MINISTERIO DE CIENCIA E INNOVACIÓN

CSIC
CONSEJO SUPERIOR DE INVESTIGACIONES CIENTÍFICAS

FICHA DESCRIPTIVA JAE Intro ICU 2023

Becas de introducción a la investigación en el Instituto de Ciencias del Mar (ICM)

a. Correo electrónico de contacto: projectes-osr@icm.csic.es

b. Número de becas: hasta 8 becas.

c. Periodo y duración de cada beca: definida en cada plan de formación, la fecha de inicio se podría convenir con el/la investigador, preferible inicio 1 de octubre.

ICM-01: 6 meses; **ICM-02**: 10 meses; **ICM-03**: 7 meses; **ICM-04**: 10 meses; **ICM-05**: 6 meses; **ICM-06**: 8 meses; **ICM-07**: 6 meses; **ICM-08**: 10 meses

d. Importe de cada beca, mensualidades y dotación adicional: No hay dotación adicional.

ICM-01: 6.000€ (1.000€/mes).; **ICM-02**: 8.000€ (800€/mes).; **ICM-03**: 4.200€ (600€/mes).; **ICM-04**: 7.500€ (750€/mes).; **ICM-05**: 3.600€ (600€/mes).; **ICM-06**: 4.800€ (600€/mes).; **ICM-07**: 3.600€ (600€/mes).; **ICM-08**: 6.000€ (600€/mes).

e. Tiempo máximo semanal de dedicación de las personas beneficiarias de la beca: 20 horas.

f. Requisitos específicos de las personas solicitantes, además de los generales establecidos en la convocatoria:

1. Rama de Grado: Estar cursando el Grado en Física para el plan **ICM-05** y no estar en posesión o disposición legal de obtener un título de Doctor en el caso de todos los planes de formación.

2. Nota media del expediente académico de grado: definida en cada plan de formación. **ICM-01**: nota media 7; **ICM-02**: nota media 7; **ICM-03**: nota media 8; **ICM-04**: nota media 7,5; **ICM-05**: nota media 6,6; **ICM-06**: nota media 7; **ICM-07**: nota media 7,5; **ICM-08**: nota media 8,5.

3. Máster Universitario Oficial: Estar cursando en el curso actual o estar admitido o matriculado en el 2023-2024 en un Máster Universitario de los definidos en cada plan de formación.

   - **ICM-01**: Física, Química, Bioquímica o disciplinas afines;
   - **ICM-02**; **ICM-03**; **ICM-04**; **ICM-07**; **ICM-08**: Ciencias, Ciencias de la Salud, Ingeniería y Arquitectura, Artes y Humanidades, o Ciencias Sociales y Jurídicas;
   - **ICM-06**: Biotecnología molecular o Genética y genómica.

h. Planes de formación ofertados y personal investigador responsable:

ICM-01: Can we observe surface-induced intratubular flow with molecular dynamics simulations? Investigador responsable: Francesco Colizzi (fcolizzi@icm.csic.es)

ICM-02: Monitoring the contemporary biodiversity crisis in the Mediterranean Sea using digital data from recreational fishing. Investigador responsable: Valerio Sbragaglia (sbragaglia@icm.csic.es)

ICM-03: Facing a warming Antarctic Ocean: Penguin population responses to increasing water temperatures and sea ice retreat. Investigador responsable: Francisco Ramírez (ramirez@icm.csic.es)

ICM-04: Abundance of microplastics in cephalopods. Investigadora responsable: Cristina Romera Castillo (crisrc@icm.csic.es)

ICM-05: Dynamical impacts of riverine discharge trends in the ocean circulation in the Western Mediterranean Sea. Investigador responsable: Joaquim Ballabrera (joaquim@icm.csic.es)

ICM-06: Microbial sentinels from sediments from the Antarctic Red Lagoon in Deception Island. Investigadora responsable: Silvia González Acinas (sacinas@icm.csic.es)

ICM-07: Comportamiento predador en octopus: ¿son capaces de discriminar el sexo de sus presas? Investigador responsable: Roger Villanueva Lopez (roger@icm.csic.es)

ICM-08: Pain indicators in lobsters applying omics Investigador responsable: Guiomar Rotllant (guio@icm.csic.es)

i. Composición de la Comisión de Selección:

1) Presidencia: Valentí Sallarès Casas

2) Vocales:

   i) Marta Coll Monton, Vicedirectora de Estrategia Científica

   ii) Francesc Piferrer Circuns, Vicedirector de Transferencia de Conocimiento

3) Secretaria: Neus Figueras Balaña, Gestora de proyectos de la Oficina de Soporte a la Investigación

Firmado electrónicamente por la dirección del ICM

SALLARES CASAS VALENTI - DNI 37330495T

Firmado digitalmente por SALLARES CASAS VALENTI - DNI 37330495T
Nombre de reconocimiento (DN): c=ES, o=CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS, ou=CERTIFICADO ELECTRONICO DE EMPLEADO PUBLICO, ou=ICM, ou=37330495, serialNumber=IDCES-37330495T, sn=SALLARES CASAS, givenName=VALENTI, cn=SALLARES CASAS VALENTI - DNI 37330495T
Fecha: 2023.07.04 19:14:04 +02'00'

j. Descripción de los programas:

ICM-01: Can we observe surface-induced intratubular flow with molecular dynamics simulations? Investigador responsable: Francesco Colizzi (fcolizzi@icm.csic.es)

Tubular flows are common natural phenomena. Examples include blood and lymphatic flows in animals and xylem and phloem flows in plants. The main driving force for the flow is typically acknowledged to be a pressure gradient. Recently, an unexpected finding of an intratubular flow that occurs without the presence of a pressure gradient has been made (see for instance Li, Z. and Pollack, GH Surface-induced flow: A natural microscopic engine using infrared energy as fuel. Science Advances 6(19) 2020: eaba0941; DOI: 10.1126/sciadv.aba0941). This surprising discovery arose during the study of the properties of the so-called exclusion zone (EZ). The EZ is a region of structured aqueous solution next to various hydrophilic surfaces that effectively prevent the entry of particles and solutes. The molecular underpinning of the EZ-guided flow remains difficult to track. This project pursues the molecular investigation of intratubular flows in hydrogels with structure modelling and advanced molecular dynamics simulations at the nanoscale (Bonomi M, et al. Nature Methods 2019). This combination will offer new insight for the understanding of the molecular foundations underlying the generation of microscopic, surface-induced flow, fueled by infrared energy. In the long-term, we aim to translate such understanding into rules supporting the design of improved materials and nanotechnologies. The student task will include structural modeling of the system, advanced Molecular Dynamics simulations, and development of analysis tools.

We are a young and ambitious team that, with computer simulations as core technology, pursues highly interdisciplinary molecular research that ranges from computational molecular biophysics, plastic-degrading enzymes, to drug discovery and molecular evolution. We develop and apply molecular simulations approaches to impulse a paradigm shift in marine sciences based on the 3D and 4D (the 4th dimension being time) representation of biomolecular processes in the Ocean. We have tight collaborations with experimental groups at ICM and abroad, and we are embedded in the ICM-CSIC group ""Ecology of Marine Microbes (EMM)"" with excellent interdisciplinary expertise and infrastructures.

ICM-02: Monitoring the contemporary biodiversity crisis in the Mediterranean Sea using digital data from recreational fishing. Investigador responsable: Valerio Sbragaglia (sbragaglia@icm.csic.es)

The Mediterranean Sea is a global marine biodiversity hotspot, which is facing a biodiversity crisis. Many aspects of such crisis remain unsolved because of the lack of the necessary ecological and socio-economic information to guide decision-makers. Emerging digital research approaches (conservation culturomics and iEcology, which use digital data to study human-nature interactions and ecological patters) can fill this gap by providing an unprecedented volume of data to advance monitoring and research on biodiversity conservation from an ecological and human-dimension perspective. Recreational fishers play a central role for two main reasons. First of all, the impact of recreational fishing on marine ecosystems is not well understood due to constrains in monitoring activity. Therefore, the development of a cost-effective monitoring tool will increase our understanding of the impact of recreational fishing on Mediterranean ecosystems. Second, recreational fishing has a huge underexplored potential for monitoring marine ecosystems. For example, European marine recreational fishers are estimated to be around 8.7 million (1.6% of the total population), with an estimated 77.6 million days fished per year. Therefore, recreational fishing catches constitute a widespread spatio-temporal network of samples that - if properly analysed - can provide an unprecedented body of information, especially for marine environments where

sampling is constrained across time and space. This JAE project will be integrated within the context of my Ramon y Cajal research activity aiming to approach complex problems with an integrative research approach. The student will be introduced to the emerging research approaches of conservation culturomics and iEcology. Research activity will be developed at the Institute of Marine Sciences in Barcelona. The main responsibilities of the student will be related to: (i) mining digital data in R with a script that has been recently developed; (ii) analyse quantitative data about ecological and social aspects of recreational fisheries (iii) interpret results and participate in writing. The JAE project is open to be adjusted to meet specific expectations and support career goals of the student. The Institute of Marine Science is a unique and vibrant international community and offers support for career and talent development of young researchers in a safe and equitable environment. "Ideal" student is nice-to-having some experience about R, digital platforms, and English language (All are encouraged to apply even without such experience!).

ICM-03: Facing a warming Antarctic Ocean: Penguin population responses to increasing water temperatures and sea ice retreat. Investigador responsable: Francisco Ramírez (ramirez@icm.csic.es)

Polar regions are warming at a higher rate than any other region in the world. As a result, species inhabiting these formerly considered pristine areas are facing unprecedented environmental changes. This might be the case for penguin species inhabiting the Antarctic. Evaluating the impact of climate-driven environmental changes on penguin populations is a major challenge that can contribute to understand and predict how this community will adapt/respond to changing environmental conditions. Ultimately, this may contribute to effective management actions aimed at promoting the conservation of penguins and their associate ecosystems as a whole.
Through this Master Thesis we aim to evaluate demographic responses by penguins to global warming related processes. To this aim, we will combine available, long-term data on population sizes from colony censuses for penguins (https://www.penguinmap.com/) with remote sensing environmental information to evaluate species and site-specific responses to increasing water temperature and changes in sea-ice dynamics.
We are seeking a highly motivated and qualified TFM student to join our initiative. As her/his main tasks, the student will contribute to compile and analyse a unique dataset that will combine massive biological and environmental information. Through this project, the student will acquire a deep knowledge on how species are responses to main drivers of global environmental change. From a methodological point of view, the student will also acquire knowledge and skills on the acquisition, management and analysis of longitudinal data and time-series.
The student will join the project SOSPEN (PID2021-124831OA-I00), aimed at using penguins as 'sentinel' species for environmental health monitoring. Within this project, the student will have the possibility of interacting with other national and international researchers and students, thus developing transversal skills on interpersonal relationships, teamwork and communication skills.

ICM-04: Abundance of microplastics in cephalopods. Investigadora responsable: Cristina Romera Castillo (crisrc@icm.csic.es)

We are searching a student to do the master thesis (TFM) with us analyzing the content of microplastics in cephalopods. The tasks will be:
-Participation in the dissection of the animals
-Quantify and analyze the microplastics in the samples
-Data treatment
-Writing the master thesis

ICM-05: Dynamical impacts of riverine discharge trends in the ocean circulation in the Western Mediterranean Sea. Investigador responsable: Joaquim Ballabrera (joaquim@icm.csic.es)

Human socioeconomic activities and climate variability have an impact on riverine outflows. In the case of the Balearic Sea, rivers display declines of about 50% in the amount of freshwater being released from the continent to the ocean, indicating that previously reported climatological values are no longer useful. Taking into account that estimates of freshwater, using the previous climatological values, stated that rivers only provided one-third of the amount of evaporation, the new freshwater budgets may further increase the salinization processes in Mediterranean water, with potential effects on the thermohaline mechanisms driving the circulation of various water masses. In this work, we intend to use a state-of-the-art ocean model to investigate the ocean dynamical response to changes in continental freshwater fluxes in the northwestern Mediterranean Sea, a region known for being one of the few regions of deep water convection.

ICM-06: Microbial sentinels from sediments from the Antarctic Red Lagoon in Deception Island. Investigadora responsable: Silvia González Acinas (sacinas@icm.csic.es)

Microbes, including bacteria and archaea, play pivotal roles in biogeochemical cycling of nutrients, energy flow, and ecosystem stability. Their sensitivity to environmental changes makes them invaluable as indicators of environmental health, acting as vigilant sentinels even in the remote and delicate polar regions. This project aims to study microbial diversity based on analyses of 16S amplicon tags (metabarcoding) and metagenomes in two sediment cores from the Antarctic Laguna Roja in Deception Island, near the penguin Collado vapor, in order to gain insights into how these communities respond to environmental changes, including contamination from human activities. Measurements of contaminants such as heavy metals (e.g., Hg) and other trace metals, can provide critical information on the extent of human-induced pollution in Laguna Roja . The presence of contaminants in sediments can have detrimental effects on microbial diversity and functional capabilities. Understanding the intricate relationships between microbial diversity and contaminant measurements can help scientists assess the impacts of human activities on the Antarctic ecosystem and formulate effective strategies for conservation and management.

ICM-07: Comportamiento predador en octopus: ¿son capaces de discriminar el sexo de sus presas? Investigador responsable: Roger Villanueva Lopez (roger@icm.csic.es)

La principal presa de los pulpos en el medio natural son crustáceos. La presente propuesta pretende desarrollar un estudio sobre el comportamiento predador en el pulpo común, *Octopus vulgaris* para determinar su posible capacidad de selección de presas en base a su sexo. Las hembras ovadas de cangrejos presentan una composición bioquímica diferente a los machos debido al desarrollo del ovario y los huevos fecundados, ricos en lípidos, en tanto que los machos suelen alcanzar mayor tamaño y con ello mayor volúmen protéico. Estas diferencias podrían ser detectadas presumiblemente por quimioreceptores presentes en los órganos olfactorios y ventosas de los pulpos. El presente estudio pretende analizar mediante experimentos de comportamiento a realizar en laboratorio, la posible capacidad de los pulpos para discriminar y/o seleccionar el sexo de sus presas. La existencia de esta posible capacidad de selección de presas en base a su sexo no se ha determinado anteriormente en ninguna especie de pulpo. En caso de demostrarse esta capacidad, se podrían inferir posibles efectos de la predación selectiva de pulpos sobre la dinámica y sex-ratio de las poblaciones de crustáceos, particularmente sobre hembras ovadas y de las comunidades litorales de crustáceos. El diseño de los experimentos de comportamiento en laboratorio estarán

encaminados a obtener resultados contrastados estadísticamente y posterior redacción y publicación de un artículo científico.

ICM-08: Pain indicators in lobsters applying omics Investigador responsable: Guiomar Rotllant (guio@icm.csic.es)

Crustaceans produced in the EU are almost all wild-caught and sold alive, fresh or frozen. The welfare of animals reared or captured for food is becoming a fundamental aspect for European society. One of the most important consideration for European consumers is whether animals are treated humanely during breeding, transport and killing and they are the main drivers to introduce welfare practices. The European Food Safety Authority (EFSA, 2005) stated that "The largest of decapod crustaceans are complex in behavior and appear to have some degree of awareness. They have a pain system and considerable learning ability", and "all decapods should receive protection". Although EFSA statement, there is not a legislation in Europe that guarantees the well-being of crustaceans, with the exception of some national laws in Switzerland, Austria and Norway. In 2022, UK recognized that crustaceans are sentient beings and new legislation is under revision. The European Partnership on Animal Health and Welfare (the IP of this project is a member of this partnership) is developing scientific new evidence in animal welfare, including crustaceans. Hence, it is mandatory to develop indicators to evidence pain in crustaceans to protect them. As outlined in the EU Farm to Fork Strategy, the use of innovative technologies in regulatory science is critical for the transition to sustainable food systems, and EFSA (2021) is expecting to routinely apply omics by 2030. The goal of these new project is to increase our understanding of crustacean welfare during slaughter (e.g. pain, suffering and distress) and to identify pain indicators. The student will do experiment in Aquarium facility at ICM using a commercial stunner "Crustastun" and follow the behavior of stunned lobsters and control animals with video cameras to identify the lobster activity, once it is realized lobster will be dissected and she will sample the nervous system (X-organ-sinus gland from the eyestalks, brain, sub-oesophagic, thoracic and abdominal ganglia), freeze the different parts and keep the tissues at -80°C. RNA will be extracted and sent it for sequencing. She will perform the bioinformatic analyses of the transcriptomic data, trimming and annotation of the genes. Differential gene expression will be used to identify pain indicators and the organ responsible for it in crustaceans.