



# PhD in INGEGNERIA AMBIENTALE E DELLE INFRASTRUTTURE / ENVIRONMENTAL AND INFRASTRUCTURE ENGINEERING - 38th cycle

Research Area n. 3 - Environmental and Hydraulic Engineering and Geomatics

**THEMATIC Research Field: CITIZEN SCIENCE INNOVATIVE METHODS FOR THE  
BIODIVERSITY ASSESSMENT OF MARINE ENVIRONMENTS**

**Monthly net income of PhDscholarship (max 36 months)**

**€ 1225.0**

In case of a change of the welfare rates during the three-year period, the amount could be modified.

## Context of the research activity

**Motivation and objectives of the research  
in this field**

Oceans and seas are the largest connected ecosystem on Earth, driving the climate, and providing manifold services such as carbon sequestration and biotic and abiotic resources. They currently exhibit very high rates of biodiversity change and their environmental quality status is threatened by anthropogenic pressures. The EU Marine Strategy Framework Directive (MSFD), among different descriptors of the environmental status, it also requires the conservation of marine biodiversity. Unfortunately, the sheer vastness of the marine realm complicates status assessments at high spatio-temporal resolution for species, habitats, and ecosystems, which are the basis for efficient biodiversity protection and conservation measures. In this context, citizen science may play a significant role by creating synergies and managing trade-offs between stakeholder groups and enabling us to strive towards bold conservation measures and effective management strategies to protect marine environments. All aquatic organisms release DNA into the environment. These molecular traces are commonly defined as “environmental DNA” (eDNA) and can be used for identifying species from water samples. The use of eDNA-based methods is revolutionizing area-based conservation since organisms across the entire tree of life can be



	<p>since organisms across the entire tree of life can be detected non-invasively from the same sample. The high sensitivity of eDNA-based approaches makes them ideal for detecting elusive, rare, endangered or invasive species. In marine and coastal environments eDNA-based methods are gaining momentum for citizen science due to the ease of water filtration and the scalability of the approach.</p> <p>Aims of the PhD research, within the framework of the BIODIVERSA+ eWHALE project, will be:</p> <ul style="list-style-type: none"> <li>- to optimize the eDNA sampling workflow and showcase the practicability of participatory marine biodiversity monitoring for the generation of datasets with unprecedented spatial, temporal, and taxonomic resolution;</li> <li>- to compare the eDNA-based datasets to conventional monitoring methods;</li> <li>- to investigate how the eDNA citizen-science-based monitoring could be used to support the conservation of marine biodiversity.</li> </ul>
<p><b>Methods and techniques that will be developed and used to carry out the research</b></p>	<p>The analysis of the eDNA-based datasets for species' presence, population structure and potential identification of individuals will benefit from bioinformatics processes implemented by the computing infrastructure available at the partner institutions. Patterns of marine biodiversity will be analysed simultaneously to assess biodiversity composition through eDNA and compare it to available baseline data obtained with non-molecular methods in other research projects. eDNA sampling and its potential will be disseminated to potential stakeholders by providing online resources that will enhance participation. Moreover, changes in awareness for marine biomonitoring will be investigated through questionnaires before and after eDNA demonstrations to evaluate the potential to expand the participatory marine monitoring into a pan-European effort. Potential institutional stakeholders, such as environmental protection agencies or environmental authorities, will be involved to understand how to facilitate the incorporation of eDNA-based data in existing assessment frameworks for the management of marine environments.</p>



<b>Educational objectives</b>	Acquisition of the critical thinking and research skills to become independent scholars; Acquisition of research methods, either quantitative and deductive either qualitative and inductive.
<b>Job opportunities</b>	Research agencies, Research Institutions, industrial sector, public Bodies and Authorities involved in environmental policies.
<b>Composition of the research group</b>	0 Full Professors 1 Associated Professors 0 Assistant Professors 1 PhD Students
<b>Name of the research directors</b>	Arianna Azzellino

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<b>Additional support - Financial aid per PhD student per year (gross amount)</b>	
<b>Housing - Foreign Students</b>	--
<b>Housing - Out-of-town residents (more than 80Km out of Milano)</b>	--

<b>Scholarship Increase for a period abroad</b>	
<b>Amount monthly</b>	612.5 €
<b>By number of months</b>	6

<b>Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information</b>
<p>Universities, Companies, Agencies and/or National or International Institutions that are cooperating in the research:</p> <ol style="list-style-type: none"> <li>1. Universität Innsbruck, UIBK, Austria</li> <li>2. Universidade dos Açores, Portugal</li> <li>3. Institute of Marine Research, IMR, Norway</li> <li>4. Institut français pour l'exploitation de la mer, IFREMER, France</li> <li>5. University College Cork, UCC, Ireland</li> </ol>



Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): approximately 1660,00 euros per PhD candidate per year, on average.

Teaching assistantship (availability of funding in recognition of support to teaching activities by the PhD student): there are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability and desk availability: individual assignment for the entire career.