



BioProtect

BioProtect Biodiversity Toolbox

Solution description

MFRI



Summary

The BioProtect Biodiversity Toolbox includes a set of tools to facilitate mapping of marine biodiversity.

What it provides

In Situ Autonomous Biosampler

Biodiversity mapping and monitoring has traditionally been based on the manual identification of key taxonomic taxa. In recent years, environmental DNA (eDNA) is increasingly being used as a proxy for biodiversity, thanks to the decrease of the cost of DNA sequencing and the improvement of reference databases. Current methods for eDNA sampling are labour intensive, including the collection of water samples using Niskin bottles, filtration, and preservation of the eDNA. Automatic samplers can facilitate the collection of eDNA samples and accelerate the use of eDNA for mapping biodiversity, but few of the existing automatic samplers can be used in the deep-sea, where biodiversity mapping is really needed.


During BioProtect, we will enhance the In Situ Autonomous Biosampler (IS-ABS), extending its depth range from 150 to 1000 m. The IS-ABS was developed by CIIMAR (Interdisciplinary Center of Marine and Environmental Research, University of Porto) and INESC TEC (INESC Technology and Science). The IS-ABS can collect, filter and preserve up to 16 samples of eDNA in each deployment with similar efficiency as traditional methods. This tool can be deployed from a vessel, for example, using a CTD winch to obtain vertical profiles or fitted on an ROV, AUV or benthic lander.

Protocol for citizen science eDNA collection

Citizen science plays an important role in the BioProtect project. BioProtect will promote citizen science by engaging and training citizens to collect eDNA samples using small transportable devices. eDNA will be collected from ballast waters in ships entering harbours to improve detection and monitoring of invasive species and also from various locations along the coastline. BioProtect will provide sampling protocols detailing the methods regarding water sample collection, filtering and preservation of the eDNA and how to ensure sterility and avoidance of cross-contamination.

Deep sea biodiversity mapping camera

Underwater images (video and photographs) are essential for mapping the distribution of large epibenthic fauna like corals and sponges. In the deep-sea, high-



quality images are obtained usually by using ROVs, AUVs or towed camera systems which require the use of large research vessels and specialised crew, which limit their use.

The Azor drift-cam was developed by the Okeanos Research Centre and the Instituto do Mar at the Universidade dos Açores, in Horta, Portugal. The Azor drift-cam is a cost-effective video platform designed for rapid assessment of deep-sea benthic habitats, capable of obtaining high-quality images at depths up to 1000m. In BioProtect, the Azor drift-cam will be deployed from commercial fishing vessels, in a process of co-creation of biodiversity information with local fishing communities.

MAIA extension of open access image analysis software

The analysis of underwater images to identify and quantify the observed organisms is a very time-consuming process. In BioProtect we will promote the use of Machine Learning Assisted Image Annotation (MAIA). MAIA tools are already available in BIIGLE, a state-of-the-art marine image annotation software, widely used in marine science. BioProtect will enhance BIIGLE's MAIA tools, to improve the detection of marine organisms and other elements (e.g. litter) on the seabed. A common problem in the analysis of marine imagery arises when machine learning methods do not detect an object due to changes in background conditions. To deal with this challenge, BioProtect will develop self-supervised learning methods to train the tools to correctly identify organisms in diverse background conditions.

VME-ID application

Bycatch in commercial fisheries is a valuable source of information to infer the diversity and the distribution of vulnerable marine ecosystems (VMEs) like cold-water coral reefs and sponge aggregations, based on the occurrence of VME Indicator Taxa (VMEIT). BioProtect will develop the VME-ID app, a tool which allows fishers and fisheries observers to identify and report the bycatch of these taxa in a standardised way. The app will feature a user-friendly interface with high-quality images and descriptions and will support offline data entry with an automated data upload function.



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