

INPHINIT RETAINING ICM-CSIC POSITIONS

Marker genes for phagocytosis in non-model marine protists

PI: Prof. Ramon Massana (ramonm@icm.csic.es)

Position

Project Title/ Job Position title: Marker genes for phagocytosis in non-model marine protists

Area of Knowledge: LIFE SCIENCES

Group of disciplines: LIFE SCIENCES

Animal, Plant and Environmental Biology, Physiology, Ecology and Conservation

Project description

The Ecology of Marine Microbes (EMM) Research group, based at the Institute of Marine Sciences (ICM-CSIC, Barcelona), integrates scientists from different disciplines and research topics that use complementary tools to address the ecological and functional role of marine microorganisms at different resolutions, from communities to species or ecotypes. I am the responsible of the group, which includes several PIs with complementary expertises in viral, prokaryotic and protistan ecology. In particular, my research is on the ecology of marine heterotrophic protists, with a focus on bacterivorous species that play a pivotal role in microbial food webs. We investigate the species forming these assemblages, their biogeography over global oceanographic scales, and access their genomes through single cell genomics. We are currently constructing hundreds of single cell genomes that will be used to recruit specific genes present and expressed in the environment through metagenomics and metatranscriptomics. We are also conducting gene expression experiments with a few selected cultured heterotrophic protists. We are searching for marker genes of bacterivory, in particular proton pumps, digestive enzymes and rhodopsins, recently found to be very diverse and prevalent in marine uncultured bacterivores

Job position description

The main objective of this PhD offer is to identify a few genes involved in phagocytosis that

are highly expressed during bacterivory and present across the eukaryotic tree of life. These genes will then be promising targets to study the important biogeochemical process of phagocytosis on marine bacteria (with implications in food webs dynamics, nutrients regeneration, and primary production) through the study of their gene expression. To achieve this objective, the PhD student will be involved in two main tasks. The first task will be to conduct differential gene expression experiments with protist cultures at contrasted physiological states, i.e. when actively phagocytizing bacteria for growth, and during the stationary phase when no bacterivory nor growth occurs. By performing these experiments with species from different eukaryotic supergroups (i.e. bicosoecids, choanoflagellates, euglenozoans), we will identify genes expressed during bacterivory in very distant taxa, thus revealing the core and ancient set of the phagocytosis machinery. The second task will be to construct solid orthologous families and phylogenetic trees for these genes including the widest representation of microbial eukaryotes. So, we will search for orthologous genes in the largest representation of microbial eukaryotic genomes (such as the EukProt database) as well as in novel genomes of uncultured species from our current collection of SAGs (Single Amplified Genomes) retrieved from single cells sampled at the BBMO (Blanes Bay Microbial Observatory). Moreover, these curated phylogenetic trees will be complemented with additional orthologous genes identified in marine metagenomes and metatranscriptomes, in order to capture the complete diversity of these functional genes. The final aim of this PhD research will be to propose a few functional genes whose expression is directly related to the critical biogeochemical process of marine bacterivory.

Group Leader

1. Title: Professor
2. Full name: Ramon Massana
3. Email: ramonm@icm.csic.es
4. Research project/ Research Group website: emm.icm.csic.es
5. Website description: Webpage of the EMM Research Group, containing a brief profile of its about 40 members (PIs, postdoctoral scientists, PhD students and technicians), Publications, and other Research outputs (Projects and PhD thesis).

Additional websites

1. Url: bbmo.icm.csic.es

Website description: Webpage of the BBMO (Blanes Bay Microbial Observatory), a monthly survey conducted by the EMM team in surface coastal waters since 2001 to characterize the abundance, activity, diversity and genomics of marine microbes.

2. Url: marbits.icm.csic.es

Website description: Web of marbits, a high-performance computing platform managed by the EMM team and devoted mostly to bioinformatic analyses.

3. Url: bbs.icm.csic.es

Website description: A web application to investigate the seasonality of picoeukaryotic taxa

during a monthly survey of 10 years at the BBMO, based in metabarcoding data of the V4 region of the 18S rDNA gene.

4. Url: **micromap.icm.csic.es**

Website description: A web application to investigate the biogeography of picoeukaryotic taxa along surface and vertical profiles taken from the circumnavigation cruise Malaspina, based in metabarcoding data of the V4 region of the 18S rDNA gene.

5. Url: **sag.icm.csic.es**

Website description: A web application to manage and retrieve genomic data from a collection of Single Cell Genomes of uncultured species obtained during the SINGEK project (www.singek.eu).

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