Technologies to address environmental threats in the Mediterranean Sea: summary of SHAREMED studies and tests

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ABSTRACT

Here we present two examples of the activities performed by the SHAREMED partners to enhance and expand capabilities for monitoring biological properties with the final aim to assess potential environmental risks in the Mediterranean. The available or newly designed methodologies were analyzed and selected under WP3 and tests of their suitability were done under WP4 in the SHAREMED selected pilot sites.

Example 1. Monitoring benthic *Ostreopsis* blooms.

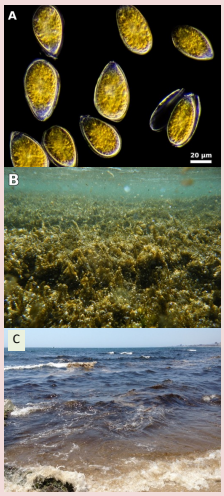
The problem. Sampling benthic microalgae, whether harmful or not, is not included in most routine monitoring programmes in the world. However, the expansion of benthic harmful species, such as *Gambierdiscus* spp., *Ostreopsis* spp. or *Prorocentrum lima*, involved in human health diseases, have increased research on the dynamics of their blooms. This requires adapted sampling procedures, transferable to enviromental agencies and different stakeholders.

The approach.

STEP 1. Developing and testing an standardizable and transferable sampling procedure (WP3)

- Sampling kits distributed to samplers of the Catalan Water Agency (CWA), training sessions by ICM scientists.
- Collection of macroalgae and freeze.
- Detach *Ostreopsis* cells by shaking the macroalgae in a known volume of filtered seawater, fix with lugol.
- Samples finally processed at the ICM. Unit: cells per gram of Fresh Weight of macroalgae.
- Shared data with samplers and the CWA. Information transferred by CWA to local authorities. Alert signes and information for beach users about health risks posted as necessary.

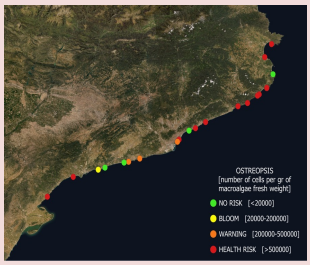
Sampling procedure during the training session by the ICM-CSIC partner to samplers of the Water Catalan Agency for monitoring Ostreopsis cf. ovata during the 2021 summer



A- *Ostreopsis* cells
B- *Ostreopsis* mucilage recovering the macroalgal community
C- Water discoloration caused by an *Ostreopsis* bloom

STEP 2. Organizing and visualizing data for assessment of human health risk: Contribution to the SHAREMED Atlas (WP4)

20 stations
2 years
180 samples



STEP 3 (Future). Forecasting potential drivers of Ostreopsis blooms using coastal biogeochemical models (WP5)

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Example 2. Monitoring hard bottom communities with the Autonomous Reef Monitoring Structures (ARMS).

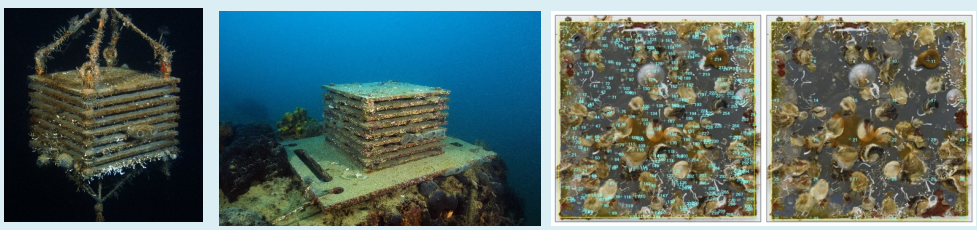
The problem. The physical properties of the hard sea bottom make difficult to observe and characterize the natural communities in these substrate. A novel methodology, the Autonomous Reef Monitoring Structures (ARMS) was explored to monitor hard bottom communities and assess their biodiversity, with a special focus on cryptic fauna in order to evaluate the anthorpogenic impacts on these communities as well.

The approach.

STEP 1. Selecting and testing an standardizable sampling procedure (WP3). The ARMS, designed by the Coral Reef of Division of the US NOAA was selected to be deployed in Porto Montnegro marina (Tivat, Montenegro) during one year, and recovered every 4 months. Photographies of the organisms were collected and biodiversity studies.

Benefits:

- Standardized methodology
- Compatible with DNA metabarcoding
- Cheap and fast deployment and recovery
- Global scale network
- Easy to compare results
- Non destructive sampling methods



ARMS structures under water. Left: deployed in the water column under the pier of the Port of Koper (Slovenia); center: deployed on the seabed at the coastal site at Fornače-Piran (Slovenia). Right: example of photographic analyses for biodiversity and biofouling tests.

STEP 2. Application to monitor anthropogenic impacts on hard bottom communities to ascertain changes in biodiversity and biological properties.

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