Biennial report 2019–2020

Contents

From the ICM to the World

Ocean science for a healthy planet.

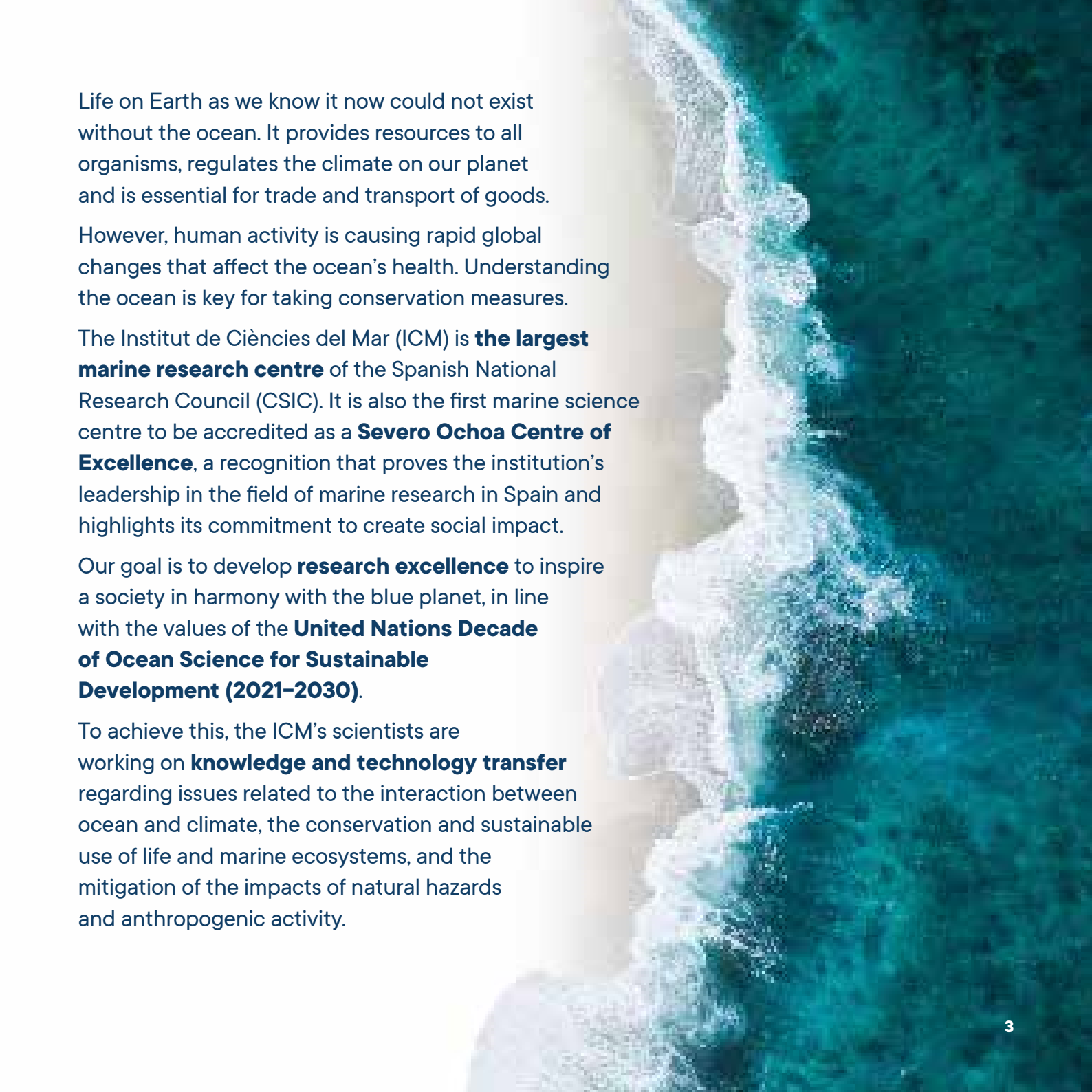
Life on Earth as we know it now could not exist without the ocean. It provides resources to all organisms, regulates the climate on our planet and is essential for trade and transport of goods.

However, human activity is causing rapid global changes that affect the ocean's health. Understanding the ocean is key for taking conservation measures.

The Institut de Ciències del Mar (ICM) is **the largest marine research centre** of the Spanish National Research Council (CSIC). It is also the first marine science centre to be accredited as a **Severo Ochoa Centre of Excellence**, a recognition that proves the institution's leadership in the field of marine research in Spain and highlights its commitment to create social impact.

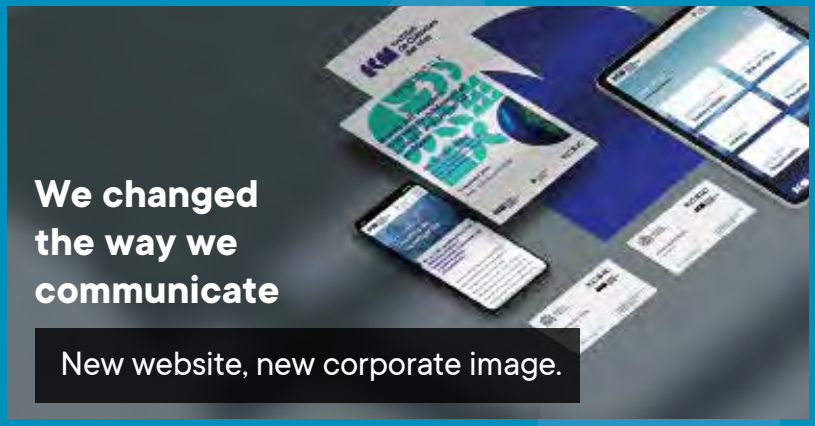
Our goal is to develop **research excellence** to inspire a society in harmony with the blue planet, in line with the values of the **United Nations Decade of Ocean Science for Sustainable Development (2021–2030)**.

To achieve this, the ICM's scientists are working on **knowledge and technology transfer** regarding issues related to the interaction between ocean and climate, the conservation and sustainable use of life and marine ecosystems, and the mitigation of the impacts of natural hazards and anthropogenic activity.



We have changed our strategy

In the 2019–2020 period we carried out a thorough self-assessment to align our **mission and values** with the scientific, environmental and social challenges of today. This change in strategy produced changes at all levels.




We gave support to all groups in the ICM to guarantee scientific excellence
Research Support Office.


We analysed and evaluated the Institute's activities to develop strategic planning
Scientific Advisory Board (SAB).


We became the first research centre in marine sciences to obtain the Severo Ochoa Excellence Award

Excellence

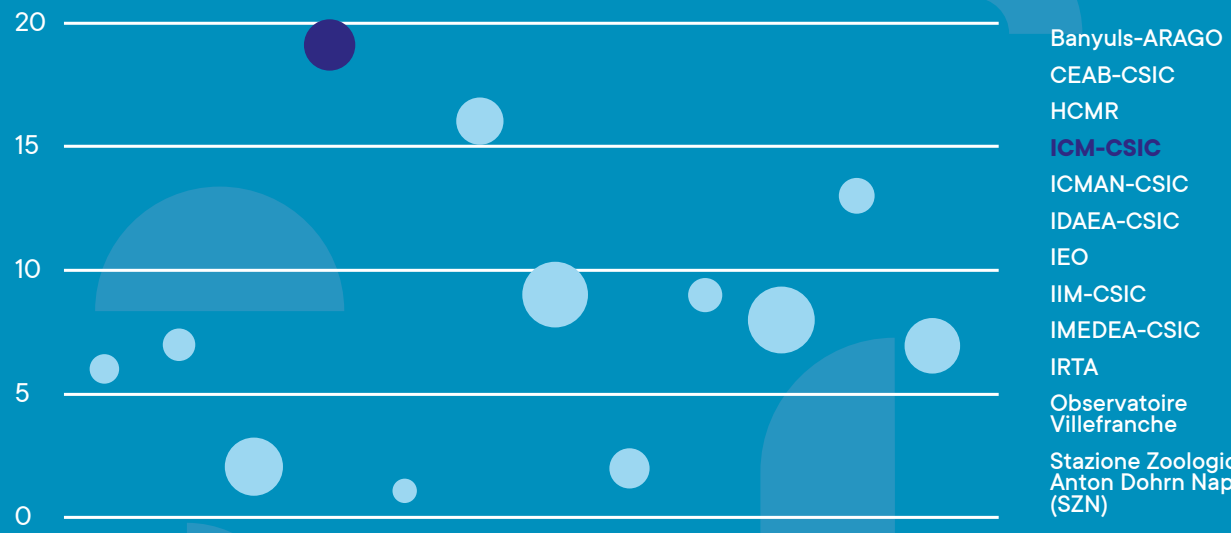
Year 2020 has been a period of uncertainty due to **COVID-19**, which has prompted a global reflection on the sustainability of the current model of society.

Rather than stepping back, we worked more intensively to promote citizen science, establish local ties, attract talent and generate publications of high quality and impact.

In fact, we are the marine research centre with the highest **Nature Index** at a national and Mediterranean level.

[The figure shows positions of Spanish and Mediterranean centres on the basis of publications in 82 scientific high-impact journals, which were selected by an independent scientific committee.]

Nature Index from December 1st 2019 to November 30th 2020



From Individuals to Teams

We work cooperatively, with rigour, passion, solidarity and commitment, to build the future we imagine for our ocean.

HR EXCELLENCE IN RESEARCH

Staff

2019

241 TOTAL

125 WOMEN

116 MEN

Categories

	Total	Women	Men
Senior Researchers	65	24	41
Postdoc Researchers	43	25	18
PhD Students	42	22	20
Technicians	64	41	23
Administrative and Support Staff	27	13	14

2020

272 TOTAL

144 WOMEN

128 MEN

Categories

	Total	Women	Men
Senior Researchers	67	24	43
Postdoc Researchers	54	32	22
PhD Students	46	25	21
Technicians	74	47	27
Administrative and Support Staff	31	16	15

DISTINTIVO DE IGUALDAD CSIC

Equality

The **Equality Task Force** designs strategies to support equal opportunities for all staff, especially with regard to gender, through a cooperation that accepts differences without imposing hierarchies.

The Group has participated in two European gender equality projects.

LeTSGEPs
Coordinated by the University of Modena and Reggio Emilia and with funding of €2 million, this project supports the implementation of Gender Equality Plans.

RESBIOS
The objective of this project is to implement Responsible Research and Innovation (RRI) measures in marine sciences to bring research closer to the needs and values of society. It is led by the Tor Vergata University of Rome and has funding of €1.5 million.

The activities included the organization of the **first meeting of the Equality Commissions of CSIC centres**, which brought together a hundred professionals.

The ICM's research and technical staff were also involved in the celebration of the **International Day of Women and Girls in Science** (11 February) and I**nternational Women's Day** (8 March).

For all these reasons, the ICM was awarded the CSIC's 2**020 Gender Equality Distinction**.

The Equality working group was also in charge of starting the development of the ICM Gender Equality Plan.

Awards and Honours

RAFEL SIMÓ. Head of the Marine Biogeochemistry, Atmosphere and Climate group.
Award Advanced Grant (ERC, 2019).
A grant of €2.5 million to fund the SUMMIT project, which studies the associative behaviour of marine microorganisms.
"In nature, microorganisms depend on each other in unexpected and even cooperative ways."

ANDREA G. BRAVO. Postdoctoral researcher.
Award Raymond L. Lindeman (ASLO, 2019).
For her work on the biogeochemical cycle of mercury in lakes, conducted while she was at Uppsala University.
"The lack of knowledge about the levels of mercury in rivers, lakes and wet soils makes it difficult to decide on possible actions."

CRISTINA ROMERA-CASTILLO. Postdoctoral researcher.
Award Raymond L. Lindeman (ASLO, 2020).
For her work on the effect of plastic on the growth of marine bacteria, published in Nature Communications.
"Plastic pollution is a great challenge for the ocean. We still don't know how it interacts with aquatic systems."

CÉSAR R. RANERO / VALENTÍ SALLARÉS
ICREA research professor / Deputy director and coordinator of the Scientific Strategy Area.
Award City of Barcelona (Barcelona City Council, 2019).
For the development of a new conceptual model that explains key characteristics of large earthquakes and tsunamis.
"Many of the abnormally large tsunamis can be explained naturally for the first time by applying our model."

2019	**Cristina Romera-Castillo**, 2019 L'Oreal-UNESCO Award for Women in Science. **Francesc Piferrer**, Member of the Royal Academy of Sciences and Arts of Barcelona.
2020	**Clara Ruiz-González**, Pius Font i Quer prize in the 2020 Sant Jordi Awards. **Francesc Piferrer**, 2020 Research Prize of the College of Biologists of Catalonia. **Janire Salazar**, 2020 Societat Catalana de Biologia Dissemination Award. **Marta Estrada**, recognized as "the most committed scientist" by Muy Interesante magazine.

Training

At the ICM we place special emphasis on training scientists with critical and independent thinking. Students from national and international universities can carry out their Marine Science PhD in an excellent environment, as the starting point for a brilliant research career.

Theses in 2019–2020

28
TOTAL

18
WOMEN

10
MEN

Friday talks

We also organize **scientific debates** and the **Friday Talks,** which have been held online as a result of the pandemic, leading to an increase in participation. Friday Talks are a forum for exchanging ideas where the research groups share the latest advances in marine science.

Talks in 2019–2020

39
TOTAL

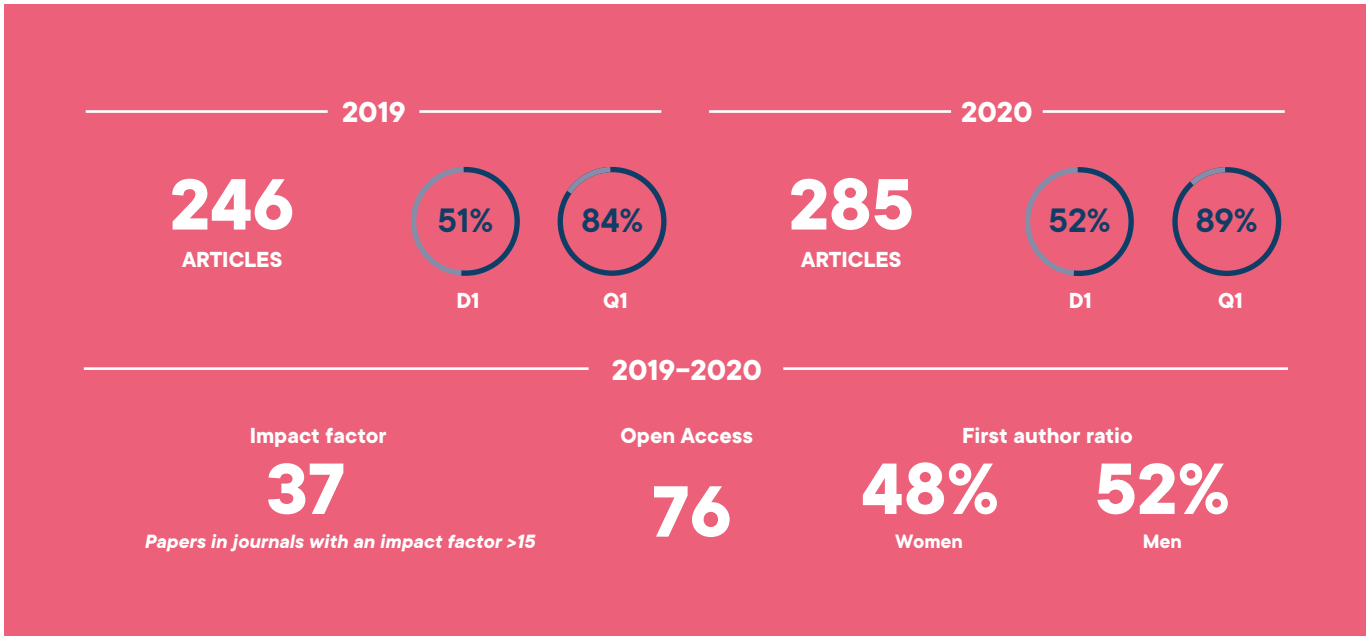
23
WOMEN

29
MEN

*Some talks have more than one speaker.

From Challenges to Research

We are committed to research to face the great global challenges and foster the sustainable development.



Selected publications within the ICM research challenges

CLIMATE

Understanding the dynamics of the ocean and their role in the Earth's past, present and future climate.

This article presents the pymedeas model for modelling the energy transition; a very complex task involving the integration of factors that interact in a non-linear way: environmental impact, scarcity of resources and economic viability.

Solé J., R. Samsó, E. García-Ladona, A. García-Olivares , J. Ballabrera-Poy, T. Madurell, A. Turiel, O. Osychenko, et al., 2020, Modelling the renewable transition: Scenarios and pathways for a decarbonized future using pymedeas, a new open-source energy systems model. Renewable and Sustainable Energy Reviews, 132, doi. org/10.1016/j.rser.2020.110105

In the Antarctic Ocean, extracellular polysaccharide polymers, which are so important for the export of carbon to the deep ocean and atmosphere, are produced mainly by phytoplankton as an adaptation to the cold of sea ice and the bright light of the polar summer.

Zamanillo, M., Ortega-Retuerta, E., Nunes, S., Estrada, M., Sala, M. M., Royer, S.-J., Lopez-Sandoval, D. C., Emelianov, M., Vaque, D., Marrase, C., & Simo, R. (2019). Distribution of transparent exopolymer particles (TEP) in distinct regions of the Southern Ocean. The Science of the Total Environment, 691, 736–748, https://doi.org/10.1016/j.scitotenv.2019.06.524

Developing tools for promoting collaborative observation networks is key to understanding the impact of mass mortality of marine organisms associated with the warming of the Mediterranean and being able to take measures aimed at adapting to and mitigating the effects of climate change.

Garrabou J, Gómez-Gras D, Ledoux J-B, Linares C, et al. 2019 Collaborative Database to Track Mass Mortality Events in the Mediterranean Sea. Front. Mar. Sci. 6:707. https:/doi.org/10.3389/fmars.2019.00707

LIFE

Advancing towards the conservation and sustainable use of marine life and ecosystems.

Underwater robots are a key complement to acoustic reception stations set on the seabed to study and recover deep-sea species exploited by humans in their own habitat, such as the Norway lobster.

Masmitja, I., Navarro, J., Gomariz, S., Aguzzi, J., Kieft, B., O'Reilly, T., Katija, K., Bouvet, P.-J., Fannjiang, C., Vigo, M., Puig P, Alcocer A, Vallicrosa G, Palomeras N, Carreras N, del Rio J, Company JB, 2020, Mobile robotic platforms for the acoustic tracking of deep-sea demersal fishery resources. Science Robotics, 5

Description of the mechanism by which sea bass acquire the 'domestication syndrome': changes in the behaviour and physical appearance of animals caused by rearing in an environment that is not their natural habitat.

Anastasiadi, D., Piferrer, F. 2019. Epimutations in developmental genes underlie the onset of domestication in farmed European sea bass. Molecular Biology and Evolution, 36: 2252–2264. doi.org/10.1093/molbev/msz153

It was found that the smallest components of the surface microbiota of the tropical and subtropical ocean on a global scale, prokaryotes and picoeukaryotes, are structured by different ecological mechanisms, which will be used to further understand the reactions of microbial plankton to global change.

Logares, R., I.M. Deutschmann, P.C. Junger, C.R. Giner, A.K. Krabberød, T.S.B. Schmidt, L. Rubinat-Ripoll, M. Mestre, G. Salazar, C. Ruiz-González, M. Sebastián, C. de Vargas, S.G. Acinas, C.M. Duarte, J.M. Gasol, R. Massana. 2020. Disentangling the mechanisms shaping the surface ocean microbiota. Microbiome, 8, 55. DOI: 10.1186/s40168-020-00827-8

IMPACTS

Addressing the threats to marine life in the ocean arising from human action and natural hazards.

Trace metal pollution of sediment varies according to the occurrence of storms and strong currents that alter and redistribute the polluted sediments. These events must be taken into account in the monitoring of pollution control.

Albert Palanques; Laura López; Jorge Guillén; Pere Puig, 2020. Trace metal variability controlled by hydrodynamic processes in a polluted inner shelf environment (Besòs prodelta, NW Mediterranean). Science of the Total Environment, 735, DOI: 139428. 10.1016/j.scitotenv.2020.139482

Laboratory experiments were conducted to investigate how certain toxins produced by marine microalgae can pass from the water into the atmosphere and form part of microscopic droplets (aerosols) causing respiratory irritations.

Medina-Pérez, N.-I.; Dall'Osto, M.; Decesari, S.; Paglione, M.; Moyano, E.; Berdalet, E.(2020) Aerosol toxins emitted by harmful algal blooms susceptible to complex air-sea interactions. Environmental Science and Technology; 55, 468 - 477

A new conceptual model based on the variation of rock rigidity can predict the behaviour of large earthquakes as a function of depth and estimate their potential to generate tsunamis with unprecedented precision.

Sallares V. & Ranero C.R. 2019 Depth-varying elastic properties of the upper plate determine mega-thrust earthquake rupture characteristics. Nature, https://doi.org/10.1038/s41586-019-1784-0

From Local to Global

We generate synergies with local agents and international teams for the care of the ocean.

Local alliances

The ICM promotes **Strategic Alliances** with public and private partners to improve fisheries governance in Catalonia.

Through **IcatMar** we collect **data to improve the management of activities carried out in marine ecosystems**, such as professional and recreational fishing.

IcatMar
An organization for cooperation between the Catalan General Directorate of Fisheries and Marine Affairs and the ICM that provides excellent scientific advice for the development of marine policies.

The ICM has been designated as the headquarters of the **Maritime Network of Catalonia (BlueNetCat)**.

Maritime Network of Catalonia
A network of researchers aimed at improving the competitiveness of the blue economy (the use of the sea and its resources for sustainable and profitable economic development).

Espai Mediterrani organized the first **meeting of non-profit environmental transformation projects** related to the sea.

Espai Mediterrani
A meeting point for entities and associations that foster the linking of society with marine culture.

The ICM also provides **Scientific Evidence** to address the main threats to our coasts.

The **Gloria Report** analyses the impacts of the storm Gloria on the eastern coast of Spain and shows the importance of tools for predicting extreme events.

The first **Report on the state of fisheries in Catalonia** has improved knowledge of the species of greatest commercial interest.

The MOSAiC Expedition

In September 2019, the German research icebreaker **Polarstern** left Tromsø, Norway, to spend a year trapped in ice drifting across the Arctic Ocean.

MOSAiC (Multidisciplinary drifting Observatory for the Study of Arctic Climate) is the largest scientific expedition to the Arctic in history, and its objective is to obtain data to better understand global climate change.

The project, led by the Alfred Wegener Institute in Germany, brings together 600 people from around 20 countries who work in rotation. It includes **two ICM research teams** who study the interaction of marine life in cloud formation and the use of satellite technology to measure the state and thickness of ice.

The data collected by **MOSAiC** will be used by scientists all over the world to take climate research to a whole new level.

From Ideas to Facts

We lead projects of excellence to advance knowledge.

Flagship projects

Severo Ochoa Excelent Award

Develops a strategic plan to increase the main indicators in terms of scientific production, social and economic impact, training activities, visibility and fundraising.

Summit

ERC Advanced Grant project studies the microalgae and bacteria cooperation in the ocean.

IcatMar

Provides scientific advice to develop the Maritime Strategy of Catalonia, a maritime governance model based on co-management.

EU coordinated projects

Prodigio

Aims to accelerate the development of a fully integrated, digitized and sustainable industry of biogas production from microalgae through technology.

Minke

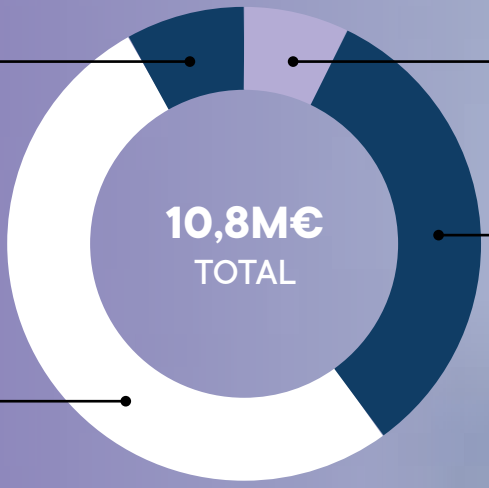
Will integrate the main European metrology research facilities and propose an innovative framework for data quality, precision and integrity.

Cos4Cloud

Develops technological services so that citizen observatories have a global scope and are available in a virtual space aimed at European scientific staff.

Raised funding

2019



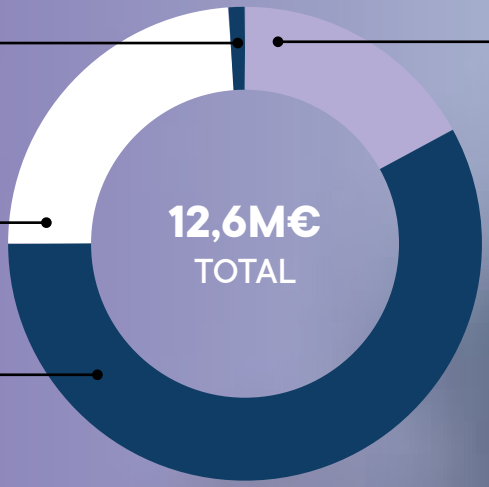
Private funding
831.974€
8%

Tech transfer
731.719€
7%

National projects
3.597.855€
33%

International projects
5.662.369€
52%

2020



Private funding
95.390€
1%

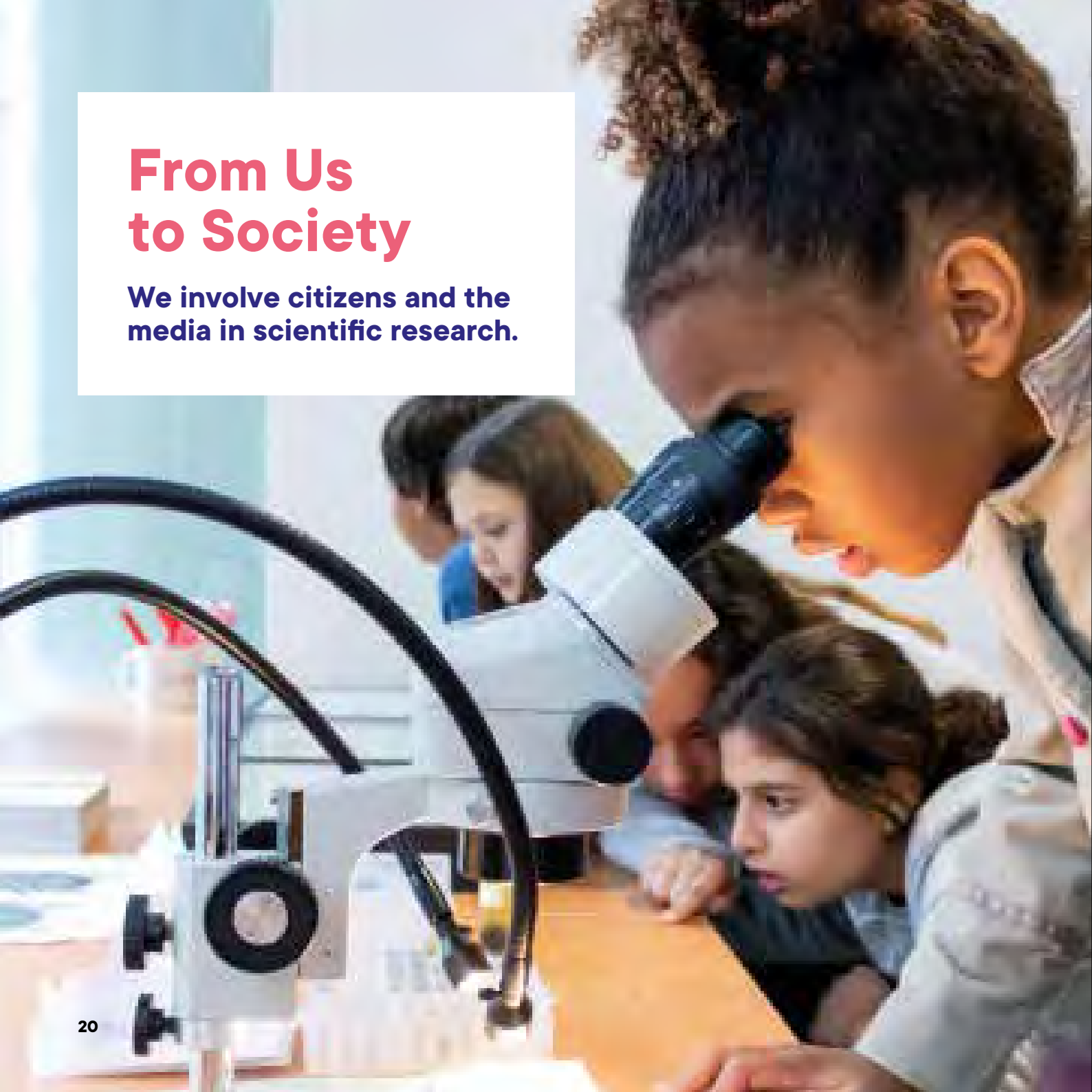
Tech transfer
1.966.020€
17%

International projects
3.053.398€
24%

National projects
7.274.984€
58%

From Us to Society

We involve citizens and the media in scientific research.



Citizen science

Besides carrying out excellent research, we also disseminate marine science so that society understands and appreciates the role of the oceans in the living Earth. We have therefore put in motion projects to bring science to the classroom in a fun and dynamic way (the **Marine Schools Network**) and to involve citizens in research (**Observadores del Mar**, **Patí Científic** and **BioMARató**).

Marine Schools Network
An educational project in the framework of the UN Ocean Decade and the efforts of ocean literacy to bring knowledge of the sea to classrooms and school curricula.

Observadores del Mar
A citizen science portal for collaboration in marine research, collecting observations and experiences of phenomena that occur at sea.

Patí Científic
A project for monitoring the coastal waters of Barcelona with the instruments of Patí Català, a small catamaran built with traditional and sustainable materials.

BioMARató
An activity that promotes the conservation of the marine environment by photographing as much fauna and flora of the Catalan coast as possible; the data are used in marine studies.

In addition to participating in the commemoration of **Margalef Year**, we created new dissemination materials in full lockdown (**L'Oceà a Casa**) and we explored the synergies between art and science (**Bosc Ancestral**).

The high number of dissemination projects, in addition to online participation, have made it possible to triple our target audience, especially among school children.

Margalef Year
A schedule of events to commemorate the centenary of the birth of the ecologist Ramon Margalef, a pioneer in high-quality marine research.

L'Oceà a Casa
Resources to allow children to discover the secrets of the ocean and to have fun during the lockdown at home.

Bosc Ancestral
A large mural in the entrance hall to the ICM by the artist Anna Rierola based on microscopy images provided by the Institute's scientists.

Communication

The recasting of the ICM's internal structures also required a new way of communicating science that is more in line with the Institute's mission and values.
In addition to completely restructuring the **website** and the **visual identity**, we created the **Outreach and Communication Unit**. We are thus beginning to act as a communication agency, professionalizing our communications and press releases and keeping in direct contact with the media to strengthen our visibility.
We already had a Twitter account, and our new presence on other **social networks** (Instagram, Facebook, LinkedIn and Youtube) has allowed us to increase our target audience and extend our communication with campaigns such as **#AnhelDeMar**.

#AnhelDeMar
An initiative to encourage members of the public to use a drawing, a poem or a video to express what the ocean gives them and how they would like to see it in the future with the hashtag #AnheloDeMar. The final video, with music by L'Últim Indi, was published on World Ocean Day.

Media appearances

'*Cranc blau, la plaga a taula*, l'espècie invasora més polèmica ha arribat per quedar-se' (TV3).
A report on the blue crab, one of the most voracious and controversial invasive species in the Mediterranean, featuring the ICM expert in crustaceans Pere Abelló.

'Òrbita Laika' (TVE).
An interview with geologist Gemma Ercilla to talk about the importance of having digital maps of the geology of the seabed to understand how the oceans react to climate change.

'Marine heatwaves: their devastating impact on wildlife' (Euronews).
A report on the devastating effect of marine heat waves on the Mediterranean ecosystem, and especially on corals, by the marine biologist Joaquim Garrabou on the Medes Islands.

'Associar-se a l'ecosistema Terra' ('Latituts', TV3).
A documentary that explains that the Earth functions as a great ecosystem in which life can evolve by association, with interventions by scientific staff such as the marine biologist Rafel Simó.

From the present to the future

We build the future we imagine for our ocean.

In these two years, we have built the foundations for taking a totally new approach to one of humanity's greatest challenges: the conservation of the marine environment.

Looking forward, **70 years after the creation of the ICM** and at the beginning of the **Decade of Ocean Science for Sustainable Development (2021–2030)**, we will continue to proceed towards excellence.

The **Severo Ochoa accreditation** will allow us to recruit 14 predoctoral and 6 postdoctoral fellows and to invest more than €1 million to reinforce our research activities.

The **Research Support Office** will continue to promote the development of talent and improve the work environment to increase the Institute's main indicators in terms of scientific production, social and economic impact, training, visibility and fundraising.

At the ICM, we are committed with the dissemination and communication of marine science, so that citizens and researchers together can build **the future we want for our ocean**.


Institut
de Ciències
del Mar

EXCELENCIA
SEVERO
OCHOA

CSIC