestas fisiológicas de Ostreopsis cf ovata a la turbulencia de pequeña escala. University: Universitat de Barcelona Kind of Thesis: End of Master. Director: E. Berdalet and M. Vila. Date: June 2017. • Student: Marina López Mor. Title: Seguimiento de un cultivo del dinoflagelado tóxico Ostreopsis cf. ovata, procedente de una proliferación natural en el noroeste del Mediterráneo. University: Universidad de Las Palmas de Gran Canaria. Kind of Thesis: End of Master. Director: E. Berdalet. Date: June 2017 • Marc Mascaró Triay. Estudi experimental sobre els efectes nocius de l'esposició de larves d'eriçó a la dinoflagel·lada tòxica Ostreopsis cf ovata (Septiembre 2018). Trabajo fín de máster. Universitat de Barcelona. Master en Oceanografía y Gestión del Medio Marino. Directoras: E. Berdalet y Magda Vila. • Kaiene Griffell Martínez. Title: Estudio ontogenético de la composición elemental del copépodo Paracartia grani y determinación del efecto de la alimentación con algas nutricionalmente deficitarias. University: Programa Interuniversitario en Acuicultura (UB-UAB-UPC). Kind of Thesis: End of Master. Director: E. Saiz. Defended in September 2018.
Other relevant contributions	• Time Series of VARITEC. Monthly. Parameters: Temperature, Salinity, Nutrients, Organic carbon (total and particulate), Chlorophyll, Bacteria, Phytoplankton, Microeukaryotes. • Monitoreig d'algues nocives bentòniques (Ostreopsis) des de L'Escala fins a Sitges amb col·laborció amb l'ACA i l'Agència de Salut Públic de Catalunya)
Highlights	• Berdalet E. is Chair of Scientific Steering Committee, SSC of the internacional GlobalHAB Programe (Global Harmful Algal Blooms), SCOR (Scientific Committee for Oceanic Research)/IOC (Intergovernmental Oceanographic Commission of UNESCO (http://www.globalhab.info) 01/01/2016-31/12/2019 • Berdalet E. Deputy Director of ICM, since March 2009. • Peters F. is Head of the Department of Marine Biology and Oceanography of the Institut de Ciències del Mar (CSIC, Barcelona)

	• Marta Estrada receives the Medalla d'Honor de Barcelona, (Honor Medal of Barcelona) awarded by the Barcelona municipality. 30/11/2017 • Calbet, A. Deputy Director of ICM, since March 2018. • Marrasé C. Is president of the Iberian Society of Ecology (SIBECOL) since July 2018.

MARINE BIOGEOCHEMISTRY, ATMOSPHERE, AND CLIMATE

Head of Group	Rafel Simó



Group Components	**PERMANENT RESEARCHERS** Rafel Simó (Research Professor) Eva Calvo (Scientist) Marta Ribes (Scientist) Carles Pelejero (ICREA Research Professor) **POSTDOCTORAL RESEARCHERS** Sergio Vallina (Ramón y Cajal) Manuel Dall'Osto (Ramón y Cajal) Lydia Kapsenberg (Marie Curie) **Ph.D. STUDENTS** Pau Cortés (FPI) Marina Zamanillo (FPU) Lucía Quirós (FPI) Pablo Rodríguez (La Caixa) Ariadna Martínez (FPI) **ENGINEERS/TECHNICIANS** Marc Catllà (Contracted) Àngel López (Contracted) **STUDENTS** Jon Magnusson (BSc Degree practicum) Ignacio Martín (BSc Degree practicum) Eric Morán (BSc Degree practicum) **SABBATICAL VISITORS** Kristin Orians
Key Words	Global change, biogeochemical cycles, marine environment, paleoceanography, geochemistry, isotopes, acidification, time-series, benthos, sponges, corals, bivalves, mass mortality events, invasive species, ecosystems, volatile compounds, aerosols, clouds,

	microphysics, photochemistry, aquatic optics, organic matter, photobiology, remote sensing, multiple stressors
Our research aims at gaining knowledge about the central role of the marine biosphere in the cycling of elements (mainly carbon, nitrogen, and sulfur) in the oceans and across the ocean-atmosphere boundary in the context of global environmental change. Both benthic and pelagic ecosystems are considered as drivers and receptors of changes in biogeochemical fluxes and climate, and the ecophysiological bases of their responses to environmental stressors are addressed. The main research topics include ocean acidification and warming, paleoceanography, ecology of benthic communities, biogenic trace gases, photochemistry and photobiology, and biogenic aerosols and clouds. Ours is a multi-scale perspective both through time (past, present, and future) and space (local to global). Tools include chemical, isotopic and microscopical analyses, molecular biology, automated in situ monitoring, time series and oceanographic studies, environment manipulation facilities, global databases, and satellites.	
Most relevant publications during this period of time	• Dall'Osto, M., J. Ovadnevaite, M. Paglione, D.C.S. Beddows, D. Ceburnis, C. Cree, P. Cortés, M. Zamanillo, S.O. Nunes, G.L. Pérez, E. Ortega-Retuerta, M. Emelianov, D. Vaqué, C. Marrasé, M. Estrada, M.M. Sala, M. Vidal, M.F. Fitzsimons, R. Beale, R. Airs, M. Rinaldi, S. Decesari, M.C. Facchini, R.M. Harrison, C.D. O'Dowd and R. Simó (2017) Antarctic sea ice region as a source of biogenic organic nitrogen in aerosols, Scientific Reports 7, 6047, doi:10.1038/s41598-41017-06188-x • Dall'Osto, M., D. Beddows, P. Tunved, R. Krejci, J. Ström, Y.J. Jun Yoon, K.-T. Park, S. Becagli, R. Udisti, C.D. O'Dowd, R. Simó and R.M. Harrison (2017) Arctic sea ice melt leads to atmospheic new particle formation, Scientific Reports 17, 3318, doi:10.1038/s41598-41017-03328-41591 • Morganti, T., R. Coma, G. Yahel and M. Ribes (2017) Trophic niche separation that facilitates co-existence of high and low microbial abundance sponges is revealed by in situ study of carbon and nitrogen fluxes, Limnology and Oceanography 62, 1963-1983 • Serrano, E., M. Ribes and R. Coma (2017) Recurrent partial mortality events in winter shape the dynamics of the zooxanthellate coral Oculina patagonica at high latitude in the Mediterranean, Coral Reefs 36, 27-38 • de la Fuente, M., E. Calvo, L. Skinner, C. Pelejero, D. Evans, W. Müller, P. Povea and I. Cacho (2017) The evolution of deep ocean chemistry and respired carbon in the Eastern Equatorial Pacific over the Last Deglaciation, Paleoceanography 32, 1371–1385 • Romera-Castillo, C., Pinto, M., Langer, T.M., Álvarez-Salgado, X.A., Herndl, G.J. (2018). Dissolved organic carbon leaching from plastics stimulates microbial activity in the ocean. Nature Communications 9, DOI:10.1038/s41467-018-03798-5

	• Pita, L., Hoeppner, M.P., Ribes, M., Hentschel, U. (2018). Differential expression of immune receptors in two marine sponges upon exposure to microbial-associated molecular patterns. Scientific Reports 8, DOI:10.1038/s41598-018-34330-w • Dall'Osto, M., Geels, C., Beddows, D.C.S., Boertmann, D., Lange, R., Nøjgaard, J.K., Harrison, R.M., Simo, R., Skov, H., Massling, A. (2018). Regions of open water and melting sea ice drive new particle formation in North East Greenland. Scientific Reports 8, DOI:10.1038/s41598-018-24426-8 • Galí, M., Levasseur, M., Devred, E., Simó, R., Babin, M. (2018). Sea-surface dimethylsulfide (DMS) concentration from satellite data at global and regional scales. Biogeosciences 15: 3497, DOI:10.5194/bg-15-3497-2018 • Simó, R., Saló, V., Almeda, R., Movilla, J., Trepat, I., Saiz, E., Calbet, A. (2018). The quantitative role of microzooplankton grazing in dimethylsulfide (DMS) production. Biogeochemistry 141: 125, DOI:10.1007/s10533-018-0506-2
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • EVOMA: The influence of Environmental Variability On Mussel Aquaculture and adaptation in the context of global ocean change. Marie Skłodowska-Curie Individual Fellowships, European Commission Horizon 2020, 16/11/2017 – 15/11/2019, 158.121,60€ (100% ICM). Researcher: Lydia Kapsenberg; Supervisor: Carles Pelejero. Institutions involved: 1, researchers involved: 2. • SORPASSO: Surveying organic reactive gases and particles in the surface Southern Ocean. A subproject of the Antarctic Circumnavigation Expedition. EPFL – Polar Swiss Institute, 15/7/2016 – 15/7/2019, 120.000€ (100% ICM). PI: Rafel Simó. Institutions involved: 6, researchers involved: 2. **SPANISH/CATALAN** • CSI-Coral: Climate change and species invasion: effect of main factors, understanding the mechanisms and forecasting population abundance in a Mediterranean coral. Ministerio de Economia y Competitividad. 1/1/2013 – 31/12/2017 (159000€ (50% ICM). Co-PI: Marta Ribes. Institutions involved: 3 (State Univ New York, CEAB, ICM). Researchers involved: 2. • SCORE: Sediments and cold water Corals to address key questions of the Oceans in the past: two case-study Regions and one Experiment. Ministerio de Economía y Competitividad, 1/1/2016 –

	31/12/2019, 225.060€ (100% ICM). PI: Carles Pelejero. Institutions involved: 1, researchers involved 3. • BIOGAPS: Biogenic trace gases and their cycling processes in the surface sea. Ministerio de Economía y Competitividad, CTM2016-81008-R, 30/12/2016 – 30/12/2019, 258.940€ (100% ICM). PI: Rafel Simó. Institutions involved: 1, researchers involved: 2. • PI-ICE: Interactiones atmosfera-hielo-oceano en zonas polares: impacto en el clima y la ecologia. Ministerio de Economía y Competitividad, CTM2017-89117-R. 145.200€ (100% ICM), 01/01/2018 - 31/12/2019. Co-PI: Manuel Dall'Osto. Institutions involved: 1, researchers involved: 2.
Master's theses defended during this period of time	• Sara Cobacho, Paleoclimatic reconstruction of the last 420 kyr in the Strait of Sicily. MS Thesis, Universitat de Barcelona. 19 Oct, 2018, Supervisors: Carles Pelejero and Eva Calvo
Other relevant contributions	• Time Series of l'Estartit, 42.05N, 3.25E, Monthly. CO2 system parameters (pH, alkalinity), dissolved O2. • Blanes Bay Microbial Observatory, 41.7N, 2.8E. CO2 system parameters (pH, alkalinity), dissolved O2. • Antarctic Circumnavigation Expedition, Southern Ocean – Antarctica, R/V Akademik Treshnikov (Rusia), 23/1-22/2 2017. • BIOGAPS expedition to Moorea, French Polynesia. Volatiles in the tropical ocean and coral reef, and their biotic and abiotic drivers. 1-27 April 2018. 11 researchers from 4 international institutions (ICM, SUNY-USA, UViena-Austria, UTSydney-Australia). Chief Scientist: R. Simó.

COELENTERATE ECOLOGY

Head of Group	Josep-Maria Gili
Group Components	**PERMANENT RESEARCHERS** Josip-Maria Gili (Research Professor) Joaquim Garrabou (Scientist) **POSTDOCTORAL RESEARCHERS** Andrea Gori (Contracted Juan de la Cierva) Verónica Fuentes (Contracted Ramón y Cajal) Rebeca Zapata (Contracted) Jordi Grinyó (Contracted) Carlos Domínguez-Carrió (Contracted) Nuria Viladrich (Contracted) Jean-Batiste Ledoux (Contracted) Nathaniel Bensoussan (Contracted) **Ph.D. STUDENTS** Stefano Ambroso (Contracted) Maria Montseny (FPU) Marina Pastor (FPU) Daniel Gómez Gras (FPU) Ignasi Montero (FPI) Janire Salazar (Contracted) Macarena Marambio (Contracted) Ainara Ballesteros (Contracted) Andreu Santín (Contracted) Patricia Baena (Contrated) Guillem Corbera (Contracted) **ENGINEERS/TECHNICIANS** Laura López (Contracted) Cristina Pérez Serra (Contracted) Paula López Sedino (Contracted) Ángel López Sanza (Contracted)

Key Words	Benthic ecology, global change, gelatinous zooplankton, marine biodiversity, marine conservation, community structure and dynamics, ecology of marine invertebrates, growth, feeding, reproduction, physiology, laboratory culture of marine invertebrates, ecosystem resilience, species, life cycles, bentho-pelagic coupling, environmental biological coupling, marine genomics, ocean literacy, education, outreach, development of new methods.

Our group conducts research projects related to marine ecology using different approaches. These approaches range from taxonomy and systematics, to species biology, structure and dynamics of populations and communities, both benthic and planktonic. The main objective of the group is to achieve an integrated view of the functioning of marine ecosystems, especially coastal areas and the continental shelf. Studies arise at different levels of biological organization, from the individual to the community; and a multidisciplinary methodological approach is always used. The projects are developed especially in the field but are supplemented by laboratory work. The group makes a special effort on the development of new technological equipment and facilities in order to conduct projects with better success. The biological model are the coelenterates, organisms having a life cycle with alternation of generations metagenic whose stages occur in both, benthic and planktonic systems. In this context, the study of the processes of benthic-pelagic coupling is one of the most important research lines of the group. In general, the research projects are focused on obtaining a rigorous scientific basis of understanding of marine ecosystems that can allow better management and to be used as references for marine conservation. To conduct work in close cooperation with the administration, authorities and society in general (educational and outreach projects) is a key issue for our research group.

Most relevant publications during this period of time	• Garrabou J, Sala E, Linares C, Ledoux JB, Montero-Serra I, Dominici JM, Kipson S, Teixidó N, Cebrian E, Kersting DK, Harmelin JG (2017) Re-shifting the ecological baseline for the overexploited Mediterranean red coral. Scientific Reports 7, 42404; doi: 10.1038/srep42404

- Montero-Serra I, Garrabou J, Doak D, Hereu B, Ledoux JB, Linares C (2017) Accounting for life-history strategies and timescales in marine restoration. Conservation letters. doi:10.1111/conl.12341

- Ambroso S, Salazar J, Zapata-Guardiola R, Federwisch L, Richter C, Gili J-M, Teixidó N – 2017. Pristine populations of habitat-forming gorgonian species on the Antarctic continental shelf. Scientific Reports. | 7: 12251 | DOI:10.1038/s41598-017-12427-y.

- Grinyó J, Isla E, Peral L, J-M Gili – 2017. Composition and temporal variability of particle fluxes in an insular canyon of the northwestern Mediterranean Sea. Progr. Oceanogr. 157: 12-26.

- Canepa A, Fuentes VL, Bosch-Belmar M, Melissa MS, Kilian T-G, Ortiz A, Durá E, Bordehore C, Gili J-M – 2017. Environmental factors influencing the spatio-temporal distribution of *Carybdea marsupialis* (Lineo, 1978, Cubozoa) in South-Western Mediterranean coasts. PLOS ONE, 12(7): e0181611.

- Bates AE, Helmuth B, Burrows MT, Duncan MI, Garrabou J, Guy-Haim T, Lima F, Queiros AM, Seabra R, Marsh R, Belmaker J, Bensoussan N, Dong Y, Mazaris AD, Smale D, Wahl M, Rilov G (2018) Biologists ignore ocean weather at their peril. Nature 560: 299-301

- Montero-Serra I, Linares C, Doak DF, Ledoux JB & Garrabou J (2018) Strong linkages between depth, longevity and demographic stability across marine sessile species. Proceedings of the Royal Society of London B Proc. R. Soc. B 285: 20172688

- Guerrero E, Gili JM, Grinyó J, Raya V and Sabatés A (2018) Long-term changes in the planktonic cnidarian community in a mesoscale area of the NW Mediterranean. PLoS One 13:e0196431.

- Grinyó J, Viladrich N, Díaz D, Muñoz A, Mallol S, Salazar J, Castillo R, Gili JM, Gori A Reproduction, energy storage and metabolic requirements in a mesophotic population of the gorgonian Paramuricea macrospina. PLoS ONE 13:e0203308, 2018,

- Lo Iacono C, Robert K, Gonzalez-Villanueva R, Gori A, Gili JM, Orejas C Predicting cold-water coral distribution in the Cap de Creus canyon (NW Mediterranean): implications for marine

	conservation planning. Progress in Oceanography 169:169-180, 2018.
Most relevant projects funded by public agencies during this period of time	• MPA-Adapt: Guiding Mediterranean MPAs through the climate change era: Building resilience and adaptation. Funding entity: Interreg Mediterranean. Coordinador: Joaquim Garrabou (CSIC). Period: 2016-2019 • MIMOSA: Are Mediterranean marine protected areas efficient against warming effects?. Funding entity: Fondation Prince Albert II Monaco. Coordinator: Joaquim Garrabou (CSIC). Period: 2016-2018 • PERFECT: Photogrammetry, gEnetics, Ecology for red coral ConservaTion. Funding entity: TOTALFondation. Coordinator: Pierre Drap (CNRS) & Joaquim Garrabou (CSIC). Period: 2015–2017 • MERCES. Marine Ecosystem Restoration in Changing European Seas. Funding entity: European Union (H2020-SC5-2015-689518-2). Coordination: Università di Ancona (Italy). Coordinator CSIC: Joaquim Garrabou, Period: 2016-2018, total 6.651.119 €, ICM-CSIC 372.080 €. • RECLAIMED Repercusiones clínicas y medioambientales de las medusas en el Mediterráneo. Convenio de Colaboración con el Consejo de Investigaciones Científicas (CSIC) para la Realización de estudios acerca de las proliferaciones de medusas y su importancia Médica. Funding entity: Fundació La Caixa. Coordinator: Josep-Maria Gili and Verónica Fuentes), Period: 2015-2017, 600,000 €. • Conservación y Recuperación de Poblaciones de Gorgonias y Corales de Profundidad mediante Restauración Ecológica y Mitigación de los Impactos de la Pesca. ResCap 2. Fundación Biodiversidad, Pleamar (UE H2020), IP J.M. Gili, 194.237 € • Implementación de Medidas Innovadoras de Cooperación entre Pescadores y Científicos para una Mejor Gestión de la Pesca Artesanal con el Objetivo de Mitigar sus Impactos en Hábitats Marinos Sensibles. Programa Pleamar (UE H2020). Fundación Biodiversidad, IP Josep-Maria Gili, 225.829,72 €.
Most relevant projects of technology and/or knowledge transfer with private companies and	• Contrato de apoyo tecnológico entre la Agencia estatal CSIC y la empresa ISDIN. Coordinador: Josep-Maria Gili. 2/2017-1/2019, 62,000€.

institutions during this period of time	• ACA2018 Revisió, tractament i validació experta de dades d'observació de meduses a les platges del litoral de catalunya per informar a la ciutadania i municipis costaners durant la temporada de bany del 2018, i avaluació de la propensió a la proliferació de meduses a les platges al finalitzar la temporada de bany. (ctn1800466)" (IP Josep-Maria Gili) 1/8/2018-5/1/2019. 39.291,61 €.
Doctoral theses defended during this period of time	• Title: Variability of the planktonic cnidarian community at different spatio-temporal scales along the Catalan coast (Northwestern Mediterranean). Author: Elena Guerrero, Director: Josep Maria Gili and Ana Sabatés, University: Universitat Politècnica de Catalunya. Date: 7/2017 • Author: Ignasi Montero Serra. Title: Resilience of Long-lived Mediterranean Gorgonians in a Changing World: Insights from Life History Theory and Quantitative Ecology. Date: 6/2018. Supervisor: C. Linares & J. Garrabou • Author: Raouia Ghanem. Title : Les populations des anthozoaires des côtes tunisiennes face au changement climatique. Date : 9/2018. Supervisor: Prof. J. Ben Soussi & J. Garrabou • Author : Carlos Domínguez Garrió. Title : ROV-based ecological study and management proposals for the offshore Marine Protected Area of Cap de Creus (NW Mediterranean). University : University of Barcelona. Date : 1/2018. Supervisor : J.M. Gili, J.L Riera
Master's theses defended during this period of time	• Title: Estudio ecológico de las comunidades de esponjas de la plataforma y talud continental del Canal de Menorca, Author: Andreu Santin Muriel, Director: Josep-Maria Gili and Jordi Grinyó, University: Universitat de Barcelona. Date: 2017 • Title: Evaluación de diferentes compuestos en la inhibición de la descarga de nematocistos de Pelagia noctiluca (Scyphozoa), Author: Ainara Ballesteros, Director: Verónica Fuentes, University: Universidad Politécnica de Valencia Date: 2017 • Title: Estudio experimental del rol de las gorgonias como hábitat preferencial de lmacrozooplancton epibentónico, Author: Marina Biel, Director: Josep-Maria Gili and Andrea Gori, University: Universitat de Barcelona Date: 2017 • Title: Estudi fisiològic de les comunitats someres i mesofòtiques de la gorgònia mediterrània Eunicella singularis, Author: Marc

	Niubó, Director: Josep-Maria Gili and Núria Viladrich, University: Universitat de Barcelona Date: 2017 • Title: Avaluació de l'estat de les poblacions de corall vermell (Corallium rubrum) als Parcs Naturals del Montgrí, El Baix Ter i les Illes Medes i del Cap de Creus., Author: Andrea Cabrito Rubau, Director: Cristina Linares i Joaquim Garrabou, University: Universitat de Barcelona. Date: 2017 • Author: Blanca del Arco. Title: Poblaciones de gorgonias en el coralígeno de Cerdeña: una nueva localidad en el Mediterránea Occidental. Director: A Gori, M Canals. University: Universitat de Barcelona. Date: 2018 • Author: Alba Garriga. Title: Diversity and distribution of deep Mediterranean soft corals assemblages (Menorca Channel, Western Mediterranean). Director: J. Grinyó. University: Universitat de Barcelona. Date: 2018 • Author: Nuria Callau. Title: Avaluació de la biodiversitat bentónica en ambients altament impactats per la pesca d'arrossegament Director: S. Ambroso, P. Puig. University: Universitat de Barcelona. Date: 2018
Highlights	• Joaquim Garrabou Scientfic coordinator of the T-MEDNet network (www.t-mednet.org) aiming to track climate change impacts in the Mediterranean Sea • Joaqum Garrabou coordinator of the marine citizen science platform Observadores del Mar www.observadoresdelmar.es • Registro de la propiedad intelectuals de "Juego Oceans" a nombre de J.M. Gili, B. Vendrell-Simón, J. Grinyó, S. Ambroso, R. Zapata, J. Salazar, L. Peral, A. Santín, C. Dominguez-Carrió, A. Martinez, M. Montseny, A. Gori, N. Viladrich, G. Corbera, B. Peral, X. Faus, representados por la Agencia Estatal Consejo Superior de Investigaciones Científicas, el día 9 de enero de 2019, Acta 7007 del Notario Pedro Antonio Mateo Salgado en Madrid. Documento, folio EK 3674213. • Registro de la propiedad intelectuals de "Gymkhana de los mares y océanos" a nombre de J.M. Gili, B. Vendrell-Simón, J. Grinyó, S. Ambroso, R. Zapata, J. Salazar, L. Peral, A. Santín, C. Dominguez-Carrió, A. Martinez, M. Montseny, A. Gori, N. Viladrich, G. Corbera, representados por la Agencia Estatal Consejo Superior de Investigaciones Científicas, el día 10 de enero de 2019, Acta 7008 del Notario Pedro Antonio Mateo Salgado en Madrid. Documento, folio EK 3674034.

	• Registro de la propiedad intelectuals de “Juego de Tierra o de Mar” a nombre de J.M. Gili, B. Vendrell-Simón, J. Grinyó, S. Ambroso, R. Zapata, J. Salazar, L. Peral, A. Santín, C. Dominguez-Carrió, A. Martinez, M. Montseny, A. Gori, N. Viladrich, G. Corbera, J. Corbera, representados por la Agencia Estatal Consejo Superior de Investigaciones Científicas, el día 9 de enero de 2019, Acta 7009 del Notario Pedro Antonio Mateo Salgado en Madrid. Documento, folio EK 3674025. • Registro de la propiedad intelectuals de “Guia de Identificación de Medusas” a nombre de M. Marambio, L. López-Castillo, J.M. Gili, V. Fuentes, representados por la Agencia Estatal Consejo Superior de Investigaciones Científicas, el día 9 de enero de 2019, Acta 7010 del Notario Pedro Antonio Mateo Salgado en Madrid. Documento, folio EK 3674016.

LITTORAL BIOLOGICAL PROCESSES

Head of Group	Esther Garcés

grup de recerca
processos biològics litorals

Group Components	**PERMANENT RESEARCHERS** Esther Garcés (CT) **POSTDOCTORAL RESEARCHERS** Albert Reñé (Contracted) Rachelle Gallisai (Contracted) Jislen Matos (Postdoctoral grant Brasil) **ENGINEERS/TECHNICIANS** Eva Flo (E. Técnicos Superiores Especializados OPIS) TISUs permanent Magdalena Vila (E. Técnicos Superiores Especializados OPIS) TISUs permanent Nagore Sampedro (Titulado Sup. Actividades Tecn. y Prof.) INFs **AD HONOREM** Jordi Camp (Scientist)

Key Words	coastal eutrophication, environmental quality, coastal zone, Harmful algal blooms, protists, diversity, taxonomy, ecology, microbial community, dinoflagellates, parasitism

Since its founding in 1990, we have investigated continent-ocean interactions within the coastal ecosystem, including continental flows and their implications for the marine environment. Particular areas of interest have been the enrichment of coastal waters and its consequences, eutrophication, and the development of harmful algal blooms. Their study

includes: i) the mechanisms considered relevant in the associated biological processes and ii) the relationships between continental inputs, spatial structure, and land use. The general approach is basic science but the results also address the growing demands formulated in management criteria and legislation enacted by the European Union on environmental quality and human health and welfare.

The group's research objectives for the period 2012–2017 have been the following: (i) a qualitative and quantitative understanding of the functioning of marine systems via the study of marine phytoplantonic communities and (ii) elucidation of the spatiotemporal patterns of relevant physicochemical and biological parameters, to understand littoral processes and to evaluate environmental quality in these coastal regions. The achievement of these two objectives requires:

- A description of the diversity of coastal microalgae and their biogeography
- Quantification of the relationships between microorganisms of the trophic food web
- Characterization of the environmental changes that affect phytoplankton communities
- Understanding the variability, origins, and consequences of coastal dynamics and how the state of these systems influences human well-being.
- The development of methodologies for assessing coastal waters based on environmental quality indicators, such as specific procedures or indexes.

Our group has a strong commitment to science dissemination and outreach.

Most relevant publications during this period of time	• Basterretxea, G., Torres-Serra, F.J., Alacid, E., Anglès, S., Camp, J., Ferrera, I., Flo, E., Font-Muñoz, J.S., Jordi, A., Reñé, A., Salgado-Hernanz, P.M., Sampedro, N., and Garcés, E. (2018). Cross-Shore Environmental Gradients in the Western Mediterranean Coast and Their Influence on Nearshore Phytoplankton Communities. Frontiers in Marine Science 5(78). doi: 10.3389/fmars.2018.00078 • Figueroa, R.I., Estrada, M. E. Garcés. (2018) Life histories of microalgal species causing harmful blooms: Haploids, diploids and the relevance of benthic stages. Harmful Algae, 73, 44-57. • Salvador Font-Muñoz, J., A. Jordi, Anglès, S., Ferriol, P., E. Garcés, Basterretxea, G. (2018) Assessing phytoplankton community composition from combined pigment and particle size distribution analysis. Marine Ecology Progress Series, 594 : 51-63. • Vassalli M, Penna A, Sbrana F, Casabianca S, Gjeci N, Capellacci S, Asnaghi V, Ottaviani E, Giussani V, Pugliese, L, Jauzein, C, Lemée R, Hachani MA, Turki, S, Açaf, L, Abboud-Abi Saabm M, Fricke A, Mangialajo L, Bertolotto R, Totti C, Accoroni S, Berdalet E, Vila M, Chiantore MC. (2018). Intercalibration of counting methods for Ostreopsis spp. blooms in the Mediterranean Sea. Ecological Indicators 85: 1092-1100. • Giner, C. R. Balagué, V., Krabberød, A., Ferrera, I., Reñé, A., Garcés, E., Gasol, J., Logares, R., Massana, R. Quantifying long-term

	recurrence in planktonic microbial eukaryotes. Molecular Ecology doi:10.1111/mec.14929 • Alacid E, Reñé A., Camp J and Garcés E (2017) In situ occurrence, prevalence and dynamics of Parvilucifera parasitoids during recurrent blooms of the toxic dinoflagellate Alexandrium minutum. Frontiers in Microbiology. 8:1624. doi: 10.3389/fmicb.2017.01624 • Anglès S., Reñé A., Garcés E., Lugliè A., Sechi, N., Camp J., Satta, C. (2017) Morphological and molecular characterization of Bysmatrum subsalsum (Dinophyceae) from the Western Mediterranean Sea reveals the existence of cryptic species. Journal of Phycology, 53 (4): 833-847. DOI: 10.1111/jpy.12546. • Frenken T., Alacid E., Berger S., Bourne E.C., Gerphagnon M., Grossart H-P., Gsell A.S., Ibelings B.W., Kagami M., Küpper F.C., Letcher P.M., Loyau A., Miki T., Nejstgaard J.C., Rasconi S., Reñé A., Rohrlack T., Rojas-Jimenez K., Schmeller D., Scholz B., Seto K., Sime-Ngando T., Sukenik A., Van de Waal D.B., Van den Wyngaert S., Van Donk E., Wolinska J., Wurzbacher C., Agha R. (2017) Integrating chytrid fungal parasites into plankton ecology. Research gaps and needs. Environmental Microbiology. DOI: 10.1111/1462-2920.13827. • Reñé, A., Alacid, E., Ferrera, I., Garcés, E. (2017) Evolutionary trends of Perkinsozoa (Alveolates) characters based on observations of two new genera of parasitoids of dinoflagellates, Dinovorax gen. nov. and Snorkelia gen. nov. Frontiers in Microbiology. doi: 10.3389/fmicb.2017.01594. • Reñé, A., Alacid E., Figueroa R.I., Rodríguez F., Garcés E. (2017) Life-cycle, ultrastructure, and phylogeny of Parvilucifera corolla sp. nov. (Alveolata, Perkinsozoa), a parasitoid of dinoflagellates. European Journal of Protistology, 58:9-25.
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • 2014-2018 — MARIABOX. MARINE environmental in situ Assessment and monitoring tool BOX. UE - FP7 Ocean 2013, Collaborative project 614088. Project coordinator: P. Philimis, CyRIC Total funding: 5.1 M €. Partner CSIC, IP: E. Garcés, Institut de Ciències del Mar (CSIC). 396.798 € **SPANISH/CATALAN** • 2018-2020 COPAs. Understanding top-down COntrol in coastal bloom-forming protists: opening the PArasitic compartment. CTM2009-08399 (subprograma MAR) IP: E. Garcés, Institut de Ciències del Mar (CSIC). 164.802 €

	• 2017-2018 DinoDiv: Molecular and morphology assessment of marine planktonic and benthonic dinoflagellates diversity. Intramural CSIC. IP: E. Garcés, Institut de Ciències del Mar (CSIC). 95.958 € • 2018-2021 BLOOMDY. Dinámica de las proliferacions de las microalgas costeras: de los mecansimos celulares a las interacciones tróficas. Intramural CSIC. IP: E. Garcés, Institut de Ciències del Mar (CSIC). 109.091 €
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	**CONTRACTS** • 2010-2018 Contrato con la empresa KAO CHEMICAL. Consulting Services about Microalgae Culture. IP: E. Garcés, Institut de Ciències del Mar (CSIC). 28.000 €
Doctoral theses defended during this period of time	• Nagore Sampedro – 2018 – "Potentially harmful dinoflagellates in the NW Mediterranean coast, with a focus on the Alexandrium genus". Universitat de Barcelona. Dr. Jordi Camp. • Elisabet Alacid Fernanadez. Host-parasite interactions: the Parvilucifera sinerae model in marine microalgae. Universidad Politécnica de Catalunya. 18 July 2017. Supervisor: Esther Garcés • Eva Flo. 2017. Opening the Black box of coastal inshore wàters in the NW Mediterranean Sea: environmental quality tools and assessment. Universitat Politècnica de Catalunya. Supervisor Jordi Camp.
Master's theses defended during this period of time	• Anna Garcia Borderia. "Supervivència de Parvilucifera sinerae en absència de bloom: el rol del sediment". Trabajo fin de Máster Oceanografia i Gestió del medi marí. UB. Director: Albert Reñé. Octubre 2018. • David Funosas Planas: "Study on the potential use of planktonic communities as bioindicators in the NW Mediterranean coast". Trabajo fin de Máster en "Bioinformática". UPF. Directora: Isabel Ferrera. Julio/2018. • Marc Mascaró Triay: "Ecotoxicology tests of Ostreopsis cf ovata on benthic macrofauna". Trabajo fín de Máster en "Oceanografia i Gestió del Medi Marí " (UB-ICM). Directora: Magda Vila y E. Berdalet. Nov-2017 a Oct-2018. • Andrea Bertran. The role of sediments in the diversity of microeukaryote parasites in coastal areas. Trabajo fin de Máster.

	Oceanography and management of the marine environment. Director: A. Reñé. University of Barcelona. October 2017. • Neus Moll. Host range and specificity of Dinovorax pyriformis, a new parasitoid of harmful marine dinoflagellates. Trabajo fin de Máster. Oceanography and management of the marine environment. Directora: E. Alacid. University of Barcelona. October 2017. • Sergio Estruch Miñana. Marine planktonic protist diversity in the Palma Bay (Mallorca) as revealed by Illumina sequencing. Directora: Isabel Ferrera, Co-director: Albert Reñé. Master Microbiologia Avançada, Universitat de Barcelona. Curs 2016-2017. Defensa: 12/09/2017 • Raquel Bañón Suñer: "Anàlisi de toxines de la microalga tòxica Ostreopsis cf ovata i experiments d'ecotoxicologia". Trabajo fín de Máster en "Oceanografia i Gestió del Medi Marí " (UB-ICM). Directora: Magda Vila i E. Berdalet. February- October 2017.
Highlights	• 2018-2021 Grup de Recerca Consolidat de Catalunya. SGR 1642 GRUP DE PROCESSOS LITORALS I OCEÀNICS (Group of Coastal and Oceanic Processes). Generalitat de Catalunya. Spain. IP: A. Palanques (ICM-CSIC).43.843.94 € **OUTREACH** • Garcés, E., Closa, D. 100 secrects dels oceans. Editorial Cossetània. 2018

FUNCTIONING AND VULNERABILITY OF MARINE ECOSYSTEMS

Head of Group	Joan B. Company
	Marine Ecosystems Functioning and Vulnerability
Group Components	**PERMANENT RESEARCHERS** Joan B. Company (Scientist) Marta Coll (Scientist) Guiomar Rotllant (Scientist) Mercedes Blazquez (Scientist) Monserrat Solé (Scientist) Jacopo Aguzzi (Scientist) **POSTDOCTORAL RESEARCHERS** Joan Navarro (Ramón y Cajal) Diego Castejon (Project Contract) **Ph.D. STUDENTS** Morane Clavel-Henry (FPI) Elena Lloret (FPU) Marta Carretón (FPU) Daniel Vilas (Project contract) Xavier Corrales (Project contract) Marta Albo (Project contract) **ENGINEERS/TECHNICIANS** Nixon Bahamon (Permanent position) José Antonio García del Arco (Permanent position) **STUDENTS** María Vigo (BSc Degree practicum)

Key Words	Biodiversity, Vulnerability, Ecosystem Functioning, Deep Sea, Fisheries, Ecopath, Marine Living Resources, Ecotoxicology of Environmental Pollutants, Marine Technology, Remote and Multiparamteric Monitoring

The principal aim of our group is to explore the effects of stressors and forcing processes on marine ecosystems with special attention given to marine living resources and human activities. The group began in 1993 as a Research Group of Consolidated Quality of the Autonomic Government of Catalunya. Since then, the group has grown steadily by training Ph.D. students that later were contracted under various Spanish and European research programs such as Ramon y Cajal, Marie Curie, Juan de la Cierva, and JAE, and/or became CSIC permanent employees. Today, the group is highly multidisciplinary in terms of research activities, but also in technological aspects, publishing high quality scientific papers and informative reports. Since the beginning, the group has led many research projects funded by the Catalan and the Spanish governments, and the European Union. The group is associated with the Polytechnic University of Catalonia (UPC).

Most relevant publications during this period of time

- Rabosky, D.L., Chang, J., Title, P.O., Cowman, P.F., Sallan, L., Friedman, M., Kaschner, K., Garilao, C., Near, T.J., Coll, M., Alfaro, M.E. (2018). An inverse latitudinal gradient in speciation rate for marine fishes. Nature. https://www.nature.com/articles/s41586-018-0273-1

- Solé, M.; Solé, M.; Sanchez-Hernandez, J.C (2018). Elucidating the importance of mussel carboxylesterase activity as exposure biomarker of environmental contaminants of current concern: An in vitro study. Ecological Indicators, 85, 432 – 439.

- Bråte, I.L.N.; Blázquez, M.; Brooks, S.J.; Thomas, K.V. (2018). Weathering impacts the uptake of polyethylene microparticles from toothpaste in Mediterranean mussels (M. galloprovincialis). Science of the Total Environment, 626, 1310-1318.

- Kathena, J.N.; Yemane, D.; Bahamon, N.; Jansen, T. (2018). Population abundance and seasonal migration patterns indicated

	by commercial catch-per-unit-effort of hakes (Merluccius capensis and M. paradoxus) in the northern Benguela Current Large Marine Ecosystem. African Journal of Marine Science, 40, 197-209. • Mecho, A.; Aguzzi, J.; De Mol, B.; Lastras, G.; Ramirez-Llodra, E.; Bahamon, N.; Company, J.B.; Canals, M. (2018).Visual faunistic exploration of geomorphological human-impacted deep-sea areas of the north-western Mediterranean Sea. Journal of the Marine Biological Association of the United Kingdom, 98, 1241-1252. • Castejón, D., Alba-Tercedor, J., Rotllant, G., Ribes, E, Durfort, M. & Guerao, G. (2018). Micro-computed tomography and histology to explore internal morphology in decapod larvae. Scientific Reports 8(1): 14399. .
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • SPELMED - Evaluation of the population status and specific management alternatives for the small pelagic fish stocks in the North-Western Mediterranean Sea. EASME/EMFF/2016/032 – European Commission Tender, 12/2017 - 12/2018 (210.000,00 €, 100 % ICM). IP: Dr. Marta Coll and Dr. Jose Maria Bellido. **SPANISH/CATALAN** • RESNEP - Reservas marinas de interés pesquero como herramienta de gestión para recuperar pesquerías icónicas del Mediterráneo: el caso de la cigala Nephrops norvegicus. Ministerio de Economía, Industria y Competitividad (Convocatoria Retos 2016), 01/01/2018 – 30/12/2020, 172.000,00 € (100% ICM). IPs: Joan Navarro and Joan B. Company. • PELWEB - Winners, losers and shifts of PELagic food WEB changes in the western Mediterranean Sea: from ecosystem consequences to future projections. Ministerio de Economía, Industria y Competitividad (Convocatoria Retos 2016), 01/01/2018 – 30/12/2020, 137.940,00 € (100 % ICM). IPs: Marta Coll and Jose Maria Bellido. • SAP - Seguimiento y valoración de las medidas de gestión pesquera en Catalunya (SAP). Fondos Europeos Marítimos Pesqueros. Generalitat de Catalunya. 07/07/2018 – 31/09/2020 (945.000,00 €, 100 % ICM). PIs: Joan B. Company, Laura Recasens, Marta Coll, Roger Villanueva y Pilar Sanchéz. • 50sels – Estudi de les conseqüències socioeconòmiques de l'ús de la malla quadrada de 50 mm a les pesqueries demersals de les comarques de Girona. Fondos Europeos Marítimos Pesqueros. GALP (Grups d'Acció Locals en Pesca). 01/08/2018 – 30/09/2019 (90.000,00 €, 100 % ICM). IP: Joan B. Company.

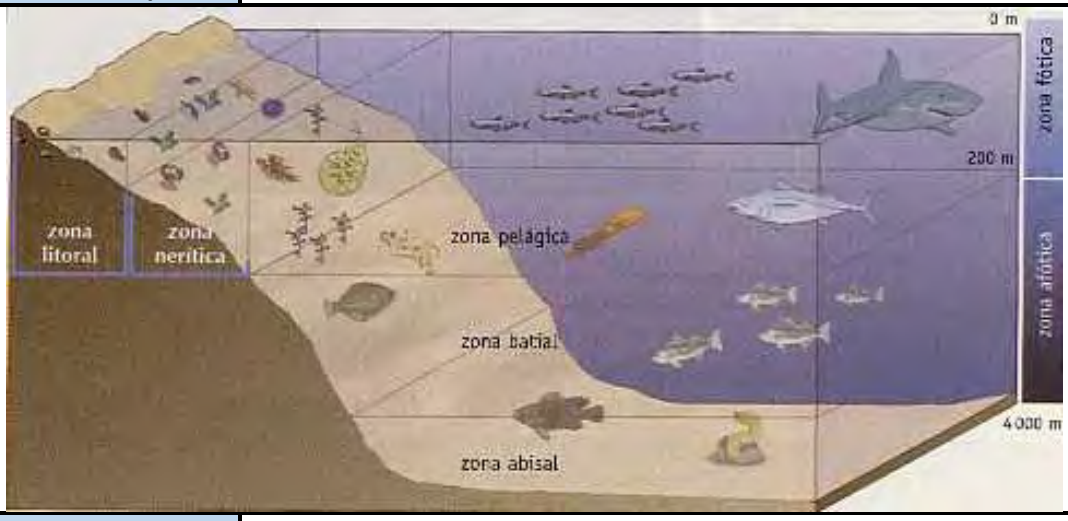
	• UniArt – Unificación como medida de gestión, desarrollo de un arte único y más sostenible para toda la flota de arrastre de gamba roja de profundidad. Programa PLEAMAR, Fundación Biodiversidad. 01/02/2019 – 30/09/2020, (195.00,00 €; Parnerts: Cofradía de Pescadores de Palamós, IEO y ICM-CSIC). IP-CSIC: Joan B. Company.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	• 50sels – Estudi de les conseqüències socioeconòmiques de l'ús de la malla quadrada de 50 mm a les pesqueries demersals de les comarques de Girona. Fondos Europeos Marítimos Pesqueros. GALP (Grups d'Acció Locals en Pesca). 01/08/2018 – 30/09/2019 (90.000,00 €, 100 % ICM). IP: Joan B. Company
Doctoral theses defended during this period of time	• Diego Castejon. Titol. Universitat Barcelona. Guiomar Rotllant
Master's theses defended during this period of time	• TITLE: Áreas de protección marinas como herramienta de gestión pesquera. Caso estudio de la cigala, Nephrops norvegicus. , MSc STUDENT: Vigo, Maria, UNIVERSITY: Master in Marine Science - Universitat de Barcelona, Barcelona, Spain. YEAR: 2018-2019, Supervisors: Joan B. Company, Joan Navarro and Marta Carretón. • TITLE: Evaluación estacional de la condición biológica y posición trófica de la población de sardina (Sardina pilchardus) y anchoa (Engraulis encrasicolus) de la costa catalana y aplicación a la gestión pesquera, MSc STUDENT: Campos, Andrea, UNIVERSITY: Master in Marine Science - Universitat de Barcelona, Barcelona, Spain. YEAR: 2018-2019, Supervisors: M.Coll, J. Gimenez and E. Lloret Lloret • TITLE: Long-term differences in the diet of a predatory pelagic fish, the little tunny (Euthynnus alletteratus) in the northwestern Mediterranean Sea: combining stomach content, isotopic markers and energetic models, MSc STUDENT: Puigarnau, Silvia, UNIVERSITY: Master in Oceanography and Marine Science Management - Universitat de Barcelona, Barcelona, Spain. YEAR: 2018-2019, Role: M. Coll,. J. Navarro & J. Gimenez • TITLE: Geographic differences in the diet of a predatory pelagic fish, the little tunny (Euthynnus alletteratus): combining stomach content and isotopic markers, MSc STUDENT: Moran, Eric, UNIVERSITY: Master in Oceanography and Marine Science Management - Universitat de Barcelona, Barcelona, Spain. YEAR: 2018-2019. Role: M. Coll, J. Navarro & J. Gimenez

	• TITLE: Practicum and Final project under the Spanish project PELWEB, BSc STUDENT: Gerez, Sara, UNIVERSITY: Environmental Sciences – University of Barcelona, Barcelona, Spain. YEAR: 2018-2019 Role: M. Coll, M. Albo-Puigserver & E. Lloret Lloret • TITLE: Influence of environmental variables in European sardine and European anchovy ecology, BSc STUDENT: Fernandez, Elena UNIVERSITY: Environmental Sciences – Autonomous University of Barcelona, Barcelona, Spain. YEAR: 2018-2019, Role: M. Coll, and M. Albo-Puigserver • TITLE: Trophic ecology of an endangered holocephalan in the Mediterranean Sea, MSc STUDENT: Tamayo, Monica UNIVERSITY: Master in Marine Sciences: Oceanography and Marine Environment Management- Universitat de Barcelona, Barcelona, Spain., YEAR: 2017-2018 MARK: 8.5/10, Role: M. Coll, J. Navarro & C. Barria • TITLE: Temporal differences in the trophic strategies between three predatory pelagic fish in the western Mediterranean Sea MSc STUDENT: Enric Serra, Pau, UNIVERSITY: Master in Marine Sciences: Oceanography and Marine Environment Management-Universitat de Barcelona, Barcelona, Spain, YEAR: 2017-2018, MARK: 9/10, Role: M. Coll, J. Navarro & MSc. M. Albo-Puigserver • TITLE: Feeding strategies of batoids in the western Mediterranean Sea. ,MSc STUDENT: Coll, Ethan, UNIVERSITY: Master in Marine Sciences: Oceanography and Marine, Environment Management-Universitat de Barcelona, Barcelona, Spain, YEAR: 2017-2018, MARK: 9/10, Role: J. Navarro & C. Barria
Other relevant contributions	• El proyecto SAP (Seguimiento y valoración de las medidas de gestión pesquera en Catalunya; leer detalles del poryecto más arriba en Apartado “Proyectos”) tiene como objetivo principal el seguimiento y evaluación de las principales especies de interés pesquero de la costa catalana. Se realizarán un total de 36 embarques en buques de pesca comercial en 9 de los puertos pesqueros más importante del litoral catalán.
Highlights	• Planning and running the workshop “Update and analysis of environmental data and explore the linkages with hake recruitment data”. NatMIRC, Swakopmund, Namibia. 3-14 Sep 2018. International cooperation action funded by Cooperación Española and CETMAR (Spain) and Ministry of Fisheries and Marine Resources (Namibia). • Coordinación del Servicio de Asesoramiento Pesquero (SAP). Seguimiento pesquero y valoración de las medidas de gestión pesquera en Catalunya. Objetivo principal: seguimiento y

	evaluación de las principales especies de interés pesquero de la costa catalana (Mediterráneo noroccidental). • Coordinating research in support to application of Ecosystem Approach to Fisheries (EAF) and management advice in the Mediterranean and Black Seas (CREAM)

ECOLOGY OF MARINE COMMUNITIES

Head of Group	Pilar Sánchez Zalacain



Group Components

PERMANENT RESEARCHERS

Pilar Sánchez (Research Scientific)
Pere Abelló (Research Scientific)
Montserrat Demestre (Research Scientific)
Antoni Lombarte (Research Scientific)
Paloma Martín (Research Scientific)
Pilar Olivar (Research Scientific)
Montserrat Ramón (Research Scientific)
Laura Recasens (senior technician)
Ana Sabatés (Research Scientific)
Roger Villanueva (Research Scientific)

POSTDOCTORAL RESEARCHERS

Eva Galimany (project contracted)
Marc Farré (project contracted)

Ph.D. STUDENTS

Joan Mir (FI)
Fernando Ángel Fernández (FI)
Tabita Contreras (CONYCIT)

ENGINEERS/TECHNICIANS

Marc Balcells (projec contracted)
Ana Isabel Colmenero (technician)
Alfredo Garcia de Vinuesa (project contracted)
Amalia Manjabacas (engineer)
Balbina Molí (technician)
Vanesa Raya (Project contracted)
Mariona Garriga (Project contracted)

STUDENTS

Ada Farrés (B.Sc. Degree practicum)

	Marta Dominguez (B.Sc. Degree practicum)

Key Words	Marine ecosystems, fisheries oceanography, recruitment, reproductive strategies, cephalopoda, trophic interactions, global change, climate variability, fish, fish early life history, physical biological coupling, anthropogenic impact, ecosystem-based management, diversity, MPAs

Our research focuses on the study of the structure and dynamics of the marine ecosystems. The final goal is to obtain a better knowledge of ecosystem functioning to establish a sustainable management of the marine resources leading towards the paradigm of reaching an equilibrium between benefits and conservation. Marine ecosystems, their populations and habitats are affected by a wide array of factors, both of natural (seasonal variability, environmental factors, natural hazards) and anthropogenic (climate change, fishing activity, habitat loss) origin. The conservation of these ecosystems, accordingly, becomes one of the most important challenges presented to the scientific community. In this context, the research activity of the group members is centered on the study of the interactions among organisms and the effects of environmental and anthropogenic factors on marine communities. Specific objectives are focused i) to improve our knowledge on biodiversity, ii) to obtain complete information on the species life history, iii) to elucidate the physical and biological processes influencing the communities and species dynamics at different spatio-temporal scales, iv) to analyze the effects of fishing activity on exploited and non-exploited organisms and their habitats, as well as v) to determine the role of marine protected areas on marine ecosystems conservation

Most relevant publications during this period of time

- Pascual, M., Acuña, J.L., Sabatés, A., Raya, V., Fuentes, V. 2017. Contrasting diel vertical migration patterns in Salpa fusiformis populations. Journal of Plankton Research 39: 836-842.

- Fernández-Álvarez, F.A., Martins C.P.P., Vidal. E.A.G., Villanueva, R. 2017. Towards the identification of the ommastrephid squid paralarvae (Mollusca: Cephalopoda): morphological description of three species and a key to the north-east Atlantic species. Zoological Journal of the Linnean Society 180: 268-287. doi: 10.1111/zoj.12496

	• Ana I. Colmenero, Víctor M. Tuset, Pilar Sánchez 2017. Reproductive strategy of white anglerfish (Lophius piscatorius) in Mediterranean waters: implications for management Fishery Bulletin 115(1):60-73 • Olivar, M.P., Hulley, P.A., Castellón, A., Emelianov, M., López, C., Tuset, V., Contreras, T., Molí, B. 2017. Mesopelagic fishes across the tropical and equatorial Atlantic: biogeographical and vertical patterns. Progress in Oceanography 151: 116-137. • Lattig, P.; Muñoz, I.; Martín, D.; Abelló, P.; Machordom, 2017. A.Comparative phylogeography of two symbiotic dorvilleid polychaetes (Iphitime cuenoti and Ophryotrocha mediterranea) with contrasting host and bathymetric patterns. Zoological Journal of the Linnean Society. 179:1-22. • Olivar, M.P., Contreras, T., Hulley, P.A., Emelianov, M., López, C., Tuset, V., Castellón, A. 2018. Variation in the diel vertical distributions of larvae and transforming stages of oceanic fishes across the tropical and equatorial Atlantic. Progress in Oceanography 160: 83-10. • Sabatés, A., Salat, J., Tilves, U., Raya, V., Purcell, J.E., Pascual, M., Gili, J.M., Fuentes, V.L. 2018. Pathways for Pelagia noctiluca jellyfish intrusions onto the Catalan shelf and their interactions with early life fish stages. Journal of Marine Systems 187: 52-61 • Alba Muntadas; Michel Lample; Montserrat Demestre; Johanna Balle-Beganton; Silvia de Juan; Francesc Maynou ;Denis Bailly. 2018. A knowledge platform to inform on the effects of trawling on benthic communities. Estuarine, Coastal and Shelf Science 201; 223-233 • Galimany, E.;Baeta, M.;Ramón, M. 2018. Immune response of the sea cucumber Parastichopus regalis to different temperatures: implications for aquaculture purposes. Aquaculture 497: 357-363 • Martins, C.P.P.;Fernández-Álvarez, F.;Villanueva, R. 2018. Invertebrate predation on egg masses of the European cuttlefish, Sepia officinalis: An experimental approach. Estuarine, Coastal and Shelf Science 200: 437-448
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • Biología de cefalópodos: reproducción y estadios juveniles de Octopus vulgaris. PROYECTOS INTRAMURALES CSIC. 19/03/2018-18/03/2019, 30.000,00 € 18/03/2019 **SPANISH/CATALAN**

	• WINFISH: Role of vertical mixing processes and dense water formation in the spawning strategy and recruitment of winter breeding fishes in the NW Mediterranean. Ministerio de Economía y Competitividad, 1/1/2016 – 31/12/2019, 217.800€ (100 % ICM). PI: Ana Sabatés • CLIFISH. Variabilidad climática y pesquerías en el siglo XXI: Efectos del cambio global sobre poblaciones y comunidades necto-bentónicas. Ministerio de Economía y Competitividad - Programa Estatal de I+D+i Orientada a los Retos de la Sociedad. 01/01/2016-31/09/2019. IP: Pere Abelló. • Relationship between the protection of maërl seabed and the quality of the marine resources (total lipids and omega 3) of the marine protected area of Cap de Creus. Park's Service of the Gvt. of Catalonia & Caixabank Foundation.08/2017-01/2018 . 17.787 €. P.I. M. Demestre.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	• Seguimiento biológico del pulpo, Octopus vulgaris en la costa catalana" ARP005/17/00117. Ayudas del Fondo Europeo Marítimo y de la Pesca destinadas al sector pesquero y acuícola catalán. 30.06.17- 30.09.17. 50.418 € (100% ICM) I.P:Roger Villanueva. • Evaluación y seguimiento del Plan de Gestión de dragas para embarcación" (Proyecto Rastell). AG-2016-233. Departament d'Agricultura, Ramaderia, Pesca i Alimentació de la Generalitat de Catalunya. Mayo 2016-Septiembre 2017. 132.214 € IP: Montserrat Ramón. • Seguiment plan gestió sonsera 152CAT00002. Departament d'Agricultura, Ramaderia, Pesca i Alimentació de la Generalitat de Catalunya. 01/03/2017 a 29/09/2017. 37788€ (100% ICM) I.P. P. Sanchez. • Transferència de coneixement sobre l'estat biològic del lluç en els caladors del port de Roses (LLUS), 152CAT00007, ARP005/17/00174. Generalitat de Catalunya. Ajuts FEMP. 02-2017 -30-09-2017. 58119.04 € (100% ICM). I.P. Laura Recasens. • Determinació maduresa sexual-fecunditat cargol punxenc-St. Carles AG-2018-207. Departament d'Agricultura, Ramaderia, Pesca i Alimentació de la Generalitat de Catalunya. February 2018-October 2018. 15.730,00 € IP: Montserrat Ramón.
Doctoral theses defended during this period of time	• Ana Isabel Colmenero Ginés. TOWARDS BIOLOGICAL AND ECOLOGICAL KNOWLEDGE OF Lophius spp. IN THE NW MEDITERRANEAN SEA FOR A SUSTAINABLE FISHERY Universitat de Barcelona, 10 noviembre 2017.Supervisor P. Sánchez

	• Fernando Ángel Fernández Álvarez. An onto-phylogenetic journey through the life history of flying squids (Cephalopoda: Ommastrephidae) Universitat Politecnica de Catalunya (UOC). 03/05/2018.Supervisor R. Villanueva
Master's theses defended during this period of time	• Ada Farrés Was: Geographical variation in the shell of Bolinus brandaris (Mollusca, Gastropoda) at two fishing grounds of the Catalan coast. Máster de Biodiversidad. Curso 2016-2017. UB-UPC. Defensa septiembre 2017. Supervisor: M. Ramón, A. Lombarte, V. Tuset • Marta Arroyo: Estudio de las comunidades de bivalvos capturados mediante el arte de pesca de Rastell de Cadenas. Curso 2016-2017. UB-UPC. Defensa septiembre 2017. Supervisora: E. Galimany • Joan Sala Coromina. Roses' no-take marine zone effectiveness and spatiotemporal hake population assessment using GIS tools. Master Universitat de Barcelona (UB). 13/07/2017. Supervisora L. Recasens • Laura Reino Ramírez. 2018. Calidad de hábitats y comunidades bentónicas de los fondos explotados por la pesca de arrastre. Master Universitat de Barcelona (UB). Supervisor M. Demestre • Eduardo Rodriguez Batista. 2018 Estudio del crecimiento relativo y la condición reproductiva de Bolinus brandaris (Gastropoda:Muricidae) en Sant Carles de la Ràpita (Mediterráneo noroccidental). Master Universidad de Barcelona (UB). Supervisor M. Ramón • Oscar Escolar Sánchez. 2018 Reproducción y dinámica poblacional de Octopus vulgaris en la costa central catalana, Master Universidad de Barcelona (UB). Supervisor R. Villanueva & F.A. Fernández Alvarez. • Laia Illa López Vulnerabilitat de les comunitats bentòniques a l'impacte de la pesca d'arrossegament: estudi dels caladors de Blanes. TFG Universitat de Girona UdG. Supervisor M. Demestre
Other relevant contributions	• Campanya WINFISH: 18 febrer - 20 març, Mar Català, B/O: García del Cid. Cap de campanya: Ana Sabatés • MEDITS_ES_2017_GSA1&2. 2017. Vaixell: Miguel Oliver. Zona: Western Mediterranean: Alboran Sea. Projecte: MEDITS. Dates: 23/04/2017-11/05/2017. Organisme: Instituto Español de Oceanografía. Cap de Campanya: Cristina García. Participants ICM: Pere Abelló.

	• MEDITS_ES_2017_GSA6. 2017. Vaixell: Miguel Oliver. Zona: Western Mediterranean: Cabo Palos - Cap de Creus. Projecte: MEDITS. Dates: 12/05/2017-06/06/2017. Organisme: Instituto Español de Oceanografía. Cap de campanya: Antonio Esteban. Participants ICM: Pere Abelló; Marc Farré. • DATA: 2018-05-23 - 2018-06-24, CAMPANYA: Bathypelagic CAP DE CAMPANYA: Santiago Hernández-León, VAIXELL: Sarmiento de Gamboa, PROJECTE: Projecte: Plan Nacional CTM2016-78853-R Bathypalagos, PARTICIPANTS: M. Pilar Olivar, Cristina López Pérez i Fernando A. Fernádez Álvarez, Arturo Castellón (UTM)., LLOC: de les Illes Canaries fins a Islandia • DATA: 2018-02-14 - 2018-02-28, CAMPANYA: WINFISH_2018 CAP DE CAMPANYA: M. Pilar Olivar, VAIXELL: García del Cid PROJECTE: WINFISH_Ana Sabatés, PARTICIPANTS: M. Pilar Olivar, Vanesa Raya, Marina Pastor, Marc Balcells, Joan Mir, Maria Montseny, Ricardo Santos, LLOC: Costa Catalana
Highlights	**BOOK CHAPTERS** • M. Demestre, A. Muntadas, P. Sanchez, A. Garcia-de-Vinuesa, J.Mas, I.Franco, R.Duran and J. Guillen. Bio and Anthropogenic Disturbance of Maërl Communities Settled on Subaqueous Dunes on the Mar Menor Continental Shelf (Western Mediterranean) Springer International Publishing Switzerland 2017, J. Guillén et al. (eds). Atlas of bedforms in the Western Mediterranean. DOI 10.1007/978-3-319-33940—5_33. Springer, 2015-219 • M. Demestre, A. Muntadas, R. Duran, A. Garcia-de-Vinuesa, P. Sanchez , J.Mas, I.Franco, A. Muñoz and J. Guillen. Characterization of benthic communities in a subaqueous dune field on the continental shelf (Mar Menor, western Mediterranean). Springer International Publishing Switzerland 2017, J. Guillén et al. (eds). Atlas of bedforms in the Western Mediterranean. DOI 10.1007/978-3-319-33940—5_32. Springer, 207-214. **OTHER** • P. Martín and Laura Recasens participate regularly in the evaluation of Mediterranean fishing resources, in sessions organized by the STECF (Scientific, Technical and Economic Committee for Fisheries) and the GFCM (General Fisheries Commission for the Mediterranean). STECF advises the European Commission on issues related to fishing activity. GFCM is an agency dependent on FAO.

GROUP OF BIOLOGY OF REPRODUCTION

Head of Group	Francesc Piferrer
	GBR Group of Biology of Reproduction
Group Components	**PERMANENT RESEARCHERS** Francesc Piferrer (Research Professor) **POSTDOCTORAL RESEARCHERS** Laia Ribas (PI of AGL project, Jóvenes Investigadores) Dafni Anastasiadi (Contract) **Ph.D. STUDENTS** Alejandro Valdivieso (FPI) Susanna Pla (Contract) Núria Sánchez (FPI) **ENGINEERS/TECHNICIANS** Sílvia Joly (Technician; Permanent) Gemma Fuster (Technician; Permanent) **STUDENTS** Javier Moraleda (UB; M.Sc. Student) María Cáceres (UPC; Practicum for the B.Sc. degree) Guillem Figueres (UPC, Practicum for the B.Sc. degree) Óscar Cubota (UB; Practicum for the B.Sc. degree)

Key Words	Genetics, Epigenetics, Reproduction, Physiology, Fish, Sex determination, Sex differentiation, Sexual patterns, Stress, Endocrinology, Immunology, Genomics, Epigenomics, Transcriptomics, Metabolomics, Fish farming, Aquaculture, Reproductive control, Sex control, Environmental factor, Global warming, Climate change, Endocrine disrupting chemicals.

The Group of Biology of Reproduction, formed in 1997, is a dynamic and consolidated research group at ICM's Dept. of Renewable Marine Resources in which the primary focus is fish reproduction. The specific objectives are the study of: a) the internal (genotype, physiological condition, age) and environmental (temperature, stress, pathogens) influences on the molecular mechanisms responsible for sexual development; b) Development, in close cooperation with the private sector, of protocols for the control of reproduction in aquaculture; and c) the evolution of different reproductive strategies in fishes of economic importance. To achieve these objectives, we use a wide range of methods that include experiments in aquaria under controlled conditions, physiology, molecular, genomics, epigenomics, transcriptomic and metabolomic approaches, as well as phylogenetic comparative methods. The species we typically focus on are relevant for fish farming: European sea bass, turbot and Senegalese sole. The zebrafish is used as a model, and we have an extensive database on phylogenetic, ecological, life-history, and reproductive-related aspects that covers thousands of fish species used to address evolutionary questions on sexual pattern evolution. The above-mentioned objectives are of great interest for CSIC's Agronomic Sciences Area. The emphasis on epigenetic regulatory mechanisms is key to understand how the phenotype develops from genomic and environmental information, particularly in the context of global change. Understanding how reproduction is regulated is essential if we aim to bring it under our control in aquaculture. Finally, understanding reproductive variability is also important for conservation biology.

Most relevant publications during this period of time	• Ribas, L., Liew, W.C., Díaz, N, Sreenivasan, R., Orban, L., Piferrer, F., 2017. Heat-induced masculinization in domesticated zebrafish is family-specific and yields a set of different gonadal transcriptomes. Proceedings of the National Academy of Sciences

of the United States of America. 114 (6): E941-E950. doi: 0.1073/pnas.1609411114.

- Ribas, L., Valdivieso, A., Díaz, N., Piferrer, F. 2017. Appropriate rearing density in domesticated zebrafish to avoid masculinization: links with the stress response. Journal of Experimental Biology, 220: 1056-1064. doi/10.1242/jeb.144980.

- Anastasiadi, D., Díaz, N., Piferrer, F. 2017. Small increases in temperature induce stage-dependent effects on DNA methylation and gene expression during fish development. Scientific Reports. 7: 12401 doi:10.1038/s41598-017-10861-6.

- Díaz, N., Piferrer, F. 2017. Estrogen exposure overrides the masculinizing effect of elevated temperature by a downregulation of the key genes implicated in sexual differentiation in a fish with mixed genetic and environmental sex determination. BMC Genomics, 18:973.1-13. DOI 10.1186/s12864-017-4345-7.

- Ribas L., Vanezis K., Imúes M.A. and Piferrer F. 2017. Treatment with a DNA methyltransferase inhibitor feminizes zebrafish and induces long-term expression changes in the gonads. Epigenetics and Chromatin, 10, Art. No. 59.

- Anastasiadi, D., Esteve-Codina, A., Piferrer, F. (2018). Consistent inverse correlation between DNA methylation of the first intron and gene expression across tissues and species. Epigenetics and Chromatin, 11, Art. 37. DOI: 10.1186/s13072-018-0205-1

- Barrachina, F.; Anastasiadi, D.; Jodar, M.; Castillo, J.; Estanyol, J.M.; Piferrer, F.; Oliva, R. (2018). Identification of a complex population of chromatin-associated proteins in the European sea bass (Dicentrarchus labrax) sperm. Systems Biology in Reproductive Medicine, 64 (6): 502-517. DOI: 10.1080/19396368.2018.1482383.

- Anastasiadi D, Vandeputte M, Sánchez-Baizán N, Allal F, Piferrer F. Dynamic epimarks in sex-related genes predict gonad phenotype in seabass, a fish with mixed genetic and environmental sex determination. Epigenetics,13 (9): 988-1011. DOI: 10.1080/15592294.2018.1529504.

- Felip. A., Piferrer, F. (2018). State of culture and breeding of Europeansea bass, Dicentrarchus labrax L. En: Liang, X.F., H.P Wang, H. Liu and R.W. Hardy, eds. World Perch and Bass Culture: Innovation and Industrialization. China Science Press, Beijing. ISBN: 978-7-03-053873-4., pp. 332-351.

Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • TRANSSEXBASS: Trans-generational epigenetic and genomic influences on sex ratios in sea bass. Joint project IFREMER-CSIC. Funding: UE AquaExcel Programme. Ref. 1/1/2017-31/12/2017. 2.220 € (ICM). Researcher: Núria Sánchez. Supervisor: Francesc Piferrer. • PERFORMFISH: Consumer Driven Production: Integrating Innovative Approaches for Competitive and Sustainable Performance across the Mediterranean Aquaculture Value Chain. Funding: EU H2020 Programme. Ref. 727610. Participation of 29 research centers of 10 countries. 7 Million euro. Coordinator: Katherna Moutou (Univ. Thesaloniki, Greece). Duration: 1/5/2017-30/4/2022. Budget: 61.877 € (ICM). PI: Francesc Piferrer • Transgenerational epigenetic inheritance of sex reversal in half-smooth tongue sole (Cynoglossus semilaevis). Funding: National natural science foundation of China (Grant No. 31472269). 1/1/2015-31/12/2018. Centers: Yellow Sea Fisheries Research Institute, CAFS and ICM. Coordinator: Shangwei Shao (CAFS). International external advisor: Francesc Piferrer (ICM). • EPIFISH: Innovative Epigenetic markers for fish domestication. Funding: European Research Council (ERC) (ref. 683210). 1/1/2016-31/12/2018. Coordinator: Jorge Fernandes (Univ. Nordland, Norway). External advisor: Francesc Piferrer (ICM). • Mitigating The Impact of Climate-Related Challenges on Salmon Aquaculture. Funding: Ocean Frontiers Institute (OFI). Ref. MJ23-17. Coordinator: Kurt Garmperl (Canada). IP (ICM): Laia Ribas. Duration 10/2016 - 10/2020. Total Budget 4.631.902€. Budget ICM: 5.200€. **SPANISH/CATALAN** • EPIMARK: Identificación de marcadores epigenéticos ligados al crecimiento gonadal y somático en peces. Ministerio de Ciencia e Innovación (AGL2016-78710-R). 1/1/2017-31/12/2019. 200.000 € (100% ICM). PI: Francesc Piferrer. • AMBISEX: Efectos ambientales durante el desarrollo gonadal en peces; el papel de la epigenética. Ministerio de Economía y Competitividad (AGL2015-73864-JIN). 1/1/2017-31/12/2019. 169.000 € (100% ICM). PI: Laia Ribas. • VALE+: Valorización de la Acuicultura a través de una Comunicación Efectiva. Red de Investigación en Acuicultura de la Generalitat de Catalunya (XRAq). 1/1/2016 a 31/12/2017. 14.000

	€ (100% UPC). Coordinator: Lourdes Reig (UPC). PI ICM: Francesc Piferrer. • Grup de Recerca Consolidat "Fisiologia i Genòmica de Peixos. Aplicacions a l'Aqüicultura", núm. Identificación (2017 SGR 1042). Funding: Generalitat de Catalunya. 1/1/201-31/12/2019. 40.000 € (ICM 50%) Coordinator: Francesc Piferrer.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	• Title: Estudio histológico, endocrinológico y molecular del efecto de gonadotropinas recombinantes en machos de lenguado. Funding: Institut de Recerca Agroalimentaria de Catalunya (IRTA). Duration: Jul 2016- Jul 2019. Budget ICM: 31,240 €. Coordinator and IP: Francesc Piferrer. No. of participating researchers: 3. • Title: Implementación de herramientas genómicas, morfométricas y epigenéticas para mejorar el cultivo de la lubina (Dicentrachus labrax L) en la planta de ABSA, S.A.U. Funding: Centro para el Desarrollo Tecnológico e Industrial (CDTI). Participating institutions: Instituto de Ciencias del Mar (ICM-CSIC), Univ. Santiago de Compostela (USC), Instituto Mediterráneo de Investigaciones Avanzadas (IMEDEA-CSIC), Instituto Nacional de Investigaciones Agrarias (INIA) y Culmarex, S.A. Duration: Dec 2016-Dec 2019. ICM Budget: 175,638.00 €. PI: Francesc Piferrer (CSIC). • Patent no. EP 18382646: Method for predicting sex in fish. European patent, requested on 09/07/2018.
Master's theses defended during this period of time	• Javier Moraleda, Universitat de Barcelona. Effects on gonad differentiation in zebrafish (Danio rerio) when reared at high density and subjected to immune stimulation. 5/09/2017. Supervisor: Laia Ribas.
Other relevant contributions	• Ribas, L , Piferrer, F. A DNA-demethylating agent (the decitabine) used for cancer treatment is able to modulate sex in the zebrafish model (2018) VIII Jornada SCB: Chromatine and Epigenetics (Barcelona) 16 March. Invited speaker. • Ribas, L (2018). L'ús de la genòmica funcional per a entendre els processos de la diferenciació sexual en peixos. II Congrés de Biologia. Jornada d'Aqüicultura (Barcelona) 3 May. Invited speaker. • Piferrer, F. 2018. Development of essential epigenetic markers: Application to the predication of gonadal sex and the identification of the early signs of domestication. XIII International Symposium of Genetics in Aquaculture. Cairns (Australia) 15-20 July Plenary lecture.

	• Piferrer, F. (2018). Sex chromosomes, sex determination and sex differentiation in fish. XVIII Simpósio de Citogenética e Genética de Peixes - SCGP 2018. Cascavel (Paraná), Brasil, 4-7 November. Plenary lecture.
Highlights	• On April 26, 2017, Francesc Piferrer was elected member of the High Level Advisory Group on "Food from the Oceans" by SAPEA (Science Advice for Policy by European Academies). • Piferrer, F. 2017. Epigenetic Regulation of Internal and External Influences on Gene Expression in Aquacultured Fish. Plant and Animal Genomics (PAG) Asia International Conference. May 29-31. Seoul, South Korea. Plenary lecture. • Ribas, L., Valdivieso, A., Sánchez-Baizán, N., Liew, W.C., Orbán, L., Piferrer, F, 2017. High temperature and rearing density can masculinize domesticated zebrafish: Possible implications for fish farming. European Zebrafish Meeting (EZM), 3-7 July. Budapest, Hungary. State-of-the-Art lecture. • L Ribas; A Valdivieso; S Sánchez; F Piferrer, 2017. Functional genomics in fish reproduction: towards understanding the sex differentiation process. XI Congreso Asociación Ibérica Endocrinología Comparada, 13-15 July. Vigo, Spain. Plenary Session • On Dec 14, 2017, Francesc Piferrer was elected member of the Royal Academy of Sciences and Arts of Barcelona (RACAB), section V (Life Sciences).

FISHERIES BIOECONOMIC MODELLING

Head of Group	Francesc Maynou

Group Components	**PERMANENT RESEARCHERS** Francesc Maynou (Research Scientist) **Ph.D. STUDENTS** John G. Ramirez (Contracted) Federico Quattrocchi (Contracted) **ENGINEERS/TECHNICIANS** Cristina López (Contracted) Silvia Gómez (Contracted) **STUDENTS** Mounira Alkassar (M.Sc. Degree practicum)
Key Words	Bioeconomic Modelling, Fisheries, Goods and Services, Ecosystem Approach, Fish Population Dynamics

In order to produce progress in bioeconomic modelling of exploited systems, it is essential to develop bioeconomic models which are spatially explicit and which incorporate the dynamics of *n* species and *m* fleets in a realistic manner, to simulate the effect of conservation measures, such as those established in the current European Framework Directives (e.g., the Marine Strategy Directive or the Habitats Directive) within ,Horizon 2020. In addition, it is important to incorporate sub models describing the dynamics of non-extractive uses, such as diving or ecotourism, to obtain the full value of conservation on non-extractive uses, to complement the list of goods and services fulfilled by marine ecosystems.

Current research in bieconomic models of exploited marine resources implies the development of conceptual models and their application to a spatially explicit marine dynamic system. The model must include:

i) trophic relationships and energy flux among coastal ecosystem compartments, with

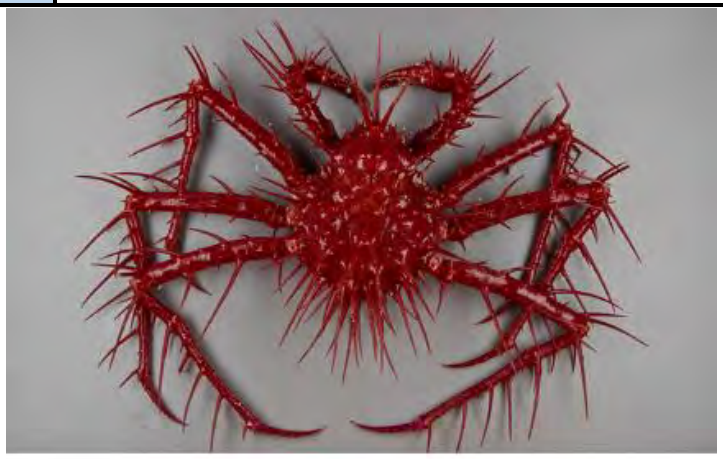
ii) spatial structure of ecosystem components (species, communities, environmental factors, and fleets), and

iii) explicit dynamics of fleets in the habitats studied, both at a spatial level and with consideration of technical interactions among species to assess the direct effects (mortality

in target species, changes in bottom structure) and indirect (discards, differential mortality, change in energy flux) of the fishing activity.	
Most relevant publications during this period of time	• Nielsen J.R., Thunberg E., Holland D.S., Schmidt J.O., Fulton E.A., Bastardie F., Punt A.E., Allen I., Bartelings H., Bertignac M., Bethke E., Bossier S., Buckworth R., Carpenter G., Christensen A., Christensen V., Da-Rocha J.M., Deng R., Dichmont C., Doering R., Esteban A., Fernandes J.A., Frost H., Garcia D., Gasche L., Gascuel D., Gourguet S., Groeneveld R.A., Guillen J., Guyader O., Hamon K.G., Hoff A., Horbowy J., Hutton T., Lehuta S., Little L.R., Lleonart J., Macher C., Mackinson S., Mahevas S., Marchal P., Mato-Amboage R., Mapstone B., Maynou F., Merzéréaud M., Palacz A., Pascoe S., Paulrud A., Plaganyi E., Prellezo R., van Putten E.I., Quaas M., Ravn-Jonsen L., Sanchez S., Simons S., Thébaud O., Tomczak M.T., Ulrich C., van Dijk D., Vermard Y., Voss R., Waldo S. 2018. Integrated ecological-economic fisheries models – Evaluation, review and challenges for Implementation. Fish and Fisheries, 19: 1-29. DOI: 10.1111/faf.12232. • Maynou F., Gil M.M., Vitale S., Giusto G.B., Foutsi A., Rangel M., Rainha R., Erzini K., Gonçalves J.M.S., Bentes L., Viva C., Sartor P., De Carlo F., Rossetti I., Christou M., Stergiou K., Maravelias C.D., Damalas D. 2018. Fishers' perceptions of the Euorpean Union discards ban: perspective from south European fisheries. Marine Policy 89: 147-153. https://doi.org/10.1016/j.marpol.2017.12.019. • Tomlinson, B., F. Maynou, Sabatés, A., Fuentes, V., Canepa, A., Sastre, S. 2018. Systems approach modelling of the interactive effects of fisheries, jellyfish and tourism in the Catalan coast. Estuarine, Coastal and Shelf Science 201: 198-207 http://dx.doi.org/10.1016/j.ecss.2015.11.012. • Martínez-Baños P., J.G. Ramírez, M. Demestre, F. Maynou. 2018. European hake (Merluccius merluccius) assessment based on size frequencies and basic biological parameters in the SW Mediterranean. Fisheries Research 205: 35-42. • Sola I, Maynou F. 2018. Bioeconomic analysis of the effects of a modification of the trawl extension piece with T90 netting. Scientia Marina, 82(S1): 27-37. https://doi.org/10.3989/scimar.04715.06A
Most relevant projects funded by public agencies during this period of time	H2020: • PANDORA "Paradigm for new dynamic ocean resource assessments and exploitation" Contract nº 773 713, coordinator DTU Aqua (Denmark), 25 partners. Period 1 May 2018 – 30 April 2022. Total budget: 5.59 M€; ICM: 0.25 M€

DEEP SEA ECOLOGY (DIVERSITY AND TROPHIC WEBS)

Head of Group	Joan E. Cartes



Group Components	**PERMANENT RESEARCHERS**Joan E. Cartes (Researcher)
Key Words	Diversity, food webs, Deep Sea ecosystems; natural variability; spatial distribution; anthropogenic impact: trawling, oil spills, damming, microplastics; species life histories; biological condition; macrofauna; (supra)hyperbenthos; peracarid crustaceans; near-bottom zooplankton; megafauna: fish, decapods, deep-sea shrimps; trophic levels; C-N stable isotopy; gut contents; daily rations; parasite-prey relationships; meso-macro temporal scales: daily/circadian rhythms, intrannual changes, seasonality, long term studies; reconstruction of deep-sea communities; climatic change; autecology; (exploited/unexploited) populations; communities; original field data; multidisciplinary cruises; empiric analyses; empiric models;

We are focused on the study of diversity and dynamics of communities and food webs in deep sea ecosystems. Influence of both natural variability (biological and physico-chemical variables) and the anthropogenic impact (trawling, oil spills, damming, plastics) on diversity patterns, on the distribution of biomass and in the biology and life histories of species of macro (hyperbenthos, near-bottom zooplankton) and megafauna (fish, crustaceans) at different trophic levels, including interaction between species (e.g., parasite-prey relationships). All focused on different spatial and temporal scales (meso-macroscales), from daily, circadian rhythms and intrannual changes (seasonality) to long term studies (in the last decades), including historic reconstruction of deep-sea communities (recent paleoceanography). Studies have been focused from autecological to community levels, including commercial species (e.g., shrimp). The approach adopted is original, based on field data from multidisciplinary cruises, empiric analyses and models, avoiding as far as possible pay-per-publish strategies.

Most relevant publications during this period of time

- Carbonell, A., Llompart, P., Gaza, M., Mir, A., Aparicio-González, A., Álvarez-Barastegui, D., Balbin, R., Cartes J.E., 2017. Long-term climatic influences on the eco-physiological condition of the red shrimp Aristeus antennatus in the Western Mediterranean Sea. Climate Research, 72: 111-127.

- Cartes, J.E., Schirone, A., Barsanti, M., Delbono, I., Martínez-Aliaga, A., Lombarte, A. 2017. Recent reconstruction of deep-water

	macrofaunal communities recorded in Continental Margin sediments in the Balearic Basin. Deep-Sea Research I. 125, 52-64. • Serrano, A. González-Irusta, J.M., Punzón, A., García-Alegre, A., Lourido, A., Ríos, P., Blanco, M., Gómez-Ballesteros, M., Druet, M., Cristobo, J., Cartes, J. 2017. Deep sea benthic habitats modeling and mapping in a NE Atlantic seamount (Galicia Bank). Deep Sea Res. I. 126: 115-127. • Dallarés, S., Padrós, F., Cartes, J.E., Solé, M. Carrassón, M. 2017. The parasite community of the sharks Galeus melastomus, Etmopterus spinax and Centroscymnus coelolepis from the NW Mediterranean deep-sea in relation to feeding ecology and health condition of the host and environmental gradients and variables. Deep Sea Res. I, 129: 41-58. • Papiol, V., E. Fanelli, J.E. Cartes, P. Rumolo, C. López-Pérez. 2017. A multi-tissue approach to assess the effects of lipid extraction on the isotopic composition of deep-sea fauna. Journal of Experimental Marine Biology and Ecology. 497, 230-242. • Cartes, J.E., López-Pérez, C., Carbonell, A. 2018. Condition and recruitment of Aristeus antennatus at great depths (to 2300 m) in the Mediterranean: relationship with environmental factors. Fisheries Oceanography. 27:114-126. • Carreras-Colom, E., Constenla, M.; Soler-Membrives, A., Cartes, J. E., Baeza, M., Padrós, F., Carrassón, M. 2018. Spatial occurrence and effects of microplastic ingestion on deep-water shrimp (Aristeus antennatus). Mar. Poll. Bull. 133: 44-52. • Bayhan, Y. K., Ergüden, D., Cartes, J. E. 2018. Deep Sea Fisheries in Mersin Bay, Turkey, Eastern Mediterranean: Diversity and Abundance of Shrimps and Benthic Fish Fauna. Acta Zoologica Bulgarica. 70(2): 259-268.

BARCELONA CENTER FOR SUBSURFACE IMAGING

Head of Group	César R. Ranero
	Barcelona CSI Center for Subsurface Imaging
Group Components	**PERMANENT RESEARCHERS** Rafael Bartolomé (Titulado Superior CSIC) Xavier Garcia (Científico Titular CSIC) Eulàlia Gràcia (Investigador Científico CSIC) César R. Ranero (ICREA Research Professor) Valentí Sallarès (Científico Titular CSIC) **POSTDOCTORAL RESEARCHERS** Alcinoe Calahorrano (contract) Alejandra Cameselle (contract) Daniel Dagnino (contract) Estela Jiménez-Tejero (contract) Adrià Melendez (contract) Héctor Perea (Marie Curie-IF-GLOBAL) **Ph.D. STUDENTS** Slaven Begovic (Marie Curie-ITN) Miquel Camafort (contract) Laura Gómez de la Peña (FPU) Clàudia Gras (contract) Irene Merino (FPI) Cristina Sànchez-Serra (FPI) **STUDENTS** Pedro Buinheira (Erasmus, University of Lisbon, Portugal) Domagoj Terzič (Erasmus, University Zagreb, Croatia) Cyril Bernard (MSc, Université du Maine, ENSIM, France) **VISITING SCIENTISTS** Jiazheng Zhang (Postdoc from Institute of Oceanology, Chinese Academy of Sciences, China) Feb 2017-Feb 2018 **SYSTEM MANAGER** Sonia Cardona (contract)

Key Words	Natural Hazards, continental margins, active processes, earthquakes, submarine landslides, tsunami, tectonics, basin evolution, sub-mesoscale ocean dynamics.

We study continental rifting, seafloor spreading, and subduction systems. To obtain the best quality observations, we regularly lead the acquisition, analysis, and processing of geological and geophysical data. We develop novel methodological strategies for travel-time tomography and full-waveform inversion, integrated with pre-stack depth migration, and electromagnetic and seismological methods, to estimate physical properties and subsurface structure at the highest possible resolution. Based on the data acquired and models developed, we lead international drilling projects to ground-truth seismic data. We interpret seismic observables integrated with geological information to advance conceptually in the understanding of active geological systems, with special emphasis on the characterization of processes related to geological hazards, such as active faults, submarine landslides, earthquakes and tsunamis. We also apply seismic methods to image and investigate oceanic fine structure and sub-mesoscale processes. We excel in data quality, novel methodologies and interpretation, which has permitted the group to actively seek funding to support our research from both governmental and industry sources.

Most relevant publications during this period of time

- Cameselle, A. L., Ranero, C. R., Franke, D., & Barckhausen, U. The continent-ocean transition on the northwestern South China Sea. Basin Research. https://doi.org/10.1111/bre.12137, 2017.

- Perea, H., Gràcia, E., Martínez-Loriente, S., Bartolome, R., Gómez de la Peña, L., De Mol, B., Moreno, X., Lo Iacono, C., Diez, S., Tello, O., Ballesteros, M., Dañobeitia, J.J. Kinematic analysis of secondary faults within a distributed shear-zone reveals fault linkages and increased seismic hazard. Marine Geology, 399, 23-33, 2017.

- Dagnino, D; Sallarès, V.; Ranero, C R. Waveform-Preserving Processing Flow of Multichannel Seismic Reflection Data for Adjoint-State Full-Waveform Inversion of Ocean Thermohaline

	Structure. IEEE Transactions on Geoscience and Remote Sensing, 56, 3, 1615 - 1625, doi: 10.1109/TGRS.2017.2765747, 2017 • Prada, M., Sallares, V., Ranero, C. R., Vendrell, M. G., Grevemeyer, I., Zitellini, N. and de Franco, R., Spatial variations of magmatic crustal accretion during the opening of the Tyrrhenian back-arc from wide-angle seismic velocity models and seismic reflection images. Basin Research doi:10.1111/bre.12211, 2017. • Buffett, G. G., Krahmann, G., Klaeschen, D., Schroeder, K., Sallarès, V., Papenberg, C., Ranero, C.R., and Zitellini, N., Seismic oceanography in the Tyrrhenian Sea: Thermohaline staircases, eddies, and internal waves. Journal of Geophysical Research: Oceans, 122. https://doi.org/10.1002/ 2017JC012726, 2017. • Booth-Rea, G. Ranero, C. R. & Grevemeyer, I. The Alboran volcanic-arc modulated the Messinian faunal exchange and salinity crisis. Scientific Reports v. 8, Article number: 13015 (2018) • Kohn, M. J., Castro, A. E., Kerswell, B. C., Ranero, C. R., Spear F. S., Shear heating reconciles thermal models with the metamorphic rock record of subduction, Proceedings of the National Academy of Sciences, 201809962; DOI: 10.1073/pnas.1809962115 (2018) • Gómez de la Peña, L., Ranero, C. R., & Gràcia, E. The Crustal Domains of the Alboran Basin (Western Mediterranean). Tectonics, 37, 10, 352-3377, https://doi.org/10.1029/2017TC004946 (2018) • Jimenez-Tejero, C. E., V. Sallares, C. R. Ranero, Appraisal of Instantaneous Phase-Based Functions in Adjoint Waveform Inversion, IEEE Transactions on Geoscience and Remote Sensing, 56, 9, 5185-5197, DOI: 10.1109/TGRS.2018.2811245 (2018) • Martínez-Loriente, S., Gràcia, E., Bartolome, R., Perea, H., Klaeschen, D., Dañobeitia, JJ, Zitellini, N., Wynn, R., Masson, D., Morphostructure, tectono-sedimentary evolution and seismic potential of the Horseshoe Fault, SW Iberian Margin, Basin Research, 0,1,382-400, doi: 10.1111/bre.12225 (2018) • Mojica, J.F., V. Sallares, B. Biescas, High-resolution diapycnal mixing map of the Alboran Sea thermocline from seismic reflection images, Ocean Science, 14,3, 403-415, DOI: 10.5194/os-14-403-2018 (2018)
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • ZIP, Zipping between the plates: Initial Training Network. Marie Skłodowska-Curie, European Commission Horizon 2020,

	16/11/2015 – 31/08/2018, ICM 724.863,24 €. Workpackage PI: C. R. Ranero & V. Sallares. • PALEOSEISQUAKE, New approaches in subaqueous paleoseismology using high-resolution seismics to derive single net paleoearthquakes displacement and to characterize the seismic cycle on active faults: Marie Skłodowska-Curie, IF, European Commission Horizon 2020, 239.191€, 2016-2019, PI: E. Gràcia, Researcher: H. Perea • EMODNET-HRSM, High Resolution Seabed Mapping, tender DG MARE (EU), PI: E. Gràcia (2016-2018) **SPANISH/CATALAN** • FRAME, Formación de los dominios geológicos en el margen oeste de Iberia y la reactivación de sus limites tectónicos. Ministerio de Economía y Competitividad. 1/1/2016 – 31/06/2020. 208.120€ (100% ICM). PI: C.R. Ranero & V. Sallares. • E-FIRE: Ministerio de Economía y Competitividad, 1/11/2016 – 30/10/2018, 200.000,00€ (50% ICM). PI: C. R. Ranero. • Grup de Recerca Consolidat Barcelona Center for Subsurface Imaging. AGAUR (Catalan Government). 01/01/2015 - 31/12/2017. 43.000,00€ (100% ICM). PI: C.R. Ranero. • Caracterización de grandes estructuras sismogénicas y tsunamogénicas del Golfo de Cádiz con tecnologías de muy alta resolución. Ministerio de Economía y Competitividad. 245,630€ 01/01/2016- 31/12/2018. PI: E. Gràcia.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	• Geomargen-4. NATURGY. 01/09/2017-31/08/2019. 150.000. P.I.: C.R. Ranero. • SOUND-2018. REPSOL. 18/12/2017-17/12/2018. 160.000 €. Coordinador: C.R. Ranero, PIs: V. Sallarès, A. Villaseñor. • Compilació i interpretació de dades sísmiques i sondeigs corresponents a la zona marina al voltant de la C.N. de Vandellós, IBERDROLA, 8/03/2017-31/10/2018, 26.000€, PI: E. Gràcia. • UNESA -Seismic Characterization of Nuclear Power Plant Sites in Spain. IBERDROLA. 8/03/2017-31/10/2018, 37.727,80 €. PI. R. Bartolomé. • SOUND-2019. REPSOL. 18/12/2018-17/12/2019. 160.000 €. Coordinador: C.R. Ranero, PIs: V. Sallarès, A. Villaseñor.

	• Compilació i interpretació de dades sísmiques i sondeigs corresponents a la zona marina al voltant de la C.N. de Vandellós, IBERDROLA, 8/03/2017-31/10/2018, 26.000€, PI: E. Gràcia.
Doctoral theses defended during this period of time	• Laura Gómez de la Peña, "The origin and tectono-sedimentary structure of the Alboran Basin", Universitat de Barcelona, 8 de Juny 2017, Advisors: César R. Ranero y Eulàlia Gràcia • Marina Viñas: Tectonic structure and formation kinematics of the western Mediterranean basins. Universitat de Barcelona, 20 January 2017 Advisor: César R. Ranero
Master's theses defended during this period of time	• Cyril Bernard, "Processing of multichannel seismic data acquired in the Alboran Sea (Western Mediterranean).. Université du Maine. Ecole Nationale Superieure d´ingénieurs du Mans (ENSIM). Sept. 2017. Supervisor: R. Bartolomé / A. Calahorrano • Ennio Piazza, "Processing of seismic multichannel data in continental margins applied to geological hazards assessment", Reservoir Geology and Geophysics Master, Unv. Barcelona. Dirección: Rafael Bartolomé (ICM-CSIC) / Beatriz Benjumea (Inst. Cartografico de Catalunya)
Other relevant contributions	• FRAME-1 Cruise with R/V Sarmiento de Gamboa. 8 July - 31 July 2018. Chief Scientist: C. R. Ranero • FRAME-2 Cruise with R/V Sarmiento de Gamboa. 26 August - 21 September 2018. Chief Scientist: V. Sallares • INSIGHTS-Leg1 cruise with R/V Sarmiento de Gamboa, 28 April -18 May 2018. Chief Scientist: E. Gràcia • MARCAN-Malta Cruise with R/V Hercules. 3 October – 11 October. Chief Scientist: A. Micallef
Highlights	• "Kirk Bryan Award of The Geological Society of America", for the article: Goldfinger, C., Nelson, C.H., Morey, A.E., Johnson, J.R., Patton, J., Karabanov, E., Gutierrez-Pastor, J., Eriksson, A.T., Gràcia, E., Dunhill, G., Enkin, R.J., Dallimore, A., and Vallier, T., 2012, Turbidite event history—Methods and implications for Holocene paleoseismicity of the Cascadia subduction zone. U.S. Geological Survey Professional Paper 1661–F, 170 p. (2017) • E. Gràcia awarded by CSIC for academic achievements in 2017. Madrid 5 July 2017. • C. R. Ranero elected 2018 Union Fellow by the American Geophysical Union (AGU). • E. Gràcia Doctor Honoris Causa 2018 University of Brest.

	• V. Sallarès appointed Vicedirector of Research Strategy at ICM-CSIC in March 2018 • Organization of "Subduction Interface Processes (SIP) meeting", >150 attendees. Funded by ILP, EU-FP7. Castelldefels (España), 18-21 April 2017

THE CONTINENTAL MARGINS GROUP

Head of Group	Gemma Ercilla Zarraga

The Continental Margins Group

Group Components	**PERMANENT RESEARCHERS** Belén Alonso (Research Professor) Gemma Ercilla (Research Scientist) **ENGINEERS/TECHNICIANS** Ferran Estrada **Ph.D. STUDENTS** Victor Tendero (FPU) **MASTER'S STUDENTS** Oscar Llamosa (UB) **VISITORS** Dr. Jesús Galindo-Zaldivar (May to Setember)

Key Words	Continental margins; sedimentary systems; natural hazards; sedimentology; tectonics; fluid dynamics; sediment transport mechanisms; sedimentary instabilities; palaeoclimatology; palaeoceanography; geotechnics; anthropogenic impact;

The Continental Margins Group—GMC—has a great deal of experience in the field of the geology and geophysics in continental margins and basins from different geological and geographical contexts, in different seas and oceans. The background of the GMC researchers includes a variety of Marine Geoscience disciplines. Our interest focuses mainly on three major themes:

FORMATION AND EVOLUTION OF CONTINENTAL MARGINS AND BASINS (I)

- To provide stratigraphic and structural architecture models to interpret the geologic record
- Studying the geological processes that control the formation and evolution of continental margins

- To analyze contourite deposits as key elements to explain the effect of Mediterranean water masses around Iberia and its implications for the evolution of margins.
- To analyze the Messinian Salinity Crisis (2 Ma) and controlling factors of one of the most important and first order event in the evolution of margins and Mediterranean basins.

GEOHAZARDS (II)

- To understand and assess the geological factors to be considered in the modeling for interpretation of sedimentary geologic record.
- To characterize and assess the potential geological hazards coming from the sea (landslides, tsunamis, earthquakes, erosion, etc) integrating sea- and-land research studies.

GLOBAL CHANGES (III)

- To establish the relationship of sedimentary sequences and systems and their palaeoceanographic and palaeoclimatic reconstructions.
- To define sedimentary sequences formed during the different stages of glacial-interglacial cycles, defining the age, the nature of the sediment and the depositional palaeoenvironments.

Most relevant publications during this period of time	• Estrada, F., Galindo-Zaldívar, J., Vázquez, J. T., Ercilla, G., D'Acremont, E., Alonso, B., & Gorini, C. (2018). Tectonic indentation in the central Alboran Sea (westernmost Mediterranean). Terra Nova, 30(1), 24-33. • D. Casas, A. Pimentel, J. Pacheco, E. Martorelli, A. Sposato, G. Ercilla, B. Alonso, F. Chiocci (2018). Serreta 1998-2001 submarine volcanic eruption, offshore terceira (azores): characterization of the vent and inferences on the eruptive dynamics. Journal of Volcanology and Geothermal Research. https://doi.org/10.1016/j.jvolgeores.2018.02.017 2018 • Galindo-Zaldivar, J., Ercilla, G., Estrada, F., Catalán, M., d'Acremont, E., Azzouz, O., ... & Sanz de Galdeano, C. (2018). Imaging the Growth of Recent Faults: The Case of 2016–2017 Seismic Sequence Sea Bottom Deformation in the Alboran Sea (Western Mediterranean). Tectonics, 37(8), 2513-2530. • Lafosse, M., Gorini, C., Le Roy, P., Alonso, B., d'Acremont, E., Ercilla, G., ... & Ammar, A. (2018). Late Pleistocene-Holocene history of a tectonically active segment of the continental margin (Nekor basin, Western Mediterranean, Morocco). Marine and Petroleum Geology, 97, 370-389. • Druet, M., Muñoz-Martín, A., Granja-Bruña, J. L., Carbó-Gorosabel, A., Acosta, J., Llanes, P., & Ercilla, G. (2018). Crustal

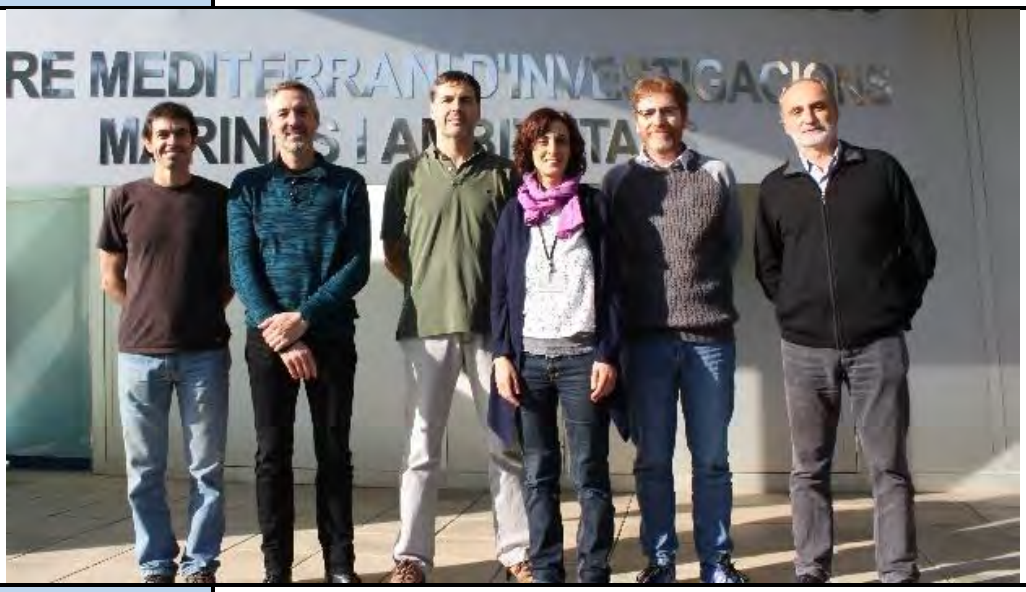
	structure and continent-ocean boundary along the Galicia continental margin (NW Iberia): insights from combined gravity and seismic interpretation. Tectonics, 37(5), 1576-1604. • Brackenridge, R. E., Stow, D. A., Hernández-Molina, F. J., Jones, C., Mena, A., Alejo, I., Ducassou, E., Llave, L, Ercilla, G.,Nombela, M.A., Perez-Arluece, Perez-Arlucea, M., Francés, G. (2018). Textural characteristics and facies of sand-rich contourite depositional systems. Sedimentology, 65,7, 2223-2252.
Most relevant projects funded by public agencies during this period of time	• FAUCES. Geological risk factors associated with the headwaters of submarine canyons on the Mediterranean continental margins of the south of Iberia. Plan Nacional I+D+i. IP: B. Alonso • DAMAGE. Active and recent deformation through the central sector of the Betic-RIF Cordillera and the Alboran Sea: geological risk factors.. Plan Nacional I+D+i. IP. J. Galindo • EDMONET. Ingestion and safe-keeping of marine data. EU. • GRACO. Gravitational and Contouritic Interactions on the Upper Slope of the Gulf of Cadiz close to the Straits of Gibraltar. Eurofleets. IP. M. Garcia • RIGEL bis. Identification of Geo-risks on the Margins of Spain. IP. J.T. Váquez. IEO. • ALBACORE. Alboran coring. IP. E. D´acremont. French National Research Agency.
Other relevant contributions	• Field Campaign DAMAGE (February 26 to March 6) in Morocco with the aim of studying deformation in the Kebdana region. • FAUCES 1BIS oceanographic campaign (September 25 to 30) aboard the Angeles Alvariño, on the Alboran Sea and the Águilas Arc margin. Head of campaign: B. Alonso. Objective: to carry out a morphological, sedimentary, stratigraphic and tectonic study, to study the geological risks of headwaters near the coast. Parametric profiles and multibeam bathymetry records were obtained. • Oceanographic campaign FAUCES 2 (3 to October 31) aboard the Sarmiento de Gamboa in the Alboran Sea and the Águilas Arc margin, Campaign leaders: D. Casas, B. Alonso and G. Ercilla. Objective: to carry out a morphological, sedimentary and stratigraphic, tectonic, sedimentological and geotechnical analysis to study the geological risks in headwaters near the coast. Videos were obtained with the ROV Argus, seismic profiles of air guns,

	parametric, multibeam bathymetry mosaics, gravity controls. Likewise, gravimety data were obtained. In addition, "in situ" consolidation measurements were made with a penetrometer from the company Igeotest. Outreach Blog: https://faucesproject.wordpress.com/blog/
Highlights	Co-Organization of the "Theoretical-practical course on techniques and instrumentation for the preparation of geological and paleontological samples". 2–6 of July. Organized by the Museum of Natural Sciences of Barcelona (MCNB) in collaboration with the University of Barcelona (UB) and the Institute of Marine Sciences (ICM-CSIC). "Techniques of preparation and conservation of marine sediment samples" were taught at ICM. **OUTREACH** • Press release - CSIC Comunicación. CSIC scientists identify a new fault in the Alboran Sea. • This news generated outreach in more than a dozen media: written, radio, and TV., YouTube: https://www.youtube.com/watch?v=LDir4RSuGC8&t=6s • Press Release in "El País" : "Found a fault in formation under the Mediterranean that has caused three earthquakes in Spain and Morocco. The submarine crack, of about 20 kilometers length, concentrates the greatest seismic activity between the coasts of both countries. https://elpais.com/elpais/2018/07/23/ciencia/1532364642_662434.html • Press Release in "El Diario Sur: "CSIC scientists identify a new fault in the Alboran Sea causing high magnitude earthquakes", 23 of July. • Press Release on "20 Minutos": "CSIC scientists identify a new fault in the Alboran Sea: https://www.20minutos.es/noticia/3401552/0/cientificos-csic-identifican-nueva-falla-mar-alboran/#xtor=AD-15&xts=467263 • Press Release in "El País": The waterfall one kilometer high that returned water to the Mediterranean. Sediments near Malta support the hypothesis of a 'mega-flood' five million years ago. April 10, 2018. • Participation as an expert on the candidate evaluation panel of the scholarship program of "la Caixa" Banking Foundation

	to pursue postgraduate studies in Europe and in Spanish centers (2018 Call). (B. Alonso) • Participation as an expert in the candidate evaluation panel of the scholarship program of "la Caixa" Banking Foundation to undertake doctoral theses in Spanish centers (call 2018). (B. Alonso). • Participation as a Member of the Advisory Board in the contest "Viraliza una científico" organized by the Tatiana Pérez de Guzmán Foundation and the Royal Academy of Sciences of Madrid (http://viraliza.fundaciontatianapgb.org/consejo-asesor/). (B. Alonso).

OCEAN AND LITTORAL SEDIMENTARY PROCESSES

Head of Group	Albert Palanques
Group Components	**PERMANENT RESEARCHERS** Albert Palanques (Research Professor) Jorge Guillén (Scientific Researcher) Pere Puig (Scientific Researcher) Gonzalo Simarro (Titular Scientist) Enrique Isla (Scientist) **Ph.D. STUDENTS** Marta Arjona-Camas **ENGINEERS/TECHNICIANS** Ruth Durán Gallego (Contracted)



Key Words	Sediment dynamics and fluxes, bottom morphology, sedimentary trace metal pollution, particulate carbon, time-series, high energy events, multiple stressors, marine environment, coastal evolution, submarine canyons, benthopelagic coupling,

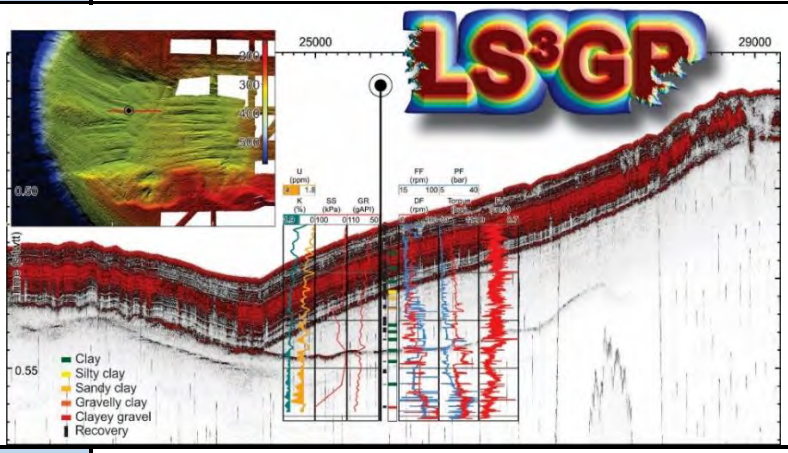
We are a multidisciplinary group devoted to investigate the processes that govern the dynamics of Recent and present marine sedimentary systems from observational and modeling techniques. We study the causes and effects of natural sedimentary processes in a multidisciplinary approach, investigating the interactions they have with the dynamics of biological, geochemical and physical processes. We analyze their effects on the ecosystem, their interactions with human activities and their implications for environmental management. We also analyze the environmental impact of human activities on sedimentary systems and their consequences for society. The main themes of our current research are the morphodynamic evolution and the erosion, transport and record of sedimentary material in relation to the current dynamic processes, anthropogenic activities and their recent evolution as a reference to help improve the knowledge of global changes.

Most relevant publications during this period of time	• Paradis, S.Puig, P.Masqué, P.Juan-Diáz, X.Martín, J.Palanques, A. 2017. Bottom-trawling along submarine canyons impacts deep sedimentary regimes. Scientific Records, 7. Grinyó, J. • Isla, E.; Peral, L.; Gili, J.M. 2017. Composition and temporal variability of particle fluxes in an insular canyon of the northwestern Mediterranean Sea. Progress and Oceanography, 159, 323 • Palanques, A., Lopez, L., Guillén, J., Puig, P.,Masqué, P. 2017. Decline of trace metal pollution in the bottom sediments of the Barcelona City continental shelf (NW Mediterranean). Science of Total Environment, 579: 755 • Quirós-Collazos, L., Pedrosa-Pàmies, R., Sanchez-Vidal, A., Guillén, J., Duran, R., Cabelloa, P. 2017. Distribution and sources of organic matter in size-fractionated nearshore sediments off the Barcelona city (NW Mediterranean) Estuarine, Coastal and Shelf Science, 189: 267. Fernandez-Arcaya, U. • Ramirez-Llodra, E., Aguzzi, J., Allcock, L., Davies, J.S., Dissanayake, A., Harris, P., Howell, K., Huvenne, V.A.I., Macmillan-Lawler, M., Martín, J., Menot, L., Nizinski, M.. Puig, P., Rowden, A.A., Sanchez, F.Van den Beld, I.M.J., 2017. • Ecological Role of Submarine Canyons and Need for Canyon Conservation: A Review. Frontiers in Marine Sciences, 4: 5 • Isla, E, Pérez-Albaladejo, E. Porte, C..2018 Toxic anthropogenic signature in Antarctic continental shelf and deep sea sediments. Scientific Reports, vol 8.9154 • C. De Leo, F., Puig, P. 2018. Bridging the gap between the shallow and deep oceans: The key role of submarine canyons. Progress in Oceanography, 169: 1-5 • Albert Palanques, Pere Puig. 2018. Particle fluxes induced by benthic storms during the 2012 dense shelf water cascading and open sea convection period in the northwestern Mediterranean basin. Marine Geology, 406: 119-131 • Paradis, S.;Masqué, P.,Puig, P., Juan-Díaz, X., Gorelli, G., Company, J.B., Palanques, A. 2018. Enhancement of sedimentation rates in the Foix Canyon after the renewal of trawling fleets in the early XXIst century. Deep-Sea Research Part I: Oceanographic Research Papers, 132: 51-59

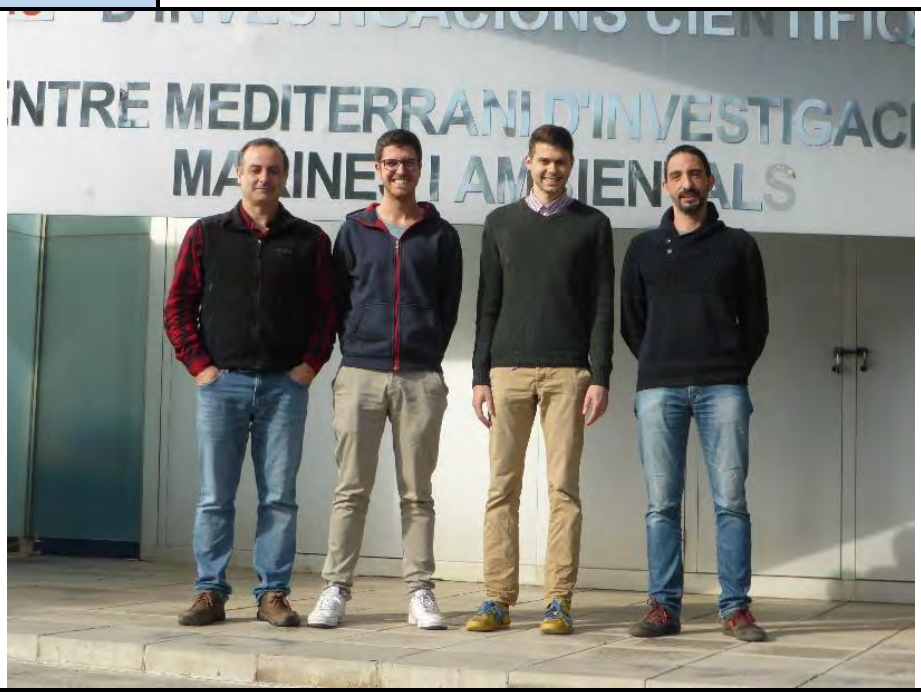
	• Ribó, M., Durán, R., Puig, P., Van Rooij, D., Guillén, J., Masqué, P. 2018. Large sediment waves over the Gulf of Roses upper continental slope (NW Mediterranean). Marine Geology, 399: 84-96
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • BLUEMED. European Commission Horizon 2020, 01/10/2016 – 30/09/2020. (85.428). PI ICM Albert Palanques **SPANISH/CATALAN** • Morfodinamica costera: modelizacion de los procesos intra-ola. Ministerio de Economia y Competitividad. 1/1/2016 – 31/12/2019 (97.163€). Co-PI: Gonzalo Simarro. • Grup de Processos Litorals i Oceànics. Generalitat de Catalunya. 01/01/2014 – 30/04/2017. (23.000). PI. Albert Palanques. • Valoración de los impactos de la pesca de arrastre en los sedimentos marinos profundos. Ministerio de Economia y Competitividad. 1/1/2016 – 31/12/2018 (235.290€). PI: Pere Puig.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	• Manteniment i gestió del sistema de monitoratge i el procesament de imatges, Parcs I Jardins De Barcelona. 15/10/2015 – 15/10/2018. 65.345€. PI Jorge Guillén. 1, 1. • Análisis de metales pesados en muestras de sedimentos marinos. Institut Catala De Recerca De L'Aigua. 01/12/2017 – 31/05/2018. 26.562€. PI: Albert Palanques. 1,1.
Master's theses defended during this period of time	• Anaïs Mollier. Sediment budget on an urban embayed beach under different erosion protection structures: La Barceloneta beach (Catalonia, NW Mediterranean), Universite De La Rochelle, 20/06/2017. Ruth Durán
Other relevant contributions	• Time Series of Hydrochange. Catalán continental rise. Currents, temperature, salinity, turbidity. • Time Series of the Coastal Ocean Observatory, Barcelona, Castelldefels, Vilanova I la Geltrú. Video monitoring, temperature, salinity, currents, turbidity, water samples, sediment samples, sediment grain size, nutrients, chlorophyll. • Oceanographic chuises: Abides1, Abides, 2, Abides ROV, Abides 3. Chief SAcientist: Pere Puig

LABORATORY OF SEAFLOOR AND SUBSEAFLOOR GEOLOGICAL PROCESSES

Head of Group	Roger Urgeles



Group Components	**PERMANENT RESEARCHERS** Roger Urgeles (Scientist) **Ph.D. STUDENTS** Davide Mencaroni (Marie Curie) **M.Sc STUDENTS** Gaia Travan (MSc Degree practicum) **EXTERNAL VISITORS** Antonietta Meleddu Mauro Agate



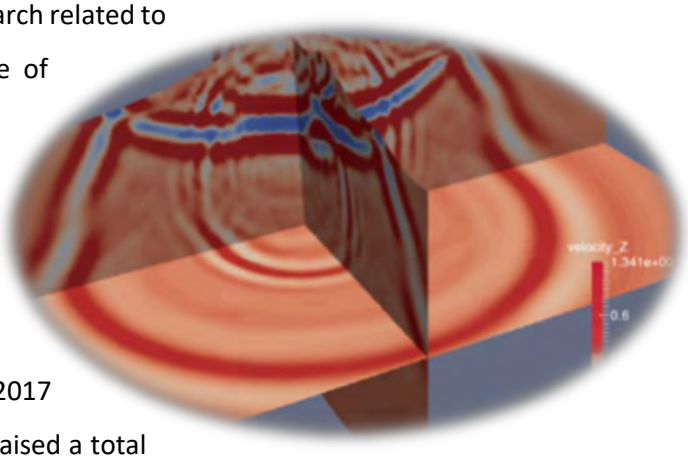
Key Words	Offshore geohazards, submarine landslides, faulting, tsunami, risk, pore pressure, seafloor, continental margins, stratigraphy, subsurface, physical properties, seismic methods, in-situ measurements, soil mechanics, numerical methods, sedimentology, geomorphology, hydrogeology, glaciology, geotechnics
We carry out multidisciplinary research aimed at gaining a holistic understanding of all contemporary physical processes that occur at or beneath the seafloor, including the anthropic influence on these processes, and those that occurred in the geological past. Our research addresses applied and fundamental aspects related to offshore geohazards such as submarine landslides, faulting and tsunamis derived from both processes, continental margin hydrogeology, glacial geomorphology and sedimentology as well as continental margin stratigraphic architecture. These topics cover the disciplines and tools of geology, geophysics, soil mechanics and hydrogeology. The LS3GP has ample experience in 1) marine field data acquisition, 2) laboratory and numerical methods and 3) data interpretation.	
Most relevant publications during this period of time	• Mauffrey, M.A., Urgeles R., Berné, S., Canning, J. (2017): The role of fluvial connections in the Plio-Quaternary development of submarine canyons revealed by 3D seismic data: the Ebro Margin, NW Mediterranean. Quaternary Science Reviews, 158: 77-93. http://dx.doi.org/10.1016/j.quascirev.2017.01.006 • Cameselle, A.L., Urgeles, R. (2017): Large-scale margin collapse during Messinian early sealevel drawdown: The SW Valencia Trough, NW Mediterranean. Basin Research, 29: 576–595. http://dx.doi.org/10.1111/bre.12170 • Horozal, S., Bahk, J.J., Urgeles, R., Kim, G.Y., Cukur, D., Kim, S.P., Lee, G.H., Lee, S.H., Ryu, B.J., Kim, J.H. (2017): Mapping gas hydrate and fluid flow indicators and modeling gas hydrate stability zone (GHSZ) in the Ulleung Basin, East (Japan) Sea: Potential linkage between the occurrence of mass failures and gas hydrate dissociation. Marine and Petroleum Geology, 80: 171-191. http://dx.doi.org/10.1016/j.marpetgeo.2016.12.001 • Madrussani, G., Rossi, G., Rebesco, M., Picotti, S., Urgeles, R., Llopart, J. (2018): Sediment properties in submarine mass-transport deposits using seismic and rock-physics off NW Barents Sea. Marine Geology, 402:264-278. • Sastre, S.Llopart, J.Puig Ventosa, I. (2018): Mind the gap: A model for the EU recycling target applied to the Spanish regions, Waste Management, 79: 415-427. • Urgeles, R., de Mol, B., Camerlenghi, A., Canning, J. (2018): 4. Ebro Margin, In Lofi et al. (Eds.): Seismic Atlas of the Messinian Salinity Crisis Markers, Vol. 2, Commission de la Carte Géologique du Monde et Mémoirs de la Société Géologique de France, pp. 17-18

	• Camerlenghi, A., Wardell, N., Mocnick, A., Del Ben, A., Urgeles, R. (2018): 2. Algero-Balearic Basin, In Lofi et al. (Eds.): Seismic Atlas of the Messinian Salinity Crisis Markers, Vol. 2, Commission de la Carte Géologique du Monde et Mémoirs de la Société Géologique de France, pp. 11-14. • Horozal, S., Bahk, J.-J., Lee, S.H., Cukur, D., Urgeles, R., Kim, G.Y., Kim, S.-P., Ryu, B.J., Kim, J.-H. (2018): Mass-wasting processes along the margins of the Ulleung Basin, East Sea: insights from multichannel seismic reflection and multibeam echosounder data, In Lintern, D.G., Mosher, D.C., Moscardelli, L.G., Bobrowsky, P.T., Campbell, C., Chaytor, J.D., Clague, J.J., Georgiopoulou, A., Lajeunesse, P., Normandeau, A., Piper, D.J.W., Scherwath, M., Stacey, C., Turmel, D. (Eds.): Subaqueous Mass Movements and Their Consequences: Assessing Geohazards, Environmental Implications and Economic Significance of Subaqueous Landslides, Geological Society, London, Special Publications, 477, pp. .
Most relevant projects funded by public agencies during this period of time	**EU/INTERNATIONAL** • SLATE: Submarine landslides and Their impact on European continental margins, MSCA-ITN-2016 - Innovative Training Networks, 01/04/2017-31/03/2021, European Commission Horizon 2020, 3.894.543,36€ (12.7% ICM), PI: Katrin Huhn (MARUM, Bremen); Local person in Charge: Roger Urgeles • MEDSALT: Uncovering the Mediterranean salt giant. COST Actions, COST Association, 30/10/2015-21/03/2020 IP: Angelo Camerlenghi (OGS, Trieste) **SPANISH/CATALAN** • INSIGHT: ImagiNg large SeismogenIc and tsunamiGenic structures of the Gulf of Cadiz with ultra-High resolution Technologies. Ministerio de Economia y Competitividad. 1/1/2016 – 31/12/2018, 245.630,00 € (100% ICM). PI: Roger Urgeles.
Most relevant projects of technology and/or knowledge transfer with private companies and institutions during this period of time	• Faulting, landslides and subsequent tsunamis in the Ulleung Basin. Korea Institute of Geosciences and Mineral Resources. 12/07/2018 - 31/12/2019, 78.306,77 € (100% ICM). PI: Roger Urgeles.
Master's theses defended during this period of time	• Gaia Travan, Study of the Messinian salinity crisis through the interpretation of seismic data from the Catalan margin to the

	Sardinian margin, Università degli Studi di Trieste, 13/12/2017, Supervisors: Anna Del Ben (University of Trieste), Roger Urgeles • Yolanda de Pro, Tectònica recent a l'offshore sicilià i processos associats d'escapament de fluid i d'esllavissaments submarins, Universitat de Barcelona, 23/10/2018, Supervisor: Roger Urgeles, Claudio Lo Iacono (NOCS)
Highlights	• Roger Urgeles is chief editor of the journal "Marine Geophysical Research" • Roger Urgeles manages ICM's Geotechnical laboratory

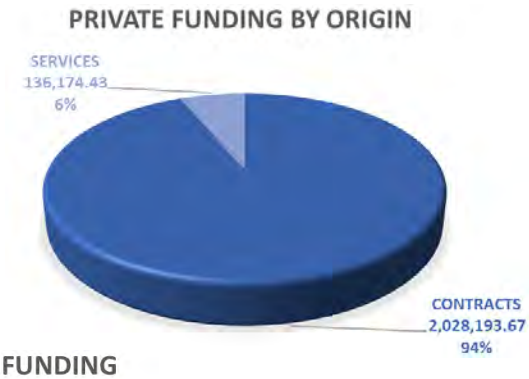
CHAPTER 3 — TECHNOLOGY AND KNOWLEDGE TRANSFER

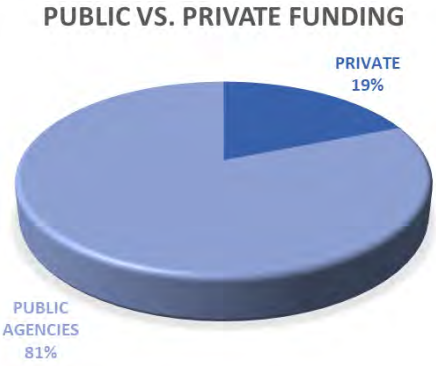
TECHNOLOGY AND KNOWLEDGE TRANSFER



In addition to conducting frontier research related to our three challenges, a key objective of ICM's strategic plan is fostering the transfer of knowledge and technology to the private sector, administration, and society as a whole through the development of applied research projects. Thus, in 2017 and 2018, ICM research groups have raised a total of **2.16 M€** through contracts of technological and knowledge transfer with private companies and administration, which represents nearly **20% of the research funds** raised in this period of time. These projects allowed **hiring 74 people*** (which is **one third of the temporary contracts** within ICM research groups) in addition to filing **one European patent**.

ICM's technology transfer in figures





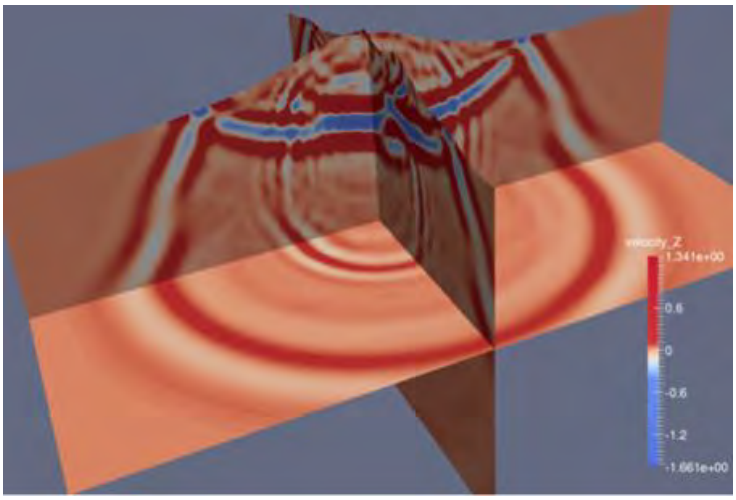
**data from 2017*

Some of ICM's sponsors

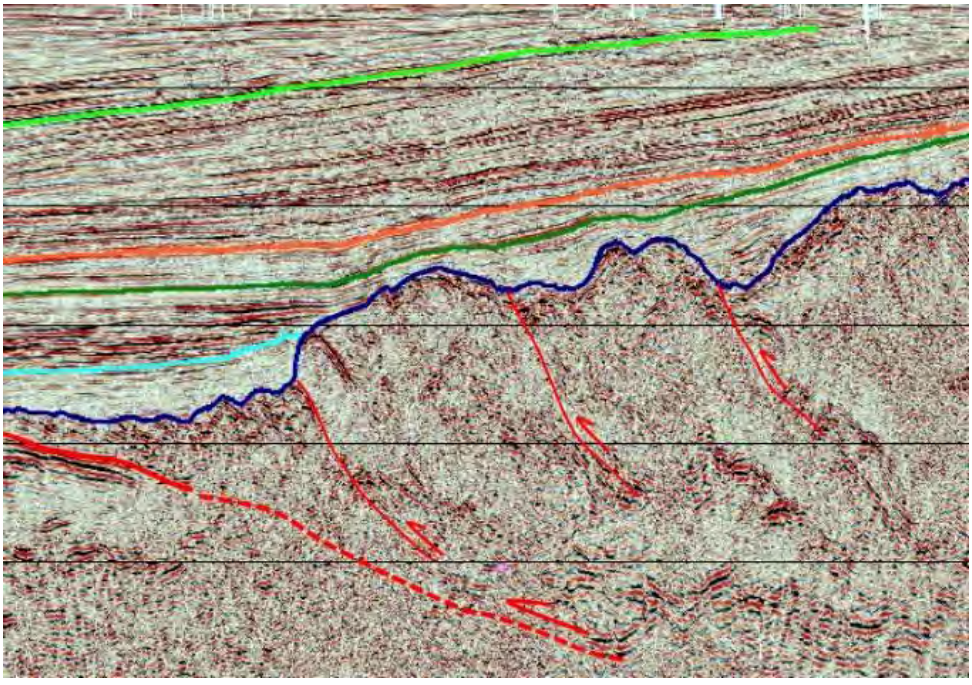
In the sections below, you can have a look at some of the most relevant individual technology transfer projects/contracts developed at ICM and funded by these companies and institutions.

SOUND-1
(SEISMIC MODELLING USING NATURAL SOURCE DATA, PART 1)

Group	Barcelona CSI Center for Subsurface Imaging
P.I.	Coordinator: C.R. Ranero, PIs: V. Sallarès, A. Villaseñor
Funding company	REPSOL, S.A.
Dates	18/12/2017–31/03/2019
Funding	392,040 €
Description	The SOUND-1 (Seismic mOdelling Using Natural source Data, part 1) project objective is to develop a specific methodology to obtain 1) 3D models of the physical properties (Vp, Vs, anisotropy…) and structure of the subsurface (including the geometry and location of geological structures), and 2) the location and focal parameters of local earthquakes and micro-earthquakes, using the event waveforms recorded by seismological networks. To achieve these goals the project develops two strategies. A first strategy uses earthquake travel time information from the seismological network (i.e., one or few points from each seismogram) to obtain physical property models of middle resolution and a first estimation of the location and focal mechanism. A second approach uses that information as an initial model and will refine the physical property models, locations and focal mechanisms thereby exploiting the full waveform or some of its characteristic attributes.

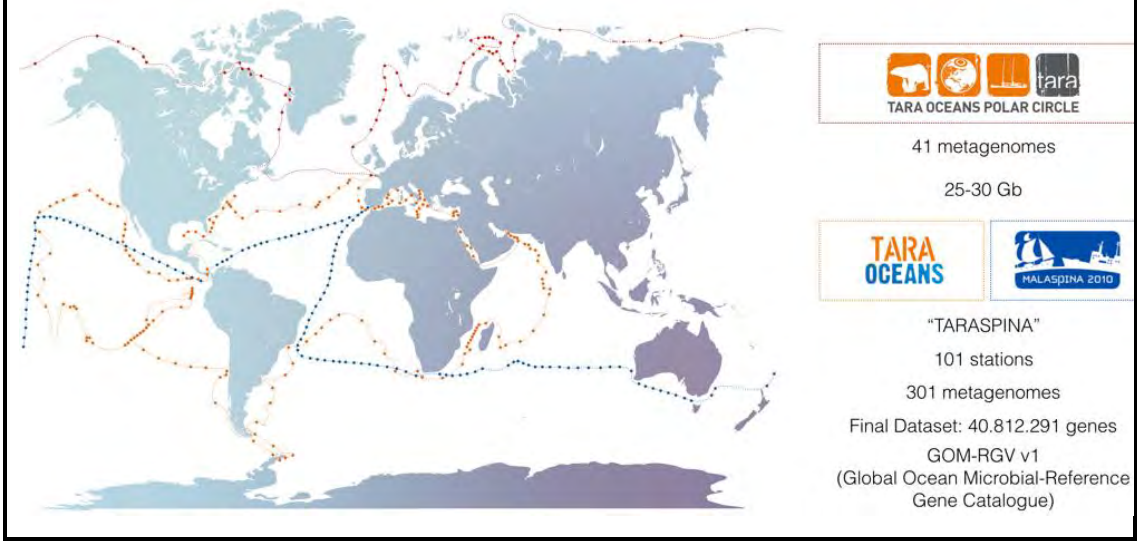


GEOMARGEN-4		
Group	Barcelona CSI Center for Subsurface Imaging	
P.I.	César R. Ranero	
Funding company	NATURGY	Naturgy
Dates	01/09/2017–31/08/2019	
Funding	145,200 €	
Description	This project aims to determine the tectonic structure of the Gulf of Cádiz and Guadalquivir Basin and to define which of the tectonic faults are currently active. The ultimate goal is to define which faults might potentially represent a significant natural hazard for the region. The interest of the project is that the region is tectonically very complex and historically has had great seismic events like the Lisbon Earthquake that caused vast devastation and an enormous number of casualties in the SW Iberian Peninsula, but the causative structure is not yet known. Using the largest-ever seismic database provided by industry and our own seismic data we will map and analyze all major tectonic structures in the region extending from onshore SW Spain to offshore NW Morocco. We will characterize the geometry, dimensions, fault offset, and potentially the slip rate of faults that might potentially cause large-great earthquakes	



GLOBAL OCEAN GENOME

Group	Ecology of Marine Microbes	
P.I.	Silvia González Acinas	
Funding company and logo	KAUST	King Abdullah University of Science and Technology
Dates	15/04/2017–15/10/2018	
Funding	174,807.00€	
Description	The dark ocean is the largest habitat in the biosphere, comprising 1.3 x 1018 m^3 and it is characterized by the absence of sufficient light to support photosynthesis. This realm differs from the epipelagic ocean by higher pressure and inorganic nutrient concentrations, and lower temperature, and no light. The water column >200 m deep contains the largest pool of microbes in aquatic systems and the bathypelagic ocean (>1000 m) is largely unexplored. This project aims at delivering key datasets on the genomic structure of deep sea microbes, involving sequencing of metagenomes and single-cell genomes across a range of deep sea microorganisms ranging from prokaryotes to eukaryotes. To do this we will generate additional genomic datasets to better cover the global deep ocean from the global samples collected from the Malaspina Expedition This project would expand current efforts already done by Tara Oceans Expedition mostly associated with the photic ocean to build the Global Ocean Microbial Gene Catalogue with the final goal to analyze the genetic potential of marine microbial communities from the deep ocean.	



SPELMED (EVALUATION OF THE POPULATION STATUS AND SPECIFIC MANAGEMENT ALTERNATIVES FOR THE SMALL PELAGIC FISH STOCKS IN THE NORTH-WESTERN MEDITERRANEAN SEA)

Group	FUNCTIONING AND VULNERABILITY OF MARINE ECOSYSTEMS	
P.I.	Marta Coll (ICM) and José María Bellido (IEO)	
Funding company	EASME/EMFF	SPELMED
Dates	01/01/2018–31/12/2018	
Funding	149,034 €	
Description	The small pelagic fish (SPF) species in the Mediterranean Sea, such as Sardina pilchardus (European sardine), Engraulis encrasicolus (European anchovy), Sardinella aurita (Round sardinella) and Sprattus sprattus (European sprat), are key elements of the marine ecosystem and are an important bulk of total landings. Fluctuations of SPF populations in the Mediterranean Sea have been linked with environmental fluctuations and change. Causes of recent declines of SPF have been related to high fishing impact, competition between pelagic organisms or ecosystem effects. Due to the important biomass, production, and key trophic links, SPF in the Mediterranean Sea can impact the dynamics of the entire ecosystem, and declining populations can have ultimate consequences for the bulk of commercial catches and economic profit. Despite their importance, available biological, ecological and management information is fragmented. Further work is needed to integrate available historical information regarding key aspects of SPF and to develop a robust knowledge to guide the management of these species in the Western Mediterranean Sea. The management of target species can have impacts on other species coexisting in the same exploitation area. Interactions at the ecosystem level shall thus be taken into account when defining management measures. The ultimate objective of the study is the evaluation of the population status of Sardina pilchardus (European sardine) and Engraulis encrasicolus (European anchovy) in the northwestern Mediterranean Sea, based on the generation of key biological and ecological information to support robust management options in the area. The study has three specific objectives: 1. Revision of biological information for both stocks 2. Revision of the ecological and fisheries information 3. Proposal and assessment of fisheries management measures The study will cover the Geographical Sub-Areas (GSAs) 6 – Northern Spain and 7 – Gulf of Lions, and will be focused on Sardina pilchardus (European sardine)	

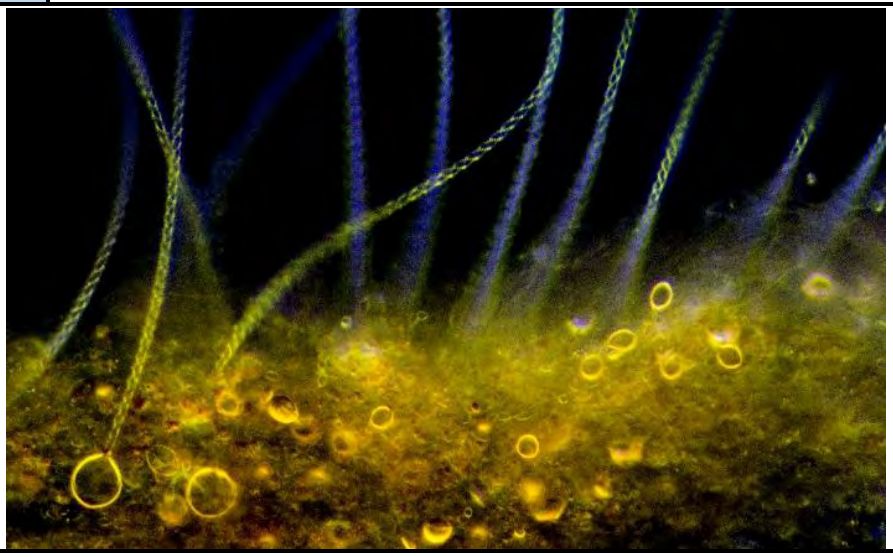
	and Engraulis encrasicolus (European anchovy) stocks, without forgetting the marine ecosystem and the mixed-fisheries interactions, in these areas. For this purpose, existing and new information should be collected regarding the small pelagic in the Gulf of Lion and the North of Spain (GSAs 6 and 7) and their fisheries, emphasizing the information at the sub-regional level within GSA areas. When possible, information from other Mediterranean areas will be collected during the first two objectives. A large part of the first objective of this project includes a phylogenetic analysis of these two species in GSA6 and GSA7.

IMPLEMENTATION OF GENOMIC, MORPHOMETRIC AND EPIGENETIC TOOLS TO IMPROVE BASS CULTIVATION (DICENTRACHUS LABRAX L) IN THE PLANT OF ABSA, S.A

Group	GROUP OF BIOLOGY OF REPRODUCTION	
P.I.	Francesc Piferrer	
Funding company	Culmarex, S.A.	grupo culmarex
Dates	01/01/2017–31/12/2019	
Funding	175,638 €	
Description	Pioneering research at the GBR on the involvement of epigenetics in the integration of genomic and environmental information led to the identification, with the aid of artificial intelligence, of molecular epigenetic biomarkers capable of predicting sex in fish. This is the first time that epigenetic markers are used to predict sex in any animal. The results of this research were published in the journal Epigenetics: Anastasiadi D, Vandeputte M, Sánchez-Baizán N, Allal F, Piferrer F., 2018. Dynamic epimarks in sex-related genes predict gonad phenotype in seabass, a fish with a mixed genetic and environmental sex determination. Epigenetics, 13 (9): 988-1011. This paper received considerable media attention in Spain and abroad and has been the basis for a project for technology transfer in close cooperation with one of largest aquaculture companies in Spain, Culmarex, S.A. Additionally, it has led to the filing of the European Patent no. EP 18382646: Method for predicting sex in fish. Filed on 09/07/2018.	

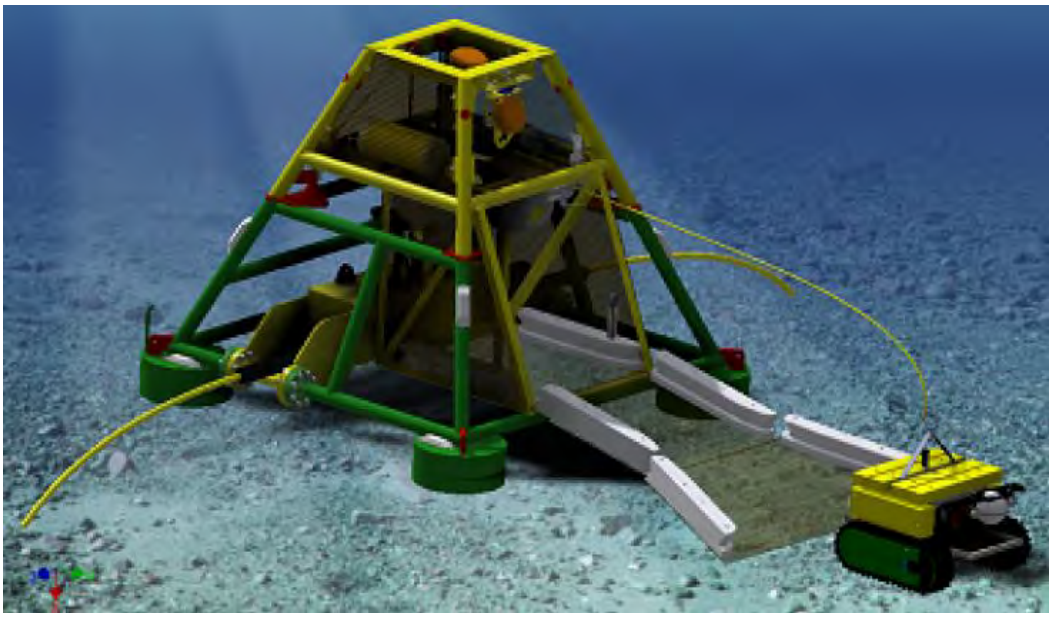
TECHNICAL SUPPORT CONTRACT BETWEEN CSIC AND ISDIN

Group	COLENTERATE ECOLOGY
P.I.	Josep Maria Gili
Funding company	ISDIN, S.A.
Dates	17/01/2018–05/01/2019
Funding	105,337 €
Description	Development of an effective product for the inhibition of the discharge of the stinging cells of Mediterranean jellyfish species. The aim of the project with the company ISDIN is to test the effectiveness of different chemical and physical components associated with sun creams on the prevention of jellyfish stings. The target species is Pelagia noctiluca which is the causative species of more than 60% of the incidences of beaches. But the ultimate goal is to develop a product that inhibits the functioning of the stinging cells of jellyfish and prevents the discharge of the poison. We are working on a product that acts naturally on the cnidocyte's activity, which allows to visualize its effectiveness on human skin, which can quantify skin reactions to the effect of the poison and that allows quantifiable trials. The methodologies known as Tentacle Blood Skin Agarose Assay are used, which is a novel technique that allows to evaluate the hemolytic activity of the jellyfish venom. The tests were started with sheep's blood and with tissue from the small intestine of the pig and later trials on human skin, with patients and volunteers in collaboration with the Hospital Clínic de Barcelona. The final product will be a sunscreen whose components not only prevent the stings of jellyfish but also inhibit the activity of stinging cells.



AUTONOMOUS ROBOTIC SEAFLOOR INFRASTRUCTURE FOR BENTHOPELAGIC MOTORIZATION

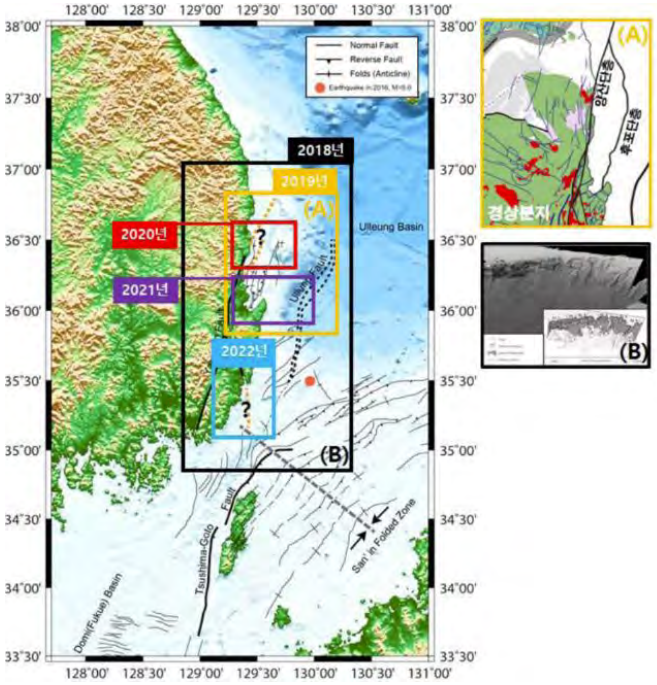
Group	FUNCTIONING AND VULNERABILITY OF MARINE ECOSYSTEMS	
P.I.	Jacopo Aguzzi, Joan Batista Company	
Funding company	DEUSTO SISTEMAS, SA	Deusto Sistemas
Dates	01/06/2018-30/11/2020	
Funding	90,750 €	
Description	The aim is to establish a science-based infrastructure for continuous online monitoring of the ocean interior including benthic, pelagic, and the demersal habitats. Merging cable-based observation technologies, mobile robotic seafloor technologies and image processing and modelling methods into one operational autonomous product will renew monitoring and support the assessment of human impact in the marine environment. Compared to today's ship-based systems, this new technology will drastically reduce monitoring costs associated to offshore and coastal industries. ARIM is funded by the MarTERA partners Research Council of Norway (RCN), German Federal Ministry of Economic Affairs and Energy (BMWi) and Spanish Centre for the Development of Industrial Technology (CDTI) and co-funded by the European Union. IMC-CSIC appears as sub-contract of DESUTO Spanish enterprise, involved in the development of Artificial Intelligence routines at animals tracking and classification.	



EMODNET-HRSM		
Group	Barcelona CSI Center for Subsurface Imaging	
P.I.	Eulàlia Gràcia	
Funding company	EMODNET	EMODnet European Marine Observation and Data Network
Dates	01/06/2016-01/06/2018	
Funding	100,015 €	
Description	The objective of EMODNET-HRSM (High Resolution Seabed Mapping) is to create and maintain an operational service that provides free and open access to digital maps of the seabed topography and coastline of European seas at the highest resolution possible and to the survey data underlying them. Its aim is to bring together bathymetric surveys of European seas and to produce, publish, and serve an harmonised and high resolution Digital Terrain Model of all European seas of the seabed topography, publishing a standard European coastline and baseline data, maintaining the EMODnetBathymetryweb portal allowing easy access to the data and data products, supporting interoperability (INSPIRE) and with organisations from outside the EU providing user and machine-to-machine services.	

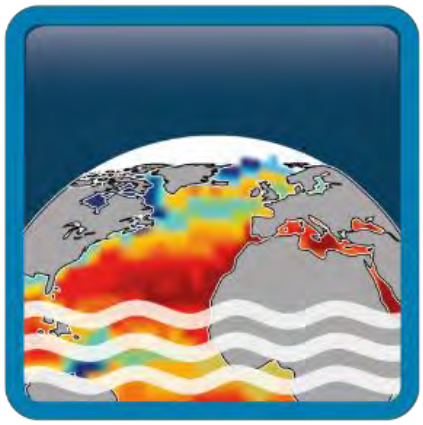
FAULTING, LANDSLIDES AND SUBSEQUENT TSUNAMIS IN THE ULLEUNG BASIN

Group	LABORATORY OF SEAFLOOR AND SUBSEAFLOOR GEOLOGICAL PROCESSES (LS3GP)	
P.I.	Roger Urgelés	
Funding company and logo	Korea Institute of Geosciences and Mineral Resources	KIGAM Korea Institute of Geoscience and Mineral Resources
Dates	12/07/2018 - 31/12/2019 (to be annually renewed until 2022)	
Funding	78,306.77 € (expected budget at end of project in 2022, ~240,000 €)	
Description	KIGAM and CSIC collaborate in the frame of this project to characterize the geological processes at the origin of geohazards in the Korean side of the East Sea and determine how big, how often and where those hazardous phenomena will occur. The project involves mapping faults and submarine landslides, determining the fault and submarine landslide characteristics that control the magnitude of hazardous events, modeling slope instability, landslide dynamics and tsunami generation and generating hazard curves by stochastic analysis of submarine landslide data. The project will deliver data for policy development and the establishment of safety measures linked to offshore geohazards and contribute to minimize Korea's economic losses from these events.	



CCI + SSS
(CLIMATE CHANGE INITIATIVE: SEA SURFACE SALINITY)

Group	PHYSICAL AND TECHNOLOGICAL OCEANOGRAPHY	
P.I.	Antonio M. Turiel	
Funding company	ARGANS LTD. (European Space Agency)	ARGANS esa
Dates	09/08/2018–09/08/2021	
Funding	57,544 € for ICM (Total 1.5 M€)	
Description	The Climate Change Initiative Extension (CCI+) is a European Space Agency (ESA) program aiming to provide a stable series of Essential Climate Variables (ECV). ECVs are physical, chemical or biological variables that critically contribute to the characterization of Earth's climate, according to the GCOS criteria. The CCI+ Program is the response by ESA to the request by United Nations Panel on Climate Change. CCI+ SSS has the commitment to provide stable Climate Data Records (CDR) of Sea Surface Salinity starting from the data provided by different remote sensing platforms, complemented by in situ data when available. The goal of the project is to demonstrate the potential of SSS CDRs for climate studies, both directly and through derived variables; and to grant the continuous production of such variables.	



salinity cci

CHAPTER 4 — INFRASTRUCTURE AND SERVICES

INFRASTRUCTURE AND SERVICES

The goal of ICM's **Infrastructure and Services** is to provide specialized facilities with high quality standards to satisfy the needs of research projects and to cover the demands of external public institutions and private companies. ICM's equipment is regularly upgraded to maintain competitiveness and is operated by specialized and highly qualified technical staff. The facilities and services at ICM include singular large **infrastructures** used by numerous ICM research groups, and more specialized **services** that cover some particular group demands.

ICM's infrastructures and services can be divided into the **following categories**:

INFRASTRUCTURE AND SERVICE LIST	
Infrastructures	• Aquaria and Experimental Chamber Facility, ZAE • Light and Electron Microscopy Facility • Research Computing and Data Science • Marine Bioinformatics
Reference Collections	• Biological Reference Collection • Marine Sediments and Seismic Profiles Collections
Field Sampling and Remote Sensing Services	• Observation and Sampling of Marine Environments • Environmental Marine Status Evaluation Service • Sampling and Identification of Exploited Marine Organisms • Assessment on Fisheries and Aquaculture Service • Barcelona Center for Subsurface Imaging (B-CSI) Laboratory • Barcelona Expert Center in Remote Sensing (BEC-RS)
Physico-chemical characterization of Water and Sediments	• The Marine Chemistry Laboratory • The Sedimentology, Geochemistry, and Geotechnical Analysis Service
Biological Characterization of Water	• Flow Cytometry Facility • Marine Activity and Production Service • Marine Molecular Biology
Marine Cultures	• The Marine Cultures Service
General Support	• The Oceanographic Engineering Service

INFRASTRUCTURE

AQUARIA AND EXPERIMENTAL CHAMBERS FACILITY

Person in charge: Mercedes Blázquez

Personnel	Elvira Martínez, Mercedes Blázquez

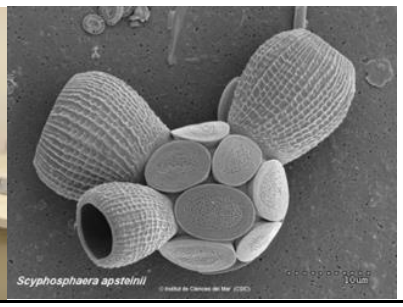
ZAE is one of the most modern facilities in the Mediterranean area. It is designed to hold different aquatic organisms and to facilitate research in several aspects of their biology. It occupies an area of more than 650 m^2 including a separate room with a collection tank and a series of filters that provide different quality waters. The water is obtained through a pipe 300 meters from the coast and at 10 m depth. The facility includes several designated areas with aquaria where different species with similar photoperiod conditions are kept. In addition, it holds eleven chambers devoted to the culture of species that require other specific experimental conditions. ZAE also includes a flume tank and several laboratories.

The facility is computer-controlled and monitored 24 hours a day by a system of sensors connected to alarms. A total of nine water regimes (related to temperature and salinity) can be supplied to more than 150 aquaria with capacities ranging from 15 to 5,000 liters. The environmental variables that can be controlled are light intensity, photoperiod, dissolved oxygen, and nutrients. Altogether, this makes it possible to simulate a wide range of aquatic habitats, from subpolar to tropical.

Technical resources and equipment	• 11 isothermal experimental chambers • Experimental aquariums from 10 to 5,000 liters
ICM Groups using the facility during this period of time	• Group of Biology of Reproduction • Marine biogeochemistry, atmosphere and climate • Coelenterate Ecology • Bioeconomic modelling of Fisheries • Biological oceanography: Planktonic ecology and biogeoch. cycles • Ecology and Genomics of Marine Microorganisms • Ecology of marine communities
Other groups or institutions using the facility during this period of time	• GEOMAR • UB • UAB • IRTA • ISDIN

LIGHT AND ELECTRON MICROSCOPY FACILITY

Person in charge: José Manuel Fortuño



Personnel	José Manuel Fortuño

The service provides fundamental tools for the observation and analysis of microorganisms or their microstructures. Advice and permanent technical support by the service staff facilitates the scientific tasks. The service is open to a wide scientific community, including ICM and other CSIC centers, public research organizations and private companies.

Calibration of the scanning electron microscopes is performed regularly. Calibration standards that are certified by the National Institute of Standards (NIST) of USA and the National Physical Laboratory (NPL) in the United Kingdom, which meet the ISO-9000, are available.

An annual review by the Hitachi official technical staff (ISO-9001) is performed to certify proper operation.

Technical resources and equipment	• Two Scanning Electron Microscopes: SEM HITACHI S-570, SEM HITACHI S-3500N, a variable pressure (VPSEM). Both instruments are equipped with backscattered and secondary electron detectors. • The VPSEM has an energy-dispersive X-ray spectrometer (BRUKER Quantas 200) for performing X-ray microanalysis and a cryo-SEM (QUORUM PP3000T) for studying cryofixed samples. • Critical Point Dryer, Sputter Coater and High Vacuum Evaporator. • The Service has 8 Optical microscopes, most equipped with epifluorescence, and 5 magnifiers. Some microscopes and magnifiers are connected to different image analysis systems.
ICM Groups using the facility during this period of time	• Biological Oceanography: Planktonic ecology and biogeochemical cycles • Littoral Biological Processes • Functioning and vulnerability of marine ecosystems • Ecology of Marine Communities
Other groups or institutions using the facility during this period of time	• Ribera, Institut de Biologia Evolutiva (CSIC) • J. Cama, Institut de Diagnosi Ambiental I Estudis de l'Aigua (CSIC) • P. Ruas Madiedo, Instituto de Productos Lácteos de Asturias (CSIC) • C. Rodríguez Abreu, Institut de Química Avançada de Catalunya (CSIC) • M. André, Laboratori d'Aplicacions Bioacústiques (UPC) J. Diogene, IRTA

RESEARCH COMPUTING AND DATA SCIENCE

Person in charge: Oscar Chic Giménez

Personnel	Sara Soto Alonso, Fernando Pérez López, Estrella Olmedo Casal, Justino Martínez González, Amália Manjabacas Soriano, José Antonio García Del Arco, Oscar Chic Giménez

Consulting and scientific computing services, high performance computation, advanced administration of calculation systems, massive data storage, scientific application development, cloud computing and virtualization services.

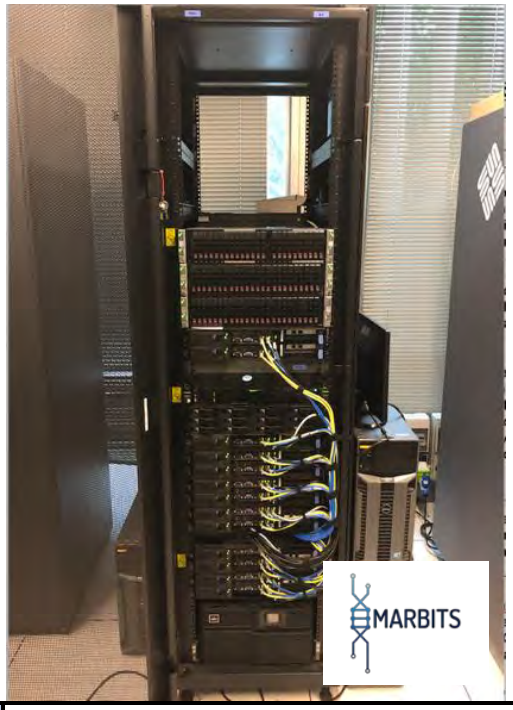
Development of applications for management, distribution, visualization, and quality control of data and metadata. Computer vision and data learning. GIS and cartography consulting and developing services.

Development and management of SDI (Spatial Data Infrastructures).

Technical resources and equipment	• 30 servers with 59 CPUs (Intel Xeon E5-2695, E5-2630, E5645, E5630, and AMD Opteron 2356) and 324 cores with 576 threads, and 1532 GB RAM • Compute nodes are connected by a 10 Gbps Ethernet high performance network with 280 nanosecond latency. • 11 servers dedicated to computing cluster with an integrated queue system. • Cluster runs a Rocks Cluster 6.1 (based in Linux RHEL/CentOS 6.3). • Hardware is updated regularly
ICM Groups using the facility during this period of time	• All ICM groups use this facility to a greater or lesser extent
Other groups or institutions using the facility during this period of time	• More than 500 external users are using this facility mostly through using data distribution of big projects as COPERNICUS, SMOS PI-MEP, ESA projects, ITERACTOMICS, MEFISTO, etc.

MARINE BIOINFORMATICS

Person in charge: Ramiro Logares



Personnel	Pablo Sánchez, Ramiro Logares

The Marine Bioinformatics Service works in its basic version by providing the its users with an account to grant access to the computer cluster. It gives users a hard disk storage quota, as well as a computational quota with associated RAM usage. The previous parameters are monitored to account the usage that they make of the infrastructure. The service manages those users, groups of users, and their associated permissions and installs and manages the third-party software and biological information databases necessary for their work. Additionally, a backup of user's data is provided, even though the user is still responsible for keeping an external backup copy.

In its advanced version, the service may also manage the sequencing data transmission from its source to the computer cluster, check for its integrity and store them. It also may carry out an integral analysis of sequencing data, from quality check and sequence cleaning to the assembly and annotation of genomes and metagenomes, or analyze the microbial diversity of environmental samples, among others.

If that is the case, the service offers users a basic instruction of the command line usage in UNIX computing environments, as well as for several applications on computational biology. It can also develop small pieces of custom software and bioinformatics pipelines.

Technical resources and equipment

- **Master/login node**

The master/login node is called Marbits. It is a Fujitsu Primergy RX2530 M2 server with 2 x Intel Xeon E5-2603v4, 2 x 240 GB SSD disks and 64GB RAM. It runs CentOS 7.4, a RedHat-based Linux distribution, with OpenHPC on top and Slurm as the job scheduler. The master node can only be accessed within the CMIMA local network. https://marbits.icm.csic.es

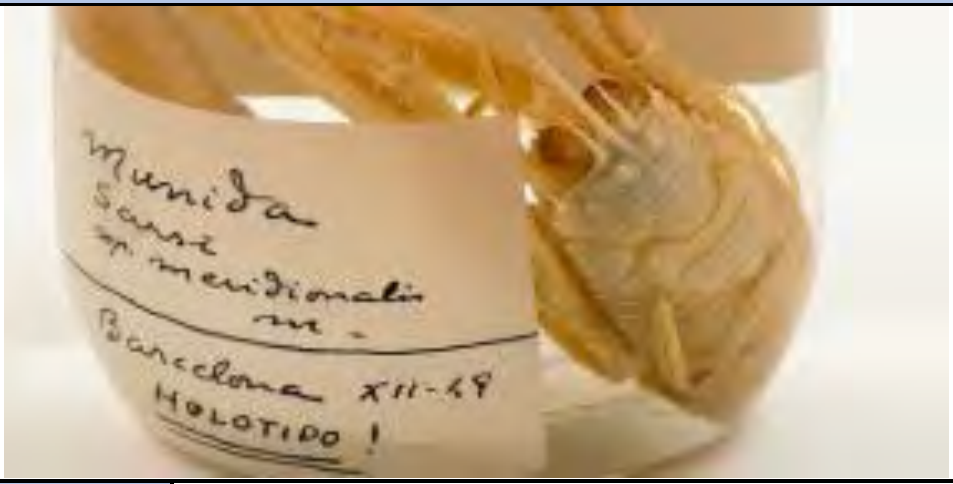
- **High-performance computing nodes**

	The 22 computing nodes are divided in 3 classes according to their configuration and brand: - **Storage** General data storage is managed by a parallel file system (Lustre) shared by other resources from CMIMA, with more than 450 TB of disk space. - **Network** All computing nodes are connected via a 1 Gbps SMC Network SMC8150L2 switch with 50 x 10/100/1000BASE-T ports. Communication with the Lustre file system is provided by a 10 Gbps Netgear XS748T switch. - **DELL workstations** Several applications needing X-Window forwarding can be carried out on the venerable DELL workstations. These are 3 DELL PowerEdge T710 servers with 2 x 4-core Intel Xeon E5620 processors, 16GB of RAM and 1 x 2TB hard drive. These servers can also be accessed only within the CMIMA network and need an independent user account.
ICM Groups using the facility during this period of time	• Ecology of Marine Microbes • Coastal Biological Processes • Marine Biodiversity Conservation • Plankton dynamics modelling • Mediterranean Oceanography Group
Other groups or institutions using the facility during this period of time	• IBV, University of Oslo, Norway • KAUST, Saudi Arabia • AZTI, Spain • University of California, USA • IEO, Spain • Finnish Environment Institute, Finland • University of Vigo, Spain

REFERENCE COLLECTIONS

BIOLOGICAL REFERENCE COLLECTION

Person in charge: Antoni Lombarte Carrera



Personnel	Antoni Lombarte, Pere Abelló, Javier Francisco Maynou, Montserrat Ramon, Ricardo Santos, Roger Villanueva

The Biological Reference Collections (CBR) were institutionalized in 1981. This service comprises more than 1,800 species of fishes, crustaceans, and cephalopods from all over the world, mainly from the Mediterranean Sea and Atlantic Ocean.

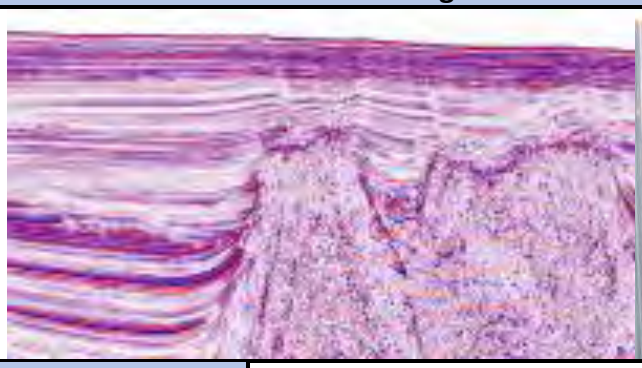
Facilities are provided to identify, perform research, catalogue, deposit, and preserve marine organisms collected during marine research studies. Nowadays, genetic analyses are widely used in population genetic and phylogeny studies and voucher specimens need to be deposited in reference biological collections. CBR acts therefore as a scientific marine reference facility.

There are more than 26,000 catalogued specimens, which are a reference for taxonomic, faunistic and phylogenetic studies for both the national and international scientific community. The database for most of these specimens is available online. The CBR actively participate in international platforms for biodiversity research such as GBIF (Global Biodiversity Information Facility).

Technical resources and equipment	• The collections are located in fireproof cupboards, on mobile shelves and other shelving racks in a room with ventilation and an air conditioning system. Almost all specimens are preserved in ethanol 70°. The CBR has laboratory facilities with material for research and for conservation tasks of the specimens: optical and photographic instruments, computer equipment, dissection material, laboratory equipment, store of containers and other materials. The specimens not yet ready for deposit are stored in freezers.
ICM Groups using the facility during this period of time	• Renewable Marine Resources Department

MARINE SEDIMENTS AND SEISMIC PROFILE COLLECTIONS

Persons in charge: Gemma Ercilla, Belén Alonso



Personnel	Belén Alonso, Gemma Ercilla, contracted person

The marine sediments and seismic profiles collections at the ICM-CSIC Cores comprise data collected from the 80s. They were collected in the Mediterranean Sea, Atlantic and Southern Ocean. The sediment cores are at cold chamber rooms, temperature (5°C) and constant humidity, and equipped with a temperature control alarm system. There is also an area for sediment and rock sample dry storage.

In addition to the repository rooms there are several instruments for conducting and/or assisting with analyses of sea sediment cores such as a core splitter, a magnetic susceptibility logger, X-radiograph, as well as a variety of microscopes, sieves, sampling tools and all traditional sediment lab supplies. The format of the seismic records are digital and hard copy.

Each of these resources has a description (or "metadata") attached to it. The collection metadata transforms a passive by-product to an active enabler offering greater efficiency, interoperability, and utility.

Technical resources and equipment	• Cold chamber rooms and workstation computer
ICM Groups using the facility during this period of time	• Continental Margin Group-GMC • Littoral and oceanic processes • Barcelona Subsurface Imaging Center
ICM Groups using the facility during this period of time	• Spanish Oceanographic Institute • Spanish Geological Survey • Vigo University • Centro de Estudios Avanzados de Blanes-CSIC

FIELD SAMPLING AND REMOTE SENSING

OBSERVATION AND SAMPLING OF MARINE ENVIRONMENTS

Person in charge: Jorge Guillén

Personnel	Oscar Chic, M.I. Colmenero, M. Emelianov, S. Soto

This service aims to obtain hydrodynamic and oceanographic parameters in the marine environment, either punctually or as time series, as well as sampling of water and sediment. Most of the services incorporate the use of oceanographic ships and coastal vessels. This service is closely coordinated with the Department of Instrumentation, Development and Innovation and Data Service, as well as other services associated with the processing of marine samples.

Technical resources and equipment	• Small boat • Current meters • CTD sensors (temperature-salinity) • Turbidity and fluorescence, video monitoring systems • All necessary equipment for hydrographic and bottom sediment sampling
ICM Groups using the facility during this period of time	• Geosciences • Biology and Oceanography • Physical Oceanography
ICM Groups using the facility during this period of time	• UPC • Ajuntament de Barcelona

ENVIRONMENTAL MARINE STATUS EVALUATION SERVICE

Person in charge: Magdalena Vila Reig

Personnel	Magdalena Vila Reig, Eva Flo Arcas

The Environmental Marine Status Evaluation Service offers the determination of water and benthic marine quality. Its determination comprises the following steps: 1) campaign planning, sampling, parameters and samples to monitor; 2) identification and analysis of different parameters (water clarity, dissolved oxygen, pH, alkalinity, pigments, organic matter, volatile organic compounds, and lipids); 3) census and identification of biological samples; 4) design and implementation of experimental approaches; 5) analysis of underwater images.

Technical resources and equipment	• Boats, diving equipment, remotely operated vehicles • CTD, SAIV, SD204, photography, and video-submarine equipment • Necessary accessories to perform sampling, measure parameters or perform analyses • Plankton nets • Two Turner Design fluorometers • Two spectrofluorometers (Perkin Elmer LS55 and Horiba Scientific—Aqualog) • Varian Cary UV spectrophotometer • Capillary column gas chromatograph with mass spectrometry detection, coupled to a purge and trap system • Packed column gas chromatograph with flame photometric detection, coupled to a purge and trap system • Sunlight simulator SUNTEST • Metrohm oxygen electrode • Light meters (Li-Cor) • PUV-2500 Biospherical Radiometer

SAMPLING AND IDENTIFICATION OF MARINE EXPLOITED ORGANISMS: PLANKTON, NEKTON AND BENTHOS

Person in charge: Ana Isabel Colmenero

Personnel	Ana Isabel Colmenero, Joan Baptista Company, Montserrat Demestre, M. Pilar Olivar, Ana Sabatés

The objective of this service is to sample exploited marine organisms that make up the communities of plankton, nekton, and benthos. Samples are collected onboard oceanographic and fishing vessels, with pelagic and benthic gears. Sample processing is done in the laboratory. This service is coordinated with the Fisheries and Aquaculture Advisory Service and with the Instrumentation, Development and Innovation Service and the Data Service. It is addressed to any public or private institutions that request advice on issues related to the sampling, identification and quantification of marine organisms. It includes the collection of samples in the field, subsequent tasks in the laboratory (separation and identification of organisms, analysis of data, diagnosis, conclusions and recommendations in relation to the object of the consultation) and the presentation of the results to the involved sectors.

Technical resources and equipment	• Microscopy lab • Wet dissection lab • The labs equipped with microscopes, weightings, and refrigerated camera and freezers
ICM Groups using the facility during this period of time	• Ecology of marine communities • Renewable marine resources • Bioeconomic fisheries modelling
ICM Groups using the facility during this period of time	• Private companies • Department of Fisheries of the Generalitat de Catalunya • Fishermen's Guilds

ASSESSMENT OF FISHERIES AND AQUACULTURE

Person in charge: Roger Villanueva

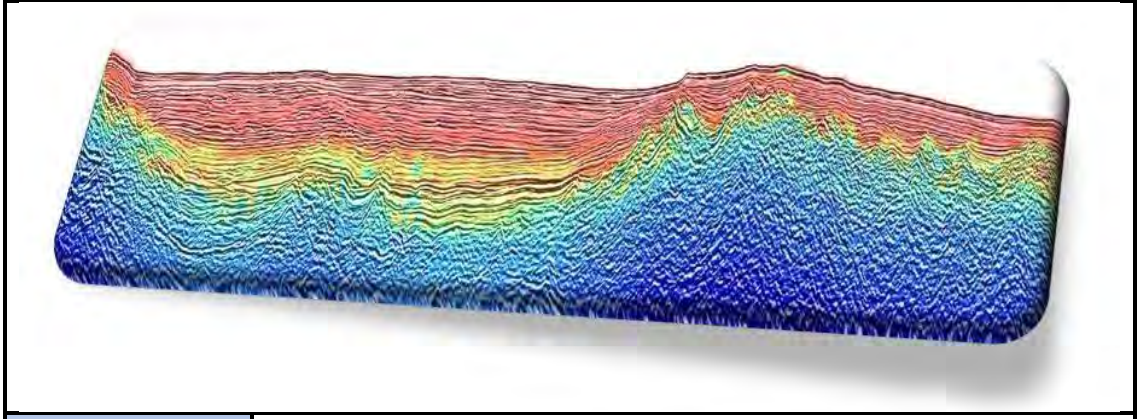
Personnel	Roger Villanueva, Paloma Martín, Montserrat Ramón, Laura Recasens, Francesc Piferrer

This service provides assessment for the sustainable management of renewable marine resources, including various aspects related to the assessment of marine fisheries and aquaculture. It provides expert R&D assistance to administrations responsible for fisheries and aquaculture, public entities, as well as professionals and private companies. It includes sampling, processing, and laboratory analysis of samples obtained by extractive methods, the implementation of fisheries management techniques and the evaluation of the impact of fishing on the ecosystem. It also provides assistance on issues related to broodstock management and production of marine species, particularly on different aspects of the biology and fish farming (mainly sea bass, turbot, and sole), molluscs (bivalves, gastropods, and cephalopods), and crustaceans.

Technical resources and equipment	• Microscopy lab • Cell and molecular biology lab • Wet dissection lab • The labs are equipped with microscopes, weightings, plus a refrigerated camera and freezers
ICM Groups using the facility during this period of time	• Ecology of Marine Communities • Renewable Marine Resources • Bioeconomic Fisheries Modelling • Group of Biology of Reproduction

BCSI GEOPHYSICAL LABORATORY

Person in charge: Rafael Bartolomé



Personnel	Rafael Bartolome, Alcinoe Calahorrano, Xavier Garcia, Estela Jiménez-Tejero, Adrià Meléndez, César Ranero, Valentí Sallarès, Arantza Ugalde

The Barcelona Center for Subsurface Imaging geophysical lab is a facility that develops and offers state of the art geophysical services on subsurface imaging and physical property models of the Earth's interior to researchers and industries.

The lab develops both experimental and theoretical projects of interest to the industrial sector and the scientific community. The projects use forefront Earth imaging techniques with access to modern resources together with highly qualified technical assistance for the demanding variety of applications required to study the subsurface.

A team of specialized physicists, geologists, computer and code-development experts offers a guided service and technical support for the design of acquisition surveys, quality control, analysis, method development, processing, modeling, and interpretation of geophysical and geological data.

Our research team performs continuous R&D on advanced imaging techniques at a variety of resolutions, with extensive experience in active and natural source seismic, and electromagnetic field recordings under diverse acquisition conditions. R&D integrates full-wave form inversion, travel-time tomography, earthquake analysis and marine seismic data processing and imaging.

The facility offers a 90 m^2 laboratory to internal and external users, equipped with workstations with front-end software for reading and analyzing the full spectrum of marine geophysical data and earthquake seismology data, and in-house software able to operate a step beyond the commercial state of the art in parallelized high-performance computing (HPC) environments.

Technical resources and equipment	• Internet servers and disc storage • A computing cluster with 22 of nodes and cores • In-house technology for Full Waveform Inversion and Travel Time Tomography • Earthquake seismology software, and both commercial and open-source processing and interpretation packages (Claritas, Promax, Kingdom Suite, and Seismic Unix), • In-house electromagnetic processing and galvanic decomposition software
ICM Groups using the facility during	• Barcelona Center for Subsurface Imaging

this period of time	
ICM Groups using the facility during this period of time	• National Oceanographic Center Southampton, UK • GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel, Germany • Key Laboratory of Marginal Sea Geology, South China Sea Institute of Oceanology, Chinese Academy of Sciences, China • Sofia Antipolis Technological Park, France • IRD-Géosciences Azur, France • University of Zagreb, Croatia. • Lisbon University, Portugal • Aveiro University. Portugal • University of Barcelona, Spain. • Woods Hole Oceanographic Institution, USA • University of Adelaide, Australia • Federal University of Rio Grande do Norte, Brazil

BARCELONA EXPERT CENTER FOR REMOTE SENSING (BEC-RS)

Person in charge: Carolina Gabarró

Personnel	Justino Martinez, Veronica Gonzalez, Estrella Olmedo, Jordi Isern, Joaquim Ballabrera, Marcos Portabella, Antonio Turiel, Emili Garcia, Oscar Chic, Sara Soto, Carolina Gabarro

The Barcelona Expert Centre Remote Sensing (BEC-RS) was born as a joint initiative of the Spanish research council (CSIC) and Universitat Politècnica de Catalunya (UPC) in the context of the Soil Moisture and Ocean Salinity (SMOS) mission of the European Space Agency (ESA).

Today, the main goal of BEC-RS is to provide a wide range of services related to remote sensing, including consulting, training, and developing, validating and distributing products. Other BEC-RS services include visualization of geophysical data, calibration and validation of data, to organize and to participate in training courses and meetings, and act as business incubators. Since 2006 BEC-RS is an ESA Expert Support Laboratory (ESL) for the SMOS mission.

BEC-RS is in the position of offering its expertise to develop remote sensing data processors at any stage of the processing chain, as well as appropriate tools for manipulation and visualization. The processors can be provided to the client as source code or as a service running at BEC-RS facilities.

Technical resources and equipment	• Parallel computational cluster with 128 nodes and 1024 cores with a 10 Gbps Ethernet net
ICM Groups using the facility during this period of time	• Physical and Technological Oceanography

PHYSICO-CHEMICAL CHARACTERIZATION

MARINE CHEMISTRY LABORATORY

Person in charge: Elisa Berdalet

Personnel	Maravillas Abad, Elisa Berdalet

The laboratory conducts analyses of the main chemical nutrient forms in water, with a particular specialization on marine samples with high precision at low detection limits. Routine analyses are conducted for the estimation of the concentration of inorganic nutrients (nitrate, nitrite, ammonia, phosphate, silicate), total nitrogen and phosphorus, total and dissolved organic carbon. In addition, the service is open to the scientific community to incorporate new analyses where possible. In all cases, direct communication with the users is fundamental to achieving the best results.

The service is open to both public and private institutions and offers working time flexibility to guarantee the analysis of fresh samples as soon as possible in accordance with the timings of scientific research. Support to oceanographic cruises and experiments is offered during their different phases, including advice on sampling procedures, manipulation, preservation and maintenance of samples. The service contributes to training (at different student levels) and outreach initiatives led by ICM in collaboration with different public institutions.

All the applied methods are official and approved, although there is no ENAC accreditation (ISO 17025) and AENOR (ISO 9001) certification for nutrient analyses. Care is taken to conduct routine calibrations for each analysis and analytical instruments and the laboratory participates in special inter-calibration exercises under international initiatives (e.g., Quasimeme, JAMSTEC, CSIRO).

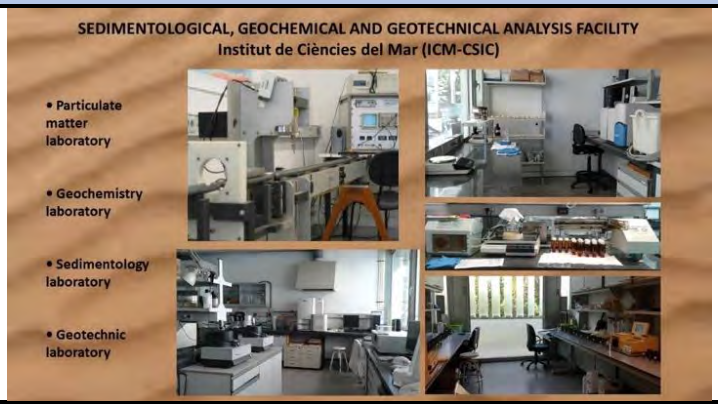
For TOC/TN determination, Certified Reference Material are used. The calibrations of the basic gravimetric (analytical balances) and volumetric (automatic pipettes) instruments are verified annually following ENAC. Integral A10 Millipore equipment for the production of ultrapure (type I) and deionized (type II) water, certified at the origin following ISO 9001 (LC0043/0171). The instruments' performance is checked annually by the Maintenance Service of the corresponding commercial company to warrant the quality of the analyses.

Technical resources and equipment	• AA3 Seal Analytical for the determination of inorganic nutrients coupled to Jasco fluorometro (for ammonia) • AA3 HR Seal Analytical with Julabo Digestor for the determination of total nitrogen and phosphorus • TOC-CSH/TN Shimadzu for organic carbon and total nitrogen determination
ICM Groups using the facility during this period of time	Biological oceanography: Planktonic ecology and biogeochemical cycles, Marine Biogeochemistry, atmosphere and climate, Littoral Biological Processes, Ocean and littoral sedimentary processes, Ecology and Genomics of Marine Microorganisms Physical and Technological Oceanography, Group of Biology of Reproduction

ICM Groups using the facility during this period of time	• Centre d'Estudis Avançats de Blanes (CEAB-CSIC) • Instituto de Diagnóstico Ambiental y Estudios del Agua (IDAEA) • Instituto Mediterráneo de Estudios Avanzados (IMEDEA) • Universitat de Barcelona (UB) • Universitat de les Illes Balears (UIB) • Universitat de Vic • Instituto Español de Oceanografía (IEO) • Private companies: Etmasa, Tecnoambiente, Port de Barcelona

SEDIMENTOLOGICAL, GEOCHEMICAL AND GEOTECHNICAL ANALYSIS SERVICE

Person in charge: Pere Puig Alenyà



Personnel	Mª Nieves Maestro, Elena Martínez, Sílvia de Diago, Roger Urgeles

The Facility is dedicated to the pre-treatment of marine sediment and seawater samples (drying, grinding, filtration, etc…), and to carry out sedimentological, geochemical and geotechnical analyses of marine sediment samples. Some of these activities are:

- **Characterization of particle size**
- **Elemental Analysis: C/N, TOC, Mercury**
- **Processing samples of Sediment Traps**
- **Quantification of the biogenic opal and calcium carbonate, Density, magnetic susceptibility and wave P-velocity profiles with a multisensory core logger system, compressibility, permeability and strength characteristics (CRS and IL consolidation, triaxial testing, flow-through permeability)**

Technical resources and equipment	• HORIBA LA-950V2 Analyzer • TRUSPEC LECO C/N • LECO AMA254 Advanced Mercury • Spectrophotometer SHIMADZU UV-VIS • JENCONS Perimatic peristaltic pump dispenser and JENCONS Perimatic P • Telstar Lyoalfa 10-55 • Multi-Sensor Core Logger (MSCL) GEOTECH • GDS Instruments Triaxial Automated System (Load Frame type), Constant Rate of Strain Cell (CRS in Load Frame type), Consolidation Testing System (Rowe and Barden Type)
ICM Groups using the facility during this period of time	• Continental Margins Group, GMC • Laboratory of Seafloor and Subseafloor Geological Processes (LS3GP) • Oceanic Coastal Sedimentary Processes • Barcelona Center for Subsurface Imaging (Barcelona-CSI) • Marine Ecology Communities
ICM Groups using the facility during this period of time	• Université Paris-Sorbonne (France) • University of Tromsø (Norway) • UPMC, University Pierre and Marie CURIE (París, France)

BIOLOGICAL CHARACTERIZATION

FLOW CYTOMETRY

Persons in charge: Clara Cardelús, Josep M. Gasol

Personnel	Clara Cardelús, Josep M. Gasol

The facility has two flow cytometers: FACSCalibur from Becton & Dickinson, connected to a Mac. Both cytometers are equipped with a blue laser (488 nm) and photomultipliers that collect the scattered and absorbed light signal to send data to the computer. One of them is equipped with a red laser (635 nm).

There is a third cytometer, Partec C6, with a blue laser and a violet one (405 nm). The lab also has a hood to fix and prepare the samples and reagents, a -80°C freezer for sample storage, a refrigerator with the necessary reagents and stains, a thermostatic bath, sonicator, vortex, precision scales, and MilliQ system access.

Both FACSCalibur cytometers can sort cells. One of them is installed in a transportable workbench for its use in the radioactivity laboratory to sort samples marked with radioactive isotopes. There is a whole tubing system for its use in this laboratory.

Technical resources and equipment	• 2 Flow cytometers FACSCalibur (Becton & Dickinson) • 1 Flow cytometer Partec C6
ICM Groups using the facility during this period of time	• Marine biogeochemistry, atmosphere and climate • Ecology and Genomics of Marine Microorganisms • Biological Oceanography: Planktonic ecology and biogeochemical cycles • Ecology of Marine Communities
ICM Groups using the facility during this period of time	• Edith Cowan University • University of Vigo • Edith Cowan University

MARINE ACTIVITY AND PRODUCTION

Persons in charge: Clara Cardelús, Josep M. Gasol

Personnel	Clara Cardelús, Josep M. Gasol

The Facility supplies the methodologies that, in the marine field, help to determine primary and secondary production by microbial plankton communities and their rates of respiratory metabolism. Other techniques are also carried out to estimate bacterial enzymatic activity.

To estimate primary and secondary (bacterial) production, the service has a 2nd category-Radioactive Facility, licensed to work with unencapsulated isotopes (tritium, carbon-14, phosphorus-32, phosphorus-33, sulfur-35, iodine-125), and with a liquid scintillation counter Tri-Carb 2810-TR Perkin Elmer, centrifuge, vortex, fridge / freezer, incubator and cold and hot rooms for isotope handling, as well as a room for waste storage.

To estimate respiration, there is a DOA-SiS titrator and calibrated bottles. Finally, for enzymatic activity, there is a microplate fluorometer: Turner Biosystems Modulus and refrigerators for the storage of substrates.

Technical resources and equipment	• Liquid scintillation counter Tri-Carb 2810-TR Perkin Elmer • DOA-SiS titrator • Fluorometer Turner Biosystems Modulus
ICM Groups using the facility during this period of time	• Marine biogeochemistry, atmosphere and climate • Ecology and Genomics of Marine Microorganisms • Biological Oceanography: Planktonic ecology and biogeochemical cycles
ICM Groups using the facility during this period of time	• Institute of Evolutionary Biology (IBE), CSIC-UPF (2017)

MARINE MOLECULAR BIOLOGY

Person in charge: Vanessa Balagué Añó

Personnel	Maria Vanessa Balague Año, Irene Forn Hernan, Joaquin Garrabou Vancells, Josep Maria Gasol Pique, Silvia Joly Ruiz Castellanos, Ramon Massana Molera, Elisabet Laia Sa Lago, M. Dolors Vaque Vidal

The facility allows the application of molecular biology techniques based on the DNA and/or RNA content of marine organisms, to unravel their identity, activity and their roles in the marine ecosystem. This service gives support and training to students and researchers of ICM or external visitors who wish to use some of these techniques applied to their samples.

The service is available for users who require to analyze their samples, after available date requests. The operation is self-service. The responsible person of the service is in charge of providing the training and they are also in charge of giving control and technical support during processing.

Technical resources and equipment	• 3 PCR machines • electrophoresis systems • DGGE and PFGE gels systems • Chemidoc XRS equipment and Quantity One software • D-Code system • Qubit Fluorometer • Nanodrop ND-1000 spetrophotometer • General equipment needed for the development of the different protocols, such as centrifuges, hybridization oven, heating bath, thermal incubator, desiccator with vacuum pump, laminar flow hoods, microwave, vortex and a heating mixing plate
ICM Groups using the facility during this period of time	• Marine biogeochemistry, atmosphere and climate • Ecology and Genomics of Marine Microorganisms • Group of Biology of Reproduction • Littoral Biological Processes
ICM Groups using the facility during this period of time	• IBE (UPF-CSIC) • UAB • King Abdullah University of Science and Technology (KAUST)

MARINE CULTURES

THE MARINE CULTURES SERVICE

Persons in charge: Cros Miguel, M. Lluïsa

Personnel	M. Lluïsa Cros Miguel, Albert Calbet, Cristina Roldan, Elisabet Sa, Nagore Sampedro, Dolors Vaqué, Laia Viure

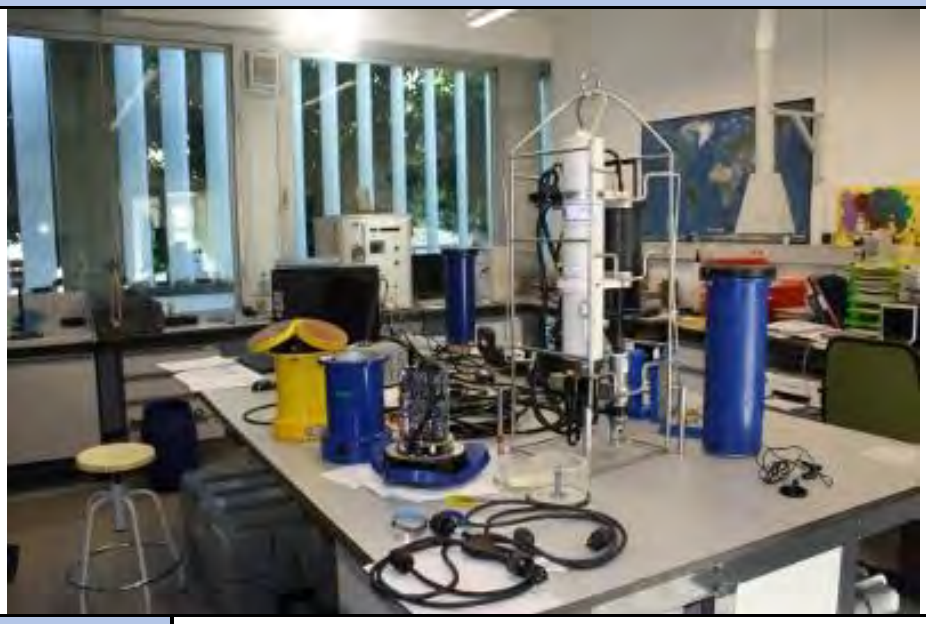
The service maintains monoclonal cultures of different species of marine viruses, bacteria, microalgae, and protozoans. Some of these strains are kept in the service for more than 10 years; others are of recent isolation from the field. The strains are maintained under controlled conditions of light, salinity and temperature.

Technical resources and equipment	• Autoclave • Two laminar airflow cabinets • Different germination chambers with light and temperature regulations
ICM Groups using the facility during this period of time	• Marine Biology and Oceanography • Marine Resources • Outreach Service
ICM Groups using the facility during this period of time	• CEAB (Blanes, Girona), • ICTA (Bellaterra, Barcelona)

GENERAL SUPPORT

OCEANOGRAPHIC ENGINEERING SERVICE

Person in charge: Jose Antonio Pozo



Personnel	Maribel Lloret, Jose Antonio Pozo

The Oceanographic Engineering Service offers technical support to research groups in the field of marine sciences. It provides the appropriate technical solutions for the client's needs as well as expert technical advice. It has qualified personnel and instrumentation, as well as the ability to innovate and develop new instrumentation, design, deploy and implement systems for fixed and mobile acquisition, and verification tools and techniques within the field of oceanographic research.

Technical resources and equipment	• Laboratory of Development and prototyping • Laboratory Testing and maintenance • Experimental tanks • Measuring instruments: CTD SBE25, SEA&SUN CTDM75, AUTOSAL Guildline 8400B, densitometer DMA 5000, SBE-39 temperature sensor
ICM Groups using the facility during this period of time	• Marine Biology and Oceanography • Marine Geosciences • Renewable Marine Resources • Physical and Technological Oceanography • Chemical Analysis • Electron Microscopy • Coastal Ocean Observatory & Area of Aquariums and Experimental Chambers (ZAE)

THE CARLES BAS LIBRARY

Person in charge: Natalia Rodríguez Roldán

Personnel	Natalia Rodríguez Roldán, Ignacio Castaño Pacho

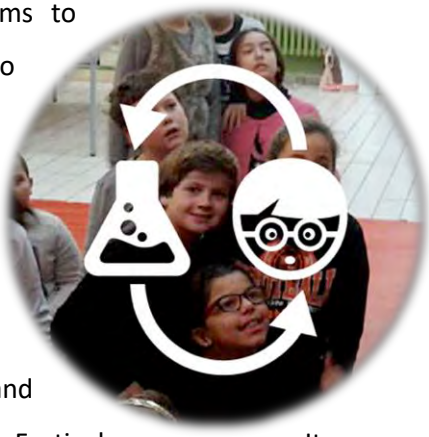
The Carles Bas library at CMIMA is specialized in the area of natural resources. It is part of the CSIC network of libraries, which includes a total of 64 specialized libraries. The library's collection covers thematic areas related to Marine Sciences, such as physics, chemistry, biology, and geology. It has more than 9,000 monographs and 1,664 journals registered in the CSIC collective catalog. The library is open to the public and serves ICM and UTM.

2017 activities	• Acquisition of 35 books and 111 open subscriptions to magazines. A total of 117 loans and 20 renewals were registered throughout the year. • The Document Collection Service processed a total of 175 requests. 48 requests (41 articles and 7 monographs) corresponded to requests from our users to other centers, and the other 127 requests (118 articles and 9 monographs) corresponded to the requests we receive from other centers. • During 2017, at Digital.CSiC (the CSIC digital repository), 783 items were archived and the digitalization and incorporation of the copies of "Meetings of Productivity and Fisheries" of the IIP and "Publications of the Institute of Applied Biology" were archived. • On the occasion of “Sant Jordi (day of the book in Catalonia)”, the library and the dissemination department, organized an exhibition entitled "Disclosure in the 21st Century", which collected books and magazines related to personal experiences, novels and scientific dissemination of CMIMA staff.
2018 activities	• Acquisition of 11 new books. A total of 68 loans were registered. • Reception, evaluation, and classification of the funds of Isabel Palomera, Jordi Lleonart, Marcellí Farrán and Josep Sanchez. • The Document Acquisition service processed a total of 256 requests.133 requests (113 articles and 20 monographs)

	corresponded to requests from our users to other centers, and the other 123 requests (115 articles and 8 monographs) corresponded to the requests we receive from other centers. • During 2018, at Digital.CSiC, 1150 items were archived. At that time ICM occupied the second place of centers concerning the largest number of records at Digital.CSIC. • Elaboration of bibliometric calculations with Scopus to determine the scientific production of the center in Q1 and the normalized impact of the production of ICM researchers • Renewable Marine Resources • Physical and Technological Oceanography • Chemical Analysis • Electron Microscopy • Coastal Ocean Observatory & Area of Aquariums and Experimental Chambers (ZAE)

CHAPTER 5 — OUTREACH AND COMMUNICATION

OUTREACH



The Outreach and Communication Service of ICM aims to disseminate its scientific activities and results, as well as to communicate new advances in marine sciences. It is designed to respond to the researchers' and projects' demand for science dissemination in the most clear and efficient way in order to generate an impact at all scales, from the local (neighborhood, city) to the international level. This service organizes activities addressed to adults and children, such as Open Days and access to stands at Science Festivals. It prepares travelling exhibitions and educational material for schools, and works as a connection between scientists and the press. It also maintains a web portal aimed at the general public, ICMDivulga (http://icmdivulga.icm.csic.es), which offers information on research projects carried out at the ICM, the oceanographic cruises in which its researchers take part, the latest results of scientific research, and the dissemination activities carried out by the ICM.

The major lines of action of the **Outreach and Communication** service are:

- **OUTREACH**

  Explaining our research to the citizens of Barcelona and to other visitors

- **EDUCATION**

  Educational visits, talks, and materials for future generations

- **CITIZEN SCIENCE**

  Actively involving society in current research

- **COMMUNICATION**

  Communication of ICM's discoveries to both general and specialized audiences

OPEN DOORS

The Open Doors activity at ICM takes place yearly in November, coinciding with Science Week in Barcelona. During Open Doors hundreds of students and families visit our installations and experience hands-on science from our scientific and technical personnel. In 2018, we also organised several extra events:

- **Clean sea, live sea:** Cross-sectional event combining science, art, and sustainability. The objective is to bolster scientific literacy among the general public, and to increase public awareness through emotional hands-on science experiences.
- **From the sea to the table:** Workshop to discuss the importance of sustainable fisheries to ensure the future of marine resources and to show the research lines of ICM with the goal of achieving better collaboration between fishermen and administration. The activity includes a visit to the fishing port and the Barcelona fish market, plus a debate with scientists from the ICM-CSIC.
- **Shark and ray dissection**: Workshop to show the anatomy and ecology of one of the most important marine predators.

SCIENCE FESTIVAL

Every year, Barcelona celebrates a Science Festival to engage society and highlight the science carried out in the city. ICM always participates in this event with various and integrated workshops. Some of the most popular ones are organized by "The Sea In-depth" outreach project, in particular, the workshop about Antarctic biodiversity or about the jellyfish life cycle.

CITY NATURE CHALLENGE 2018

The City Nature Challenge is a friendly competition between cities all around the world to see who can make the most observations of nature, find the most species and engage the most people in citizen science with respect to urban biodiversity. 2018 was the first year that this event was held in Barcelona, using the Natusfera app to gather all the data. ICM, as a promoter institute, together with other research centres, have organized activities to engage people in collecting data about local marine biodiversity. In the end Barcelona was the third city with the most registered observations. In 2019, we will participate again to break our records in terrestrial and marine biodiversity data.

ADDITIONAL PUBLIC VISITS TO ICM

2017

- Jesuites de Casp secondary school — 15/03/2017
- I.E.S Poeta Maragall secondary school — 05/04/2017
- Marine Science students from “San Vicente Mártir”, University of Valencia — 24/03/2017
- “Barcelona, Pol de Ciència” Barceloneta neighbours - 06/04/2017

2018

- Catalunya Biology Olympics — 16/02/2018
- Marine Science students from the University of Barcelona (UB) — 22/10/2018
- "El Congrés" primary school — 13/11/2018
- Students from Vic University — 14/12/2018
- “Col·legi Montserrat” secondary school — 20/12/2018
- Jesuites de Casp secondary school
- I.E.S Poeta Maragall secondary school

THE SEA IN-DEPTH

The Sea In-depth is a project created and developed in a collaboration between the Institute of Marine Sciences (ICM-CSIC) and the "la Caixa" Banking Foundation. This project brings knowledge about the seas and oceans to the forefront of education through various teaching proposals. The project aims to create new educational resources for teachers and educators, making the marine environment a new, and at the same time, complementary source for covering school curriculum contents, but also to fuel (in theory and in practice) the teaching plans of education centres.

LITTLE OCEANOGRAPHERS

The sea, despite being a key element for our planet, is very poorly studied at school. Starting in 2016, the project "Little Oceanographers" aims to close this gap, by bringing the scientific method in a pleasant and dynamic way into schools, and raising awareness among students about the importance of preserving the sea. 200 students from 10 to 12 years old have the opportunity to live the experience of being scientists, becoming young oceanographers during one school year. The project focuses on ocean physics, a topic sometimes difficult to

address at school. It includes: 6 hours of training for the teacher, experimental workshops with scientists, on-line dialogue with scientists on board an oceanographic vessel, the opportunity to become experimental oceanographers by taking physical measurements on-board the historic vessel Santa Eulalia, as well as a conference with all pupils involved in the project, where they have the opportunity to share their work and experiences carried during the project.

PROJECT MAGNET

The Magnet program generates a link between educational centres and institutions of excellence across different fields of knowledge, such as art museums or research centres, which have a commitment to society. Magnet accompanies the schools in the development of an innovative and attractive educational project that generates magnetism and serves as a reference for their territory, both for families and for the educational community. In Catalonia it is promoted by the Jaume Bofill Foundation, the Department of Education, the Diputació de Barcelona, the Consorci d'Educació de Barcelona and the Institut de Ciències de l'Educació of Universitat Autònoma de Barcelona (UAB). Our first Magnet alliance started in 2013 with the Concepció Arenal and Eduard Marquina schools. In 2018, the ICM started an alliance with Tanit school. During the next 4 years, Tanit school will design an innovative educational project with the sea as its axis, relying on ICM to transmit fundamental ocean knowledge.

PLASTIC ZERO

Micro-plastics (plastic fragments smaller than 5 mm) have a great impact on marine ecosystems. Among other problems, micro-plastics enter the food chain through filtering marine organisms or fishes that ingest these particles. On the other hand, many marine species can get tangled in macro-plastics. All these problems are well known by the scientific community, and demonstrate the urgent need for social and political action. The Plastic Zero citizen science project, included in the Sea Watchers (Observadores del Mar) platform, seeks to reveal the problem and raise awareness throughout society to motivate social action and to fight the global plastic crisis. This educational project is coordinated by ICM, CEAB, and MMB, and currently involves more than 30 schools in Catalonia and the Balearic Islands.

BARCELONA OCEAN COURSES

Barcelona Ocean is a joint initiative by InvestigAdHoc and researchers at ICM. We offer specialized training in marine sciences to professionals and researchers, graduate students and to the general public. Courses are held at ICM's facilities, located by the beach and near a wide range of accommodations. Barcelona Ocean organizes the courses into three main training blocks: General Topics and Outreach, Fundamentals of Marine Sciences, and Specialized Technical Courses. http://barcelona-ocean.com/

2017

- Ocean Dynamics: propagating anomalies — January
- Powering curiosity of oceanography: concepts and tools for primary teachers — February
- Scientific writing — May
- RNA sequencing in a nutshell — Perspectives and applications in marine biology — June
- Intensive hands-on course on metagenomic data processing — August
- Introduction to food web modeling with the software Ecopath and Ecosim — November

2018

- Modeling species distributions: methods and applications — February
- Powering curiosity of oceanography: concepts and tools for primary teachers — February
- Ecopath with Ecosim and Ecospace (Two courses: intro and advanced) October
- Introduction to food web modeling with ecopath with ecosim
- Advanced spatial – temporal modeling with ecospace

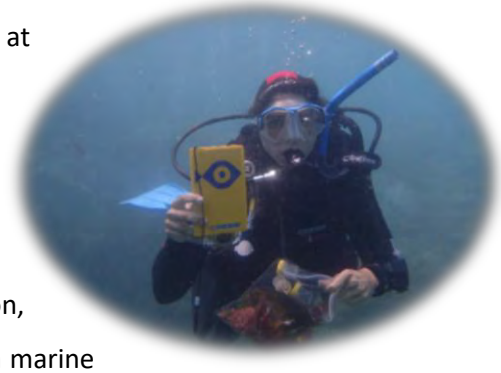
RAMON MARGALEF SUMMER COLLOQUIUM

The Ramon Margalef Summer Colloquium (RMSC) has been running yearly since 2013 (http://www.acoio.org/margalef-summer-colloquia) and aims at training young researchers in Ecology and related fields, as well as promoting their networking and debate with invited lecturers as well as among themselves. The Colloquium is inspired in the figure of Ramon Margalef (Barcelona, 1919-2004), who was one of the founders of modern ecology.

The Colloquium takes place every July, typically with 20-25 graduate students and young postdocs attending invited lectures and participating in workshops and debates and presenting some final results on one of the Colloquium topics. The lecturers are split between ICM staff and researchers from other institutions. The Colloquium lasts between one and two weeks. The 2017 edition was on “Spatial and temporal patterns in physical-biological oceanic processes: from

scale interaction to the rise of the living ocean" while the 2018 edition explored "Ecology through the '-omics' lens".

SEA WATCHERS



The SEA WATCHERS platform is a website aimed at connecting citizens and scientists in order to investigate the current state of our seas and oceans together. Citizens can participate by contributing their observations and experience. We wish to better understand the effects of global warming, pollution, biodiversity changes, invasive species, and overfishing in marine ecosystems. To this end, the platform collects observations on the distribution and abundance of common marine species, the emergence of rare or invasive marine species, or the signs of change in ecosystems (mortality of organisms, amassing of surface and bottom pollution, etc).

Sea Watchers is coordinated by ICM, in collaboration with CEAB and IMEDEA. Since 2012, it has 15 open scientific projects, with more than 10,000 records from more than 2,000 volunteers. This platform relies on the collaboration of citizens and scientists from different national and international centres, to establish a reciprocal dialogue around all these issues based on established records.

NATUSFERA

Natusfera is a free citizen science app created to record, organize, and share observations of nature (natusfera.gbif.es). It aims at stimulating the participation of a wide variety of nature enthusiasts and to promote knowledge of the natural world and its exploration. Anyone can participate by uploading their observations of species (images or sounds). The contributions can be identified with the help of other users (including scientists). You can also identify observations of other users, make questions and exchange comments on these observations. In addition, Natusfera allows to create personal or educational projects in a study area that one can define or customize, something very relevant for the educational community.

Natusfera

iMEDJELLY

iMedJelly is an app that provides daily and real-time information on the presence of jellyfish on the Catalan coast during the summer season. This information is validated by experts from ICM in real time. The information includes the species sighted, their abundances and the level of danger that they present to swimmers. It also has protocols of first aid action against a jellyfish sting and allows for direct contact between swimmers affected by stings and experts in dermatology and toxicology at the Hospital Clínic de Barcelona. In the Citizen Science Section called "Participate", anyone can send observations and photographs to the experts —at ICM.

COMMUNICATION

SCIENTIA MARINA

(ISSN-L 0214-8358)

This journal is the successor to Investigación Pesquera, a journal of marine sciences published since 1955 by ICM. The journal has been included in the Science Citation Index since 1998 (Impact Factor: 1.183). It publishes original papers, reviews, and comments concerning all aspects of marine research.

NEWSLETTER

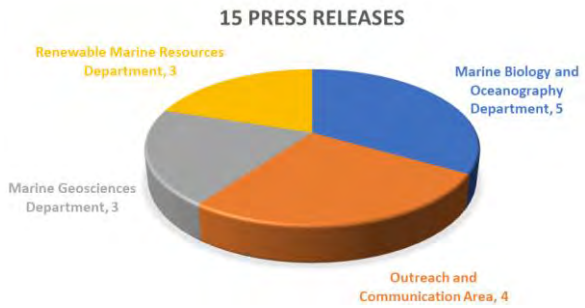
Every month we publish a free summary of the latest news (in Spanish and English) and talk about any upcoming events at ICM.

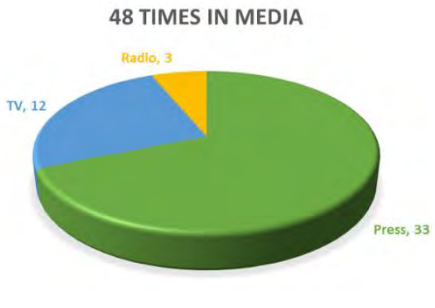
It's available anytime at:

http://www.icm.csic.es/es/noticias
http://www.icm.csic.es/en/news

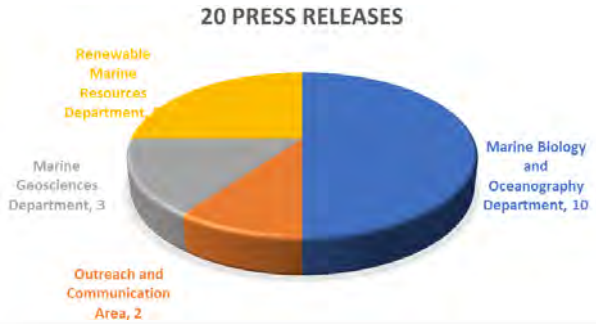
TRADITIONAL AND SOCIAL MEDIA COMMUNICATIONS

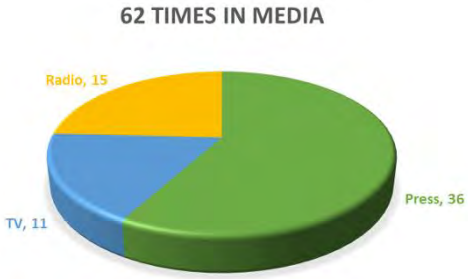
Traditional Media Coverage 2017





Traditional Media Coverage 2018





LA VANGUARDIA | Vida

Al Minuto Internacional Política Opinión Vida Deportes Economía Local Gente Cultura Sucesos Temas

CAT-CAMBIO CLIMÁTICO

El calentamiento del mar está modificando el epigenoma de los peces

REDACCIÓN
29/09/2017 11:12

Actualizado a
29/09/2017 16:44

Madrid, 29 sep (EFE).- Que el calentamiento global asociado al cambio climático está afectando a la biodiversidad planetaria es un hecho. Ahora, un estudio liderado por españoles ha constatado que el aumento de las temperaturas marinas está modificando algunos rasgos del genoma de los peces.

El trabajo, publicado hoy en Scientific Reports (revista del grupo Nature), muestra que el calentamiento del mar está modificando la variedad de rasgos fenotípicos de los peces, es decir, las características que se heredan y que ayudan a los seres vivos adaptarse al entorno, sobrevivir y desarrollarse.

La investigación, cuyo primer autor es la investigadora Dafni Anastasiadi, contribuirá a conocer mejor el futuro impacto del cambio global en los peces a través de modificaciones epigenéticas en todo el genoma, indica el Consejo Superior de Investigaciones Científicas (CSIC) en una nota.

SINC
La ciencia es noticia

CIENCIAS NATURALES: Ciencias de la Tierra y del Espacio

Presentan los primeros mapas de salinidad del Mediterráneo

En el marco de su décimo aniversario, el Barcelona Expert Center ha presentado mapas de humedad del suelo, útiles para la prevención de incendios y, desde ahora, mapas de de salinidad con una resolución de 5 km, que permiten prever fuertes precipitaciones con hasta dos meses de antelación, informar sobre la presencia de bancos de peces y mejorar las estimaciones de las corrientes marinas.

Más información sobre: clima satélite mar mapa

SINC | 20 junio 2017 10:43

SMOS-BEC SSS

Mapa de salinidad del Mar de Alborán, en el Mediterráneo. / Barcelona Expert Center

EM Secciones España Opinión Internacional Economía Sociedad Cultura Deportes Ciencia Tecnolo

CAMBIO CLIMÁTICO - Un equipo internacional analizó las partículas suspendidas en el aire

El deshielo del Océano Antártico puede formar más nubes

EFE | Barcelona 20 JUL. 2017 17:18

0 Comentar →

Brecha de la plataforma antártica Larsen C / AFP

- Es un proceso que hasta ahora no se había tenido en cuenta en los estudios del clima polar
- Se desprende de la Antártida un gigantesco iceberg

El hielo marino antártico se convierte, al deshacerse, en una fuente, desconocida hasta ahora, de nitrógeno atmosférico, un compuesto que favorece la formación de nubes, según un estudio internacional liderado por científicos del Instituto de Ciencias del Mar del CSIC.

El resultado de la campaña antártica PEGASO 2015, liderada por los investigadores del CSIC de Barcelona Rafael Simó y Manuel Dall'Osto, ha demostrado que "en la atmósfera de la Antártida **hay partículas que provienen de la vida microscópica que habita en el hielo marino** y las aguas que le rodean"

EL PUNT AVUI+

SECCIONS EDICIÓ IMPRESA EL PUNT AVUI TV MÉS

PORTADA LOCAL SOCIETAT SUCCESSOS POLÍTICA ECONOMIA CULTURA EUROPA-MÓN COMUNICACIÓ OPINIÓ IN ENGLISH ESPORTS

MEDI AMBIENT PALAMÓS / ROSES / BLANES - 12 agost 2018 2.00 h

Màxim respecte entre els pescadors per les tres grans zones de veda

- Els patrons majors de Blanes, Palamós i Roses, satisfets pels primers mesos de la zona de repoblació Blanes-Palamós i la de l'escamarlà de Roses-Palamós

Un pescador feinejant en una barca de pesca CONFRARIA DE PESCADORS DE PALAMÓS.

LA VANGUARDIA | Girona

Frente común para recuperar el fondo marino del Cap de Creus

- Varias pruebas piloto han permitido demostrar que más del 90% de las que se han devuelto al mar sobreviven

Una de las gorgonias que se ha devuelto al mar en el Cap de Creus (Gemma Tubert / ACN)

Pescadores, **científicos** y la **administración pública** se han unido en un **proyecto** para **recuperar** y proteger el **fondo marino** del **Cap de Creus**. La **gorgonia** es un animal marino que vive a grandes

EL PAÍS CIENCIA

Hallada una falla en formación bajo el Mediterráneo que ha causado tres terremotos en España y Marruecos

La grieta submarina, de unos 20 kilómetros, concentra la mayor actividad sísmica entre las costas de ambos países

NUÑO DOMÍNGUEZ

23 JUL 2018 - 19:24 CEST

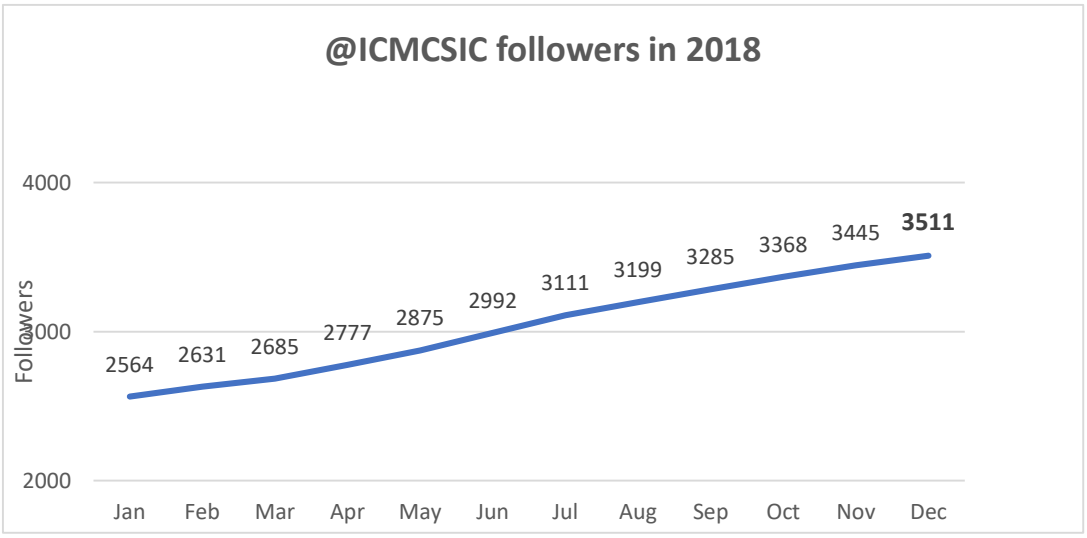
Un terremoto en 2004 causó 564 en Marruecos. En la imagen habitantes de Imzuren, ante varios edificios gravemente dañados por el temblor. JULIÁN ROJAS

Social Media—Twitter @ICMCSIC

Twitter profiles	Followers	Open in
Research groups		
@MBEC_Benthos	60	2015
@MBEC_OL	190	2015
@BECICMRS	42	2017
@BiolReproGroup	29	2018
@EMM_Barcelona	75	2018
Services		
@coo_icm	135	2013
@ScientiaMarina	293	2016
@marbits_bcn	21	2018
Outreach projects		
@obsdelmar	3111	2014
@NatusferaCitSci	1550	2016
@petits_oceans	86	2018
EU projects coordinated by ICM		
@SINGEK_ITN	309	2016
@ProjectMEDEAS	421	2017
@MERCES_eu	618	2016
Training programs		
@margalef_bcn	124	2018
@BarcelonaOCEAN	434	2014

Most popular tweet in 2018

+ 1003 new followers in 2018



OTHER SCIENTIFIC COMMUNICATIONS

2017

- Barcelona Expert Center (BEC) 10th anniversary — 19/06/2017)
- The Crustacean Society Mid-Year Meeting 2017 — 19–22/06/2017
- V Ramon Margalef Summer Colloquia — 3–12/07/2017
- MAPMAS (International Workshop on Marine Pollution and Maritime Safety) — 3–6/10/2017
- The 5th Meeting of the Natural Science Technical Collections of Catalonia— 25/10/2017
- ICE-ARC EU project final meeting — 27–29/11/2017
- CLIFISH project meeting - 12/12/2017

2018

- International Ocean Vector Winds Science Team Meeting — 24–26/04/2018
- VI Ramon Margalef Summer Colloquia — 8–13/07/2018
- SIBECOL Fundation act (Iberian Ecological Society) — 02/07/2018
- *European Marine Observation and Data Network* (EMODnet) meeting — 16–17/04/2018

CONFERENCES AT ICM

2017

- 26 Friday Talks (Annex “Talks-year-2017”)
- 6 talks in the “Bosc Ancestral” (Ancestral Forest) conference cycle (Annex “Cicle xerradas-Bosc Ancestral”)

2018

- 35 Friday Talks (Annex “Talks-year-2018”)