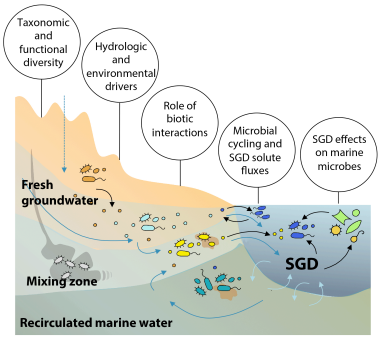
Title and Topic of the Thesis project

Groundwater discharge to the Mediterranean Sea from a microbial perspective: Diversity, functioning and connectivity at the terrestrial-marine interface

The discharge of groundwater from coastal aquifers to the coastal ocean (i.e., submarine groundwater discharge, SGD) represents a relevant hydrologic pathway, delivering large amounts of nutrients, pollutants and other terrestrial elements to the sea with large effects on coastal ecosystems. However, SGD-driven processes have been poorly studied from a microbiological point of view: On the one hand, the belowground mixing of seawater and groundwater (the so-called subterranean estuary) results in areas of active microbial activity and diverse communities that can modify the chemistry of the groundwater reaching the ocean, but almost nothing is known about the microorganisms inhabiting the underexplored coastal aquifers. On the other hand, SGD can largely influence marine microbial communities through the delivery of chemical compounds but also microorganisms, yet the potential consequences of these groundwater inputs on marine microbial communities, specially on planktonic microorganisms and the biogeochemical cycles they control, remain unknown.



The objective of the thesis will be to study the microbial dimension of SGD in coastal areas of the Mediterranean Sea, considering the diversity, functional potential and connectivity of microbial communities at this terrestrial-marine interface. The student will characterize the taxonomic and functional diversity of the microbial communities along the whole hydrologic continuum, from the coastal groundwater to the open coastal sea. Spatio-temporal samplings will be performed across different coastal aquifers sites in order to elucidate the microbial diversity hidden in these systems, its environmental drivers and its role in biogeochemical cycling at the land-sea interface. Second, the potential consequences of these groundwater inputs for the structure and functioning of marine microbial communities will be studied.

This PhD project integrates different disciplines (chiefly microbiology, hydrogeology and oceanography) and will combine field samplings, experimental manipulations and modern molecular techniques such as sequencing methods, microscopic visualization, and techniques that allow linking taxonomy to activity to gain insight into the microbial dimension of SGD processes. Most of the work will be done at the Institut de Ciències del Mar (ICM-CSIC, Barcelona) and will include a series of coastal field samples, as well as the possibility of participating in oceanographic cruises.

Requirements (see call link: https://cutt.ly/LgfKxoV)

- Degree in Biology, Biochemistry, Microbiology, Environmental Sciences, Bioinformatics, Marine Sciences, Biotechnology, or similar.
- Applicants must prove that they are accepted in a doctoral program at a Spanish university or that they will finish an official university master's degree that gives access to a doctoral program at the end of this academic year (June 2021).
- Good academic record. Good level of spoken and written English, good writing skills.
- Curiosity, desire to learn, to work in a team and to develop professionally in a multidisciplinary environment between the fields of microbiology, ecology, oceanography, hydrogeology, bioinformatics and molecular biology.
- Desire to travel, work in the field and know laboratories of other countries.

Work team and workplace

Project co-supervised by Dr. Clara Ruiz González at the ICM-CSIC (Barcelona, https://www.icm.csic.es), and Dr. Valentí Rodellas (Univ. Autònoma de Barcelona, UAB, https://mers.uab.cat). The selected candidate will join a multidisciplinary group with several doctoral students, technicians and post-docs (Ecology of Marine Microbes group: https://emm.icm.csic.es) in an institute that develops a large number of marine research projects of varied topics. The group maintains an important training commitment with its students to ensure maximum use of learning, and this includes participation in courses and conferences, stays in national and international laboratories, seminars and other training strategies. Specific research activities will also be carried out at the Marine and Environmental Biogeosciences Research Group of the UAB (https://mers.uab.cat).

Interested candidates should submit an application to the Call 2020 FPI Grants (https://cutt.ly/LgfKxoV) before 27h Oct 2020 14:00h, specifying the offer CEX2019-000928-S-20-2, Conservación y uso sostenible de los ecosistemas.
Applicants are also encouraged to send a complete CV, a short outline of research interests and experience and the contact details of two refeeres to clararg@icm.csic.es and Valenti.Rodellas@uab.cat. Do not hesitate to contact us for further questions regarding the project and the application:
Dr. Clara Ruiz González (clararg@icm.csic.es) Personal webpage: https://clararuizgonzalez.weebly.com
Dr. Valentí Rodellas (Valenti.Rodellas@uab.cat)